



# HOSPITAL EMPLOYEE HEALTH



THE PRACTICAL GUIDE TO KEEPING HEALTHCARE WORKERS HEALTHY

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RELIAS MEDIA

## Nurses Call for OSHA Regulation as Pandemic Takes Bitter Toll

*Hundreds of healthcare workers dead in CDC ‘underestimate’*

*By Gary Evans, Medical Writer*

The continuing onslaught of COVID-19 is decimating the ranks of U.S. healthcare workers, leading to calls for the Occupational Safety and Health Administration (OSHA) to issue an infectious disease standard requiring employers to protect medical staff.

OSHA had an infectious disease standard in the legislative pipeline, but it fell into political limbo after the 2016 presidential election led to a new antiregulatory environment. The recently proposed Heroes Act (H.R. 6800) would require OSHA to issue an emergency temporary standard to protect workers in hospitals,

meatpacking plants, retail stores, and other workplaces during the pandemic. Although stuck in the Senate, the proposed law also would prohibit employers from retaliating against

workers for sounding the alarm about unsafe conditions.

“There is no question that an OSHA infectious disease standard would prevent illnesses and deaths among healthcare workers,” says **David Michaels**, PhD, a professor of environmental and occupational health at George Washington University. “For the sake of the thousands

of healthcare workers not yet sickened by COVID-19, I hope that Congress can overcome this shortsighted

“THERE IS NO QUESTION THAT AN OSHA INFECTIOUS DISEASE STANDARD WOULD PREVENT ILLNESSES AND DEATHS AMONG HEALTHCARE WORKERS.”

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opposition and pass this important legislation.”

Michaels served as OSHA director during both terms of the Obama administration, shepherding the infectious disease standard and other regulations forward. Hospital groups have opposed OSHA regulations as burdensome, and the agency itself has said in recent congressional testimony that it currently has sufficient regulatory authority under its general duty clause to protect healthcare workers from COVID-19.

“The at least 400 deaths among nursing home and hospital workers are proof that just recommendations are not enough,” Michaels says. “We have to do better that. To hear hospital administrators say we don’t need this standard is unfortunate and tragic.”

As originally proposed, the standard would include a Worker Infection Control Plan (WICP). Employers would have been required to create a WICP for those at risk of occupational exposures to infectious diseases during patient care and other duties. In a provision that seems particularly germane to the situation, the standard called for worker protections to be reviewed and updated to meet the threat of new and emerging infectious diseases.

## Infections, Deaths

As of July 1, the Centers for Disease Control and Prevention (CDC) reported 88,763 COVID-19 infections in healthcare workers, with 483 deaths. However, the precise count is likely much worse, as the CDC data came from limited reports.<sup>1</sup>

Data were collected from 2,214,536 people, but healthcare

personnel status was only available for 477,371, the CDC noted. Of the 88,763 cases, death status was only available for 58,067.<sup>1</sup>

“The CDC reporting is not mandatory. That is really the problem. You are not required to report any of this,” says **Deborah Burger**, RN, president of the California Nurses Association and co-president of National Nurses United (NNU). “We are calling for federal OSHA to pass an emergency temporary standard on infectious disease to mandate that our employers give us the highest level of protection.”

Burger is not optimistic about their chances. “It’s gotten attention, but it has become a political pawn,” she laments. “We can’t even get a consistent public health message that everyone should be wearing masks. I have been a nurse for over 45 years and I never thought that the federal government would play such a large role in politicizing a public safety issue.”

A new regulation likely is a nonstarter politically, but current Principal Deputy Assistant Secretary of Labor for Occupational Safety and Health **Loren Sweatt**, BA, MBA, said the agency can protect workers without creating a new standard.

“While extensive guidance is important as the rapidly changing dynamic of this pandemic continues, it is important to recognize OSHA also has existing standards that serve as the basis for its COVID-19 enforcement,” she said at a recent congressional hearing. “Those standards include rules regarding respiratory protection, personal protective equipment [PPE], eye and face protection, sanitation, and hazard communication.”

U.S. Rep. **Alma Adams**, D-NC, chair of the House Subcommittee on Workforce Protections, gave a withering assessment of OSHA at the hearing.

“OSHA, the agency that this nation has tasked to protect workers, has been largely invisible,” she said. “It has failed to develop the necessary tools it needs to combat this pandemic and it has failed to fully use the tools it has.”

In March, OSHA rejected Alma’s request for an emergency temporary standard “on the grounds that the healthcare industry fully understands the gravity of the situation and is taking the appropriate steps to protect its workers,” Alma said.

Depending on the outcome of this year’s election, an infectious disease standard could be back on the table. California’s state regulation on infectious diseases might form the basis of an eventual federal standard, Burger says. Creating a standard before the next pandemic hits could prevent worker protections from politicization.

“Healthcare worker safety would be a bit more insulated from the political arena,” Burger says. “There is no reason we have to lose doctors, nurses, and other healthcare workers in an infectious disease environment if we are given the proper equipment.”

The mixed messages from political and public health officials have given the pandemic response an “Orwellian” tone, she says. “I can’t even wrap my mind around how crazy this whole thing is.”

Although it has always been the case, the situation has revealed how voluntary guidelines from the CDC can be diluted or simply ignored if there is no regulation behind them.

“It’s voluntary — you can follow these, or not,” Burger says. “We

know that the employers are going to do whatever they can to spend the least amount of money.”

## The ‘Terrible Reality’

There certainly are exceptions to that harsh assessment, but the infections and deaths of healthcare workers on the frontlines are strongly linked to the lack of PPE, particularly N95 respirators, says **Daniel Lucey**, MD, a professor of infectious diseases at Georgetown University.

“Something needs to be done,” he says. “The very terrible reality is that the strategic national stockpile did not get replenished with masks and N95 respirators after the influenza pandemic of 2009-2010. Why not?”

Other public health measures took precedent, resulting in insufficient supplies and shifting CDC guidelines, dropping from N95 recommendation to masks, and the widely criticized last resort of “bandanas and scarves.”

“The proof is in the numbers — the 84,000 — they didn’t have the PPE,” he says. “What is the CDC’s role? To say it is OK to use something that doesn’t protect you — a surgical mask when you need an N95, simply because we don’t have enough N95s? It has really damaged the faith of healthcare workers in the CDC, and there are still shortages now.”

After spending decades investigating pandemics and major outbreaks, Lucey’s grim take on the healthcare worker toll carries considerable weight.

“It is unlike anything I have ever seen,” he says. “It is an astonishing number of infections and deaths. It is going to continue to climb, hopefully not as quickly.” The healthcare workers who survived COVID-19

may still have health problems, both physical and mental, in the future, he notes.

The current situation does not bode well for the fall and winter, when there will likely be a “high tide” of COVID-19 cases during seasonal influenza, Lucey says.

“I think it is going to take some authority to make sure that we have enough tests, and it looks like it is not going to be the federal government,” he says. “The Trump administration has said it is up to the states. I really hope we use July and August to ramp up our testing.”

Healthcare worker flu vaccination also will be critical. Messaging to the public will emphasize the threat of a “double-barreled” viral season in 2020-21, says **William Schaffner**, MD, professor of preventive medicine at Vanderbilt University.

“With flu and COVID — not to mention RSV [respiratory syncytial virus] and all the other viruses — we fear a great surge of patients coming into the healthcare system,” Schaffner says. “At the moment, flu vaccine is the best intervention we have — not only to provide individual protection, but to mitigate the impact of a very substantial demand for medical care.”

## ‘We Are Expendable’

Will there be enough PPE to face such a surge? A recent NNU national survey of 23,000 nurses found the lack of PPE has become a chronic problem, leading to frequent reuse of equipment that was not designed to be reprocessed. The survey results included responses from union and nonunion nurses in all 50 states polled from April 15 to May 10. Overall, 87% of respondents reported reusing a single-use, disposable respirator or mask with

a COVID-19 patient. In addition, 28% of respondents had to reuse “decontaminated” respirators with confirmed COVID-19 patients, a practice equipment manufacturers do not recommend, the NNU reports.<sup>2</sup>

The survey results revealed 27% of nurses providing care to confirmed COVID-19 patients reported they were exposed without appropriate PPE and then worked within the next two weeks. In addition, 84% of respondents had not been tested for the novel coronavirus. Of those nurses who have been tested, more than 500 reported a positive result, and another 500-plus were awaiting results when surveyed.

“How can we protect our patients from COVID-19 if we ourselves do not know whether or not we are positive?” Burger asks. “Nurses are fighting to get tested.”

One-third of survey respondents reported having to use their own sick leave, vacation, or paid time off to miss work or quarantine if they acquire or are exposed to COVID-19.

The NNU argues illness caused by the novel coronavirus should be presumed to be occupationally acquired and covered by workers’ compensation. The nurse union is calling for states to pass bills ensuring nurses are protected with “presumptive eligibility” for COVID-19.

“Our employers won’t act to protect us on their own,” says **Zenei Cortez**, RN, co-president of the NNU. “They have totally disregarded the health and safety of nurses and the patients we [care for] every day. It was not a secret that a pandemic was coming. Nurses have been standing up and demanding infectious disease protections for years and years, during SARS, Ebola, and MERS.”

In addition to an OSHA emergency standard, the NNU is calling for implementation of the federal Defense Production Act to ramp up testing and PPE supplies.

“It’s been five months now and we haven’t gotten the adequate stores we need to provide care,” she says.

“We are still in the first wave of this, and we are reopening.”

Certainly, some healthcare worker infections and deaths were a result of the shortage of PPE, she emphasizes.

“We know that because in Spain, where they used the correct PPE, they had four deaths of nurses,” she says. “We know when the proper equipment is used, there are fewer deaths.”

As CDC mask and respirator messages started out strong and steadily weakened in the face of shortages, the message to nurses was “we are expendable,” Burger says. ■

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# Universal Masking Could Blunt COVID-19 Surge

**G**rowing evidence shows universal masking in public could dampen the feared “second wave” of COVID-19, says **Monica Gandhi**, MD, MPH, an infectious disease physician at the University of California, San Francisco.

“I am profoundly hopeful of that when I look at other countries,” she says. “As they open up, the most effective measure to prevent resurgence is universal masking.”

Although the issue may be hopelessly politicized, universal masking is considered the best option to reopen the economy amid a continuing pandemic.

Gandhi cites a study of a

coronavirus outbreak on a cruise ship where all passengers were issued surgical masks. Researchers found 81% of those who tested positive for COVID-19 remained asymptomatic.<sup>1</sup> In a paper in press, Gandhi and colleagues propose an “inoculum” theory hypothesizing masks lower the viral dose emitted and received in a setting of a universal masking.<sup>2</sup> It is well established that a mask acts as source control, protecting others from the wearer.

“But there is a second benefit that has received less attention,” Gandhi and co-authors noted. “Exposure to a lower inoculum or dose of any virus (whether respiratory, gastrointestinal,

or sexually transmitted) can make subsequent illness far less likely to be severe. Increasing rates of asymptomatic and mild infection with COVID-19 seen over time, in the setting of masking, supports this theory.”

Lower rates of COVID-19 mortality are documented in Asian countries where wearing a mask in public is a cultural norm, the authors emphasized.

“While there is some correlation between universal masking and number of COVID-19 cases, there is a near-perfect correlation between public masking and suppression of COVID-related death rates,”

they concluded. “Case fatality from COVID-19 is universally low in regions with universal masking.”

## Changing the Message

There is confused messaging and political divisiveness on this issue, with the initial rationale that wearing a mask is to protect others. Gandhi argues that in a public setting, surgical masks may afford the wearer some protection by lowering the viral inoculum inhaled.

“The beginning message was that it protects others. But in a society that has not exactly been altruistic — especially in the current climate — that has not been the most effective way to convince people to wear masks,” she says. “The message needs to be that masks protect both. It protects others and it protects you, as well. It makes sense that it would protect you. You can’t contract it directly through your skin; you

get it into your body through your mouth or nose. Wearing a mask also protects you from touching your mouth and nose.”

Mask-wearing in public is not a cultural norm in the United States, Gandhi concedes, but notes that neither is mass isolation of people in their homes.

“We have figured out a lot about this virus in the last few months,” she says. “Before it was ‘radioactive’ — can you touch a surface and get it? We [know] that it is shed from the nose and mouth. That makes it so simple in a way; all you have to do is cover the nose and mouth.”

There could be some benefit if any resulting infection is mild or asymptomatic, particularly if it is found that such cases develop immunity and thus increase protection of the herd.

“As the economy opens up, universal masking may not prevent exposure but potentially lead to only mild disease,” Gandhi and

colleagues stated. “One model found that if 80% of the population wears a moderately effective mask, nearly half of the projected deaths over the next two months could be prevented.<sup>3</sup> That means less illness, fewer deaths, and a safer reopening of society.” ■

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# Have 1 Million Healthcare Workers Been Infected in Pandemic?

*CDC: 10 uncounted cases of coronavirus for every one reported*

It is possible 1 million healthcare workers have been infected with COVID-19, as public health officials report there likely are 10 unknown cases for every one that is documented.

As of July 1, the Centers for Disease Control and Prevention (CDC) reported 88,763 COVID-19 infections in healthcare workers with 483 deaths.<sup>1</sup> However, the precise count likely is much worse, as the CDC data came from limited reports. These limitations include the many asymptomatic cases or

those with symptoms who were never tested.

“[That is] one of the realities because this virus causes so much asymptomatic infection,” CDC Director **Robert Redfield**, MD, said at a recent press conference. “Again, we don’t know the exact number. There are ranges between 20%, as high as 80% in different groups. The traditional approach of looking for symptomatic illness and diagnosing it obviously underestimated the total amount of infections.”

The CDC is using more

serology tests and the new assays for antibodies, Redfield added. These diagnostics clearly suggest the numbers are much higher than the official tallies, perhaps by a range of multiples from 5 to 1, to 12 to 1, he noted.

“I think a good rough estimate right now is 10 to 1,” Redfield said. “I wanted to highlight that because at the beginning, we were seeing diagnosis in cases of individuals who presented in hospitals, emergency rooms, and nursing homes. We were selecting for symptomatic or higher-

risk groups. There wasn't a lot of testing that was done of younger-age, asymptomatic individuals."

That means roughly 90% of the outbreak has been the bottom of the iceberg for both healthcare workers and the general public, at least for March through May. "We are continuing to try to enhance surveillance systems for individuals

who are asymptomatic to be able to start detecting that asymptomatic infection more in real time," he says.

Redfield did not try to extrapolate the ratio to patient and healthcare worker deaths, but the CDC concedes the latter are based on partial data that underestimates the total.

Of the 88,763 cases in health-care workers, death status was only

available for 58,067, the CDC notes. Applying the tenfold formula to the national case count as of June 25 reveals a staggering 24 million cases. ■

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# The Effects of COVID-19 on the Brain

*Dual risk to HCWs of infections, stress of pandemic*

**H**ealthcare workers and patients who have acquired SARS-CoV-2, particularly if they were hospitalized, could be at risk of neurological deficits in the short term as well as long-term cognitive problems, says **Majid Fotuhi**, MD, PhD, the lead author of a new paper on the effects of COVID-19 on the brain.<sup>1</sup>

"For healthcare workers, there are two issues," says Fotuhi, medical director of NeuroGrow Brain Fitness Center in McLean, VA, and an affiliate staff member at Johns Hopkins Medicine. "One is the impact of SARS-CoV-2 virus itself [on the] brain. The other is the stress of the COVID-19 pandemic, seeing patients die before their eyes. That causes post-traumatic stress disorder [PTSD]. I think we need to monitor frontline healthcare workers even more closely [than patients] because the stress response in our body can actually harm the brain significantly."

Anosmia, "stroke, paralysis, cranial nerve deficits, encephalopathy, delirium, meningitis, and seizures are some of the neurological complications in patients with COVID-19," Fotuhi and co-authors noted. "There remains a challenge to determine the

extent to which neurological abnormalities in COVID-19 are caused by SARS-CoV-2 itself, the exaggerated cytokine response it triggers, and/or

**"WE NEED TO MONITOR OUR HEALTHCARE WORKERS DEALING WITH COVID-19 PATIENTS CLOSELY. THEY MAY HAVE SECONDARY HARM DUE TO PTSD, EVEN IF THEY DON'T HAVE THE VIRUS THEMSELVES."**

the resulting hypercoagulopathy and formation of blood clots in blood vessels throughout the body and the brain."

The article authors reviewed neurological problems reported in COVID-19 patients and proposed

a basic "NeuroCovid" classification scheme.

"Keeping accurate registries of COVID-19 patients with neurological deficits may enable us to establish plausible connections with aging-associated and neurodegenerative disorders such as Parkinson's disease in the future," the authors concluded. "Standardized evaluations such as quantitative EEG, fluid biomarkers, cognitive evaluations, and multimodal neuroimaging can also lend insight to possible long-term neurological sequelae in COVID-19 such as depression, memory loss, mild cognitive impairment, or Alzheimer's disease."

The authors identified three distinct NeuroCovid neurological categories or stages:

- **Stage I:** The virus damage is limited to epithelial cells in the nose and mouth. "Ninety-five percent recover without any problem," Fotuhi says. "These are the patients who are least likely to have long-term neurological problems."

- **Stage II:** Patients may experience blood clots in their brain partially caused by an inflammatory immune response called the "cytokine storm." This can result in mini-strokes that may cause cumulative neural damage.

“We can take care of large strokes the same way we do in patients that do not have COVID-19,” Fotuhi says. “But when they have small strokes, the patient may have no symptoms, an MRI is not done, and no one knows what this patient has suffered. These patients, long term, are likely to have depression, memory loss, and other neurological [problems].”

• **Stage III:** This damages the blood-brain barrier, which protects blood vessels of the brain, causing seizures or encephalopathy.

“The cytokine storm is so huge that it ruptures and damages the blood-brain barrier, such that the virus particles get inside the brain along with the inflammatory markers,” Fotuhi says. “When that happens, there is significant damage

to the brain cells. These are the patients who I think will have the highest degree of neurological issues in the future.”

There are blood tests to measure the intensity of the inflammatory immune response, which may be responsible for the relatively rare severe infections in younger people. “It is the body’s own immune system that harms the patient,” he says.

In healthcare workers, the neurological effects of COVID-19 could be compounded by the stress of fighting the pandemic.

“The more stressed you are, the more the part of your brain for memory — the hippocampus — shrinks,” Fotuhi says. “Frontline healthcare workers dealing with patients in dire situations experience an extreme amount of stress. The cortisol that is

produced in response to stress indirectly harms the hippocampus. We need to monitor our healthcare workers dealing with COVID-19 patients closely. They may have secondary harm due to PTSD, even if they don’t have the virus themselves.”

PTSD can harm areas of the brain affecting regulation of emotion, memory, and executive functions, he adds.

Overall, the basic measures to boost brain performance, regardless of patient history, include vigorous exercise, stress reduction, and eight hours of sleep nightly, he recommends. ■

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# Seize the Day: Make COVID-19 Count

*Employee health should emphasize their critical role*

**A**lthough they have paid a high price for recognition, nurses are among the high-profile heroes on the frontlines of the COVID-19 pandemic. The profession has an opportunity to leverage this moment to improve their status and standing in healthcare, says **Lori Armstrong**, DNP, RN, NEA-BC, chief executive officer and chief clinical officer for Inspire Nurse Leaders.

*Hospital Employee Health* asked the nursing leadership consultant to share her thoughts on the effect of the COVID-19 pandemic in the following interview, which has been edited for length and clarity.

**HEH:** You note that public recognition during the pandemic gives nursing leaders momentum to make real and necessary change.

**Armstrong:** Nursing has captured global attention, and rightly so (and probably long overdue). The critical role nurses play in the health and well-being of patients and their families has been talked and written about during pandemic. The nurses have really been the lifeline for the family because of isolation requirements. I began to share with my colleagues and team that we have to hold on to this global recognition and attention and do something with it. I like to call it “making COVID count.” Making it count in a way to re-imagine the future of nursing and how we impact the health and well-being of the nation and the world.

**HEH:** What do you think of the calls for new legislation or regulations to protect nurses and

frontline workers during and after the pandemic?

**Armstrong:** As much as I am opposed to politicizing COVID-19, I think that all elected officials have a great responsibility for their next steps. I think what COVID-19 has brought to light are many cracks in the armor. The supply chain issue is not the result of one or two years. The supply chain issue and our inability to provide proper personal protective equipment for nurses and other healthcare workers is the result of decades of policymaking and decisions by private businesses. I urge every healthcare worker and organization to come together to solve this problem. There is not one solution — it is so complex. We have to come together in unity to

address such a national problem that continues to put healthcare workers in harm's way. We can't allow that.

**HEH:** Some of these same concerns were raised during the 2014-15 Ebola outbreak in West Africa. How is this different?

**Armstrong:** When I compare them, I think it is an order of magnitude. Ebola was very scary, but when it came to the United States, it was in isolated incidents. [COVID-19] has hit every part of the country. Yes, certain cities have been the epicenters, but the magnitude has made it a real and present danger. Ebola waxed and then waned, and other priorities took over in public health. The protection of our healthcare workers in delivering care and protecting themselves took a second, third, fourth, 10th seat.

**HEH:** What other things can come out of this pandemic for nursing?

**Armstrong:** I think it is essential that nursing is viewed as the critical link to good outcomes. We measure trust and respect of professions every year through a national Gallup Poll. Every year, nurses rank as the most trusted profession. But despite this, we are not always the decision-makers in healthcare at the organizational level or the state and national level. Nurses need to come together as a

profession and seize this opportunity to make sure our voices are heard. We need to cement our role as the critical voice in the delivery of healthcare.

**HEH:** How has the pandemic affected employee and occupational health, and keeping healthcare workers healthy?

**Armstrong:** Their leadership should take stock of where they are in the organization. Are they on the right committees? Do they have a seat at the table where policy decisions are made? Quite often, I find that certain smaller departments are not in the conversation. They need to be. They need to seize this opportunity because they play such a significant role in keeping our employees safe and healthy. They need to make sure their voices are heard. I would recommend they partner immediately with their nurse leadership colleagues and their physician leaders. When you have that collaboration in occupational health with a physician leader and the chief nursing officer, that is one strong, unified voice.

To have a seat at the table, they have to have data. The data from within their own organization [showing] what their impact is, and what opportunities there may be to improve. We might be coming out the other side of COVID-19 now,

but we don't know what the winter is going to look like. I would encourage occupational health and safety leaders to make sure they learn from their current experience and are prepared for the winter.

## Be Courageous

Armstrong offers the following tips for employee health professionals and healthcare workers:

- **Be courageous.** "It's time for nurses to stand up and speak out on behalf of themselves and their patients," she says. "Nurses must always be professional and well prepared, but they must also learn to use their voices to lead from wherever they are."

- **Humanize the facts.** "Use irrefutable facts, combined with real stories about real people — a powerful combination," Armstrong advises.

- **Invite yourself.** "Don't wait for an invitation," Armstrong says. "Take the initiative to show up at important meetings and reach out to influential people."

- **Invent, innovate, and inspire.** "Don't miss the opportunity to reinvent yourself, your team, and your community," she says. "Sometimes, innovation is in plain sight." ■



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# Limiting Aerosolization, Droplet Spread of COVID-19

*Avoid high-velocity gas flow procedures, if possible*

The authors of a new study on limiting aerosolization and occupational exposures to COVID-19 outlined methods to interrupt disbursement of the novel coronavirus. They also made several recommendations for consideration.

“Methods for prevention of respiratory viral infections depend upon their propensity to be carried in respiratory droplets or as fine droplet nuclei (airborne transmission),” the authors stated. “The respiratory transmission of SARS-CoV-2 virus that causes COVID-19 is mainly by respiratory droplets. Respiratory transmission of this virus via aerosols has not been definitively established, but is possible under certain circumstances.” These include aerosol-generating procedures (AGPs) such as intubation and bronchoscopy.

“[AGPs] generate potential infectious bioaerosols by provoking coughs and are associated with increased infection rates among employees working in healthcare,” the authors reported. “In contrast, AGPs such as oxygen therapy, use of humidified

high-flow nasal cannula, noninvasive ventilation, and manual ventilation via mask are less about ‘generating’ bioaerosols and more about ‘dispersing’ aerosols farther away from the patient.”

The paper’s recommendations, consistent with Centers for Disease Control and Prevention guidelines, include:

- Avoid procedures that irritate airways and provoke violent coughing. Reduce the exposure to infectious aerosol. The authors stated that “rapid sequence intubation is preferable because bioaerosol production is reduced by inhibiting patients’ breathing efforts and coughing with neuromuscular blockade and deep sedation.”
- Stay six feet away from infected patients when possible, especially if the patient coughs or sneezes. Increasing air exchange frequency also helps reduce the bioaerosol concentration in the room air.
- “Institute barriers to filter virus or reduce virus dispersion, e.g., by placing a filter at the exhalation port of the mechanical ventilator

or connecting a filter to the oxygen mask,” the authors noted.

- Place a surgical mask on spontaneously breathing patients, or use tissue to cover the mouth or nose, especially when the patient is coughing, sneezing, or talking.
- “Open systems with high-velocity gas flow, such as a vented NIV mask, should be avoided,” the authors recommended. “Likewise, when invasive ventilation circuits need disconnection, such as changing an in-line suction catheter or switching ventilators, the endotracheal tube might be clamped and the ventilator turned off before disconnection.”
- Practice good hand hygiene and respiratory hygiene, including use of personal protective equipment such as N95 respirators. ■

## REFERENCE

1. Dhand R, Li J. Coughs and sneezes: Their role in transmission of respiratory viral infections, including SARS-CoV-2. *Am J Respir Crit Care Med* 2020; doi: 10.1164/rccm.202004-1263PP. [Online ahead of print.]



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# Hospital Uses N95 Reprocessing System

*Masks not reprocessed if soiled or exposed to liquid*

A lack of personal protective equipment (PPE), including N95 respirators, was one of the major reasons why hospitals nationwide closed their operating rooms (ORs) to elective surgery during the COVID-19 pandemic.

A new study suggests a solution that involves disinfecting N95s so they can be safely reused. A team that includes surgeons devised a reproducible and scalable process for disinfecting N95 respirators.<sup>1</sup>

The team developed a disinfection process that includes vaporized hydrogen peroxide (VHP) and ultraviolet radiation, says **Shaina R. Eckhouse**, MD, FACS, assistant professor of surgery at Washington University School of Medicine in St. Louis.

N95 respirator masks and other PPE were in short supply in March and April, so the health system followed federal guidelines for extending their use.

“We ran our first N95 disinfection run on April 1,” she says. “If the N95 has visible soilage or is exposed to any liquid, we discourage disinfection and strongly recommend getting a new N95 mask.”

Eckhouse wears an N95 respirator with a regular mask over the respirator while in the OR. Her own N95 respirator was disinfected twice over a three-week period. “I put a mask over [the respirator] to help protect it and to prevent gross soilage,” she explains.

Everyone receives his or her own N95 because it ensures these will fit them well and it provides some sense of security. Each disinfection process takes 24 hours. Since everyone

owns one N95 respirator, they were encouraged to wear the same N95 until they have a day off.

When they send out their N95 respirator for cleaning, it is labeled so the respirator will be returned to the original user. Unless the N95 is damaged or contains visible soilage, it can be disinfected up to 20 times, Eckhouse notes.

## Disinfection Process Is Effective

The disinfection process has worked well and was extended to multiple hospitals, post-acute care facilities, and to surgery centers in the region.

“We have one surgical center that is open and that will start using our N95s,” Eckhouse reports. “They do time-sensitive cases — it’s not an emergency, but if surgery is not performed the function of the limb will be undermined with waiting.”

The disinfection process works as follows:

- **Pick up the N95.** The healthcare provider places the used N95 respirator in a Tyvek pouch and closes it with self-sealing adhesive tape. The pouch is labeled with the person’s employee identification number or name, the hospital and department, and the unit’s location.

Every 12 hours, someone picks up the pouches, inspects them for proper labeling, and transports them to the VHP room.

“The N95s are picked up in the evening, at the end of a shift. First thing in the morning, 7:30 a.m., we start the VHP process, which takes a

little less than four hours,” she says. The Tyvek pouches are not reused.

- **Designate disinfection area.** “We have a completely separate ... four-room area for the vaporized hydrogen peroxide disinfection room,” Eckhouse says. There also is an aeration room, a common workspace, and a soiled utility area. The areas include access to hand hygiene and eye washing stations.

The N95 respirator collection bins are staged on wire racks in the soiled utility area. When the VHP room is sealed and closed, the Bioquell Z-2 disinfection cycle starts, lasting 4.5 hours. After each disinfection cycle, biological indicators are used to show whether the disinfection cycle was successful. This is followed by aeration.

- **Drop off N95.** After aeration, the disinfected N95 respirators are placed in new Tyvek pouches and dropped into clean bins. They are arranged alphabetically and returned to pick-up locations.

As hospitals stock up on N95 respirators, collecting enough to last for a month or so, they could issue two to each employee who needs them. This way, an employee could wear one while the other is cleaned and not have to schedule the disinfection process for their days off. “Our hope is that we created a process that is reproducible in a quick manner,” Eckhouse says.

Evidence-based disinfection processes are another resource for healthcare providers to employ when PPE are in short supply, she notes.

Creating a safe and effective disinfection process for N95 respirators makes it possible for

hospital ORs and surgery centers to reuse the equipment during a crisis and PPE shortage. This disinfection process also could prove helpful to surgery centers as they reopen for elective procedures.

“Now that we have this process in place, we are hoping to get back to elective surgery here in the near future,” Eckhouse says. “I am a bariatric surgeon, truly elective

surgery. I’m involved in perioperative services leadership.”

When the pandemic and PPE shortage are over, some may begin to use N95 respirators as single-use items again.

“Once the demand drops, and N95 supply increases, we’ll go back to normal uses of N95 respirators,” she says. “But in the future, if another pandemic hits, we can utilize the

processes we’ve developed to set up this in a shorter time frame.” ■

## REFERENCE

1. Grossman J, Pierce A, Mody J, et al. Institution of a novel process for N95 respirator disinfection with vaporized hydrogen peroxide in the setting of the COVID-19 pandemic at a large academic medical center. *J Am Coll Surg* 2020;S1072-7515:30349-30355.

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## Simulation Can Improve Staff PPE Safety

It is important for healthcare workers to learn and practice the correct way to wear personal protective equipment (PPE). One helpful technique is to use medical simulation.

“You want to be confident in your personal protective equipment when you go to work, enter a room, and intubate a patient,” says **Patrick Hughes, DO, MEHP, FACEP, FACOEP**, emergency medicine residency assistant program director, assistant professor of integrated medical science, and director of the emergency simulation program at Florida Atlantic University’s Schmidt College of Medicine.

Hughes led a team that developed a simulation that is inexpensive, easy to create, and effective. “We developed a solution with the inside of a highlighter. You put the highlighter refills into warm water,” Hughes explains. “It leaks into the warm water, and then we spray the water on a mannequin.”

The highlighter creates a fluorescent solution, which can be put in a spray bottle. After soaking, the solution can sit for a few minutes. Hughes’ simulation lab typically sprays a mannequin within five minutes of starting the simulation. It

does not matter whether the spray is wet or dry when the simulation starts, he notes.

The staff don their PPE and perform a simulation of a common operating room task or nebulizing treatment. Then, the surgery center’s infectious disease leader can turn on a black light to show how the simulated contagion spread.

“We have them go out and see if there is any contagion on them after they took off their PPE, and 25% of participants might have some fluorescents on their forehead or face that they touched while contaminated,” Hughes reports.

For a hospital environment, the simulation scenario goes like this: A member of the staff roleplays a patient in respiratory distress. “They do a history and physical exam, and then the patient needs an airway intervention,” Hughes says. “They do a nebulizer treatment on the patient.”

This shows how using the nebulizer can put viruses like the SARS-CoV-2 into the air. “The person finished the procedure, and we have them care for the patient. At the end, we turn off the light in the room and shine the UV light on participants to show them all of the contagion,” Hughes explains.

“Then, we turn the light back on and have them take off their PPE in the manner they were taught. We reuse the UV light to see if anything was left on them.”

Seeing the visual impact of their PPE mistakes allows managers and staff to correct their use of PPE in real time. “For instance, one person had some left on their cheek,” Hughes recalls. “When they had taken off their outer gloves, they had touched the under glove with the contaminated outer glove. Then, they touched the side of their face with their contaminated glove and left some of the solution on their face.”

Healthcare facilities can create a simulation that more closely reflects an operating room, presurgery procedure. The materials cost less than \$25, and the mannequin can be anything that might work with the equipment used in the simulation.

“This is something that can be done in any hospital or surgery center. You don’t necessarily need a high-fidelity simulator,” Hughes says. “We found that people liked the extra training and refresher course on using personal protective equipment. They liked the fact that we showed them how contaminated they were at the end of the scenario.” ■



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## CE QUESTIONS

- 1. During congressional testimony about the COVID-19 pandemic, Occupational Safety and Health Administration (OSHA) Administrator Loren Sweatt, BA, MBA, said:**
  - a. OSHA cannot adequately protect healthcare workers without an emergency standard.
  - b. OSHA requires universal use of N95 respirators by all healthcare workers.
  - c. existing standards can be used to protect healthcare workers.
  - d. many state OSHA plans are going above and beyond the federal respiratory requirements.
- 2. A study revealed a “near-perfect correlation” between public masking and suppression of COVID-19:**
  - a. mortality rates.
  - b. in indoor common spaces.
  - c. asymptomatic infections.
  - d. neurological symptoms.
- 3. Centers for Disease Control and Prevention Director Robert Redfield, MD, said novel coronavirus testing early in the pandemic selected out:**
  - a. asymptomatic cases.
  - b. symptomatic or higher-risk groups.
  - c. a 10-to-1 ratio of known cases to unknown.
  - d. emergency department workers.
- 4. Majid Fotuhi, MD, PhD, said COVID-19 in healthcare workers can cause neurological damage compounded by stress. The cortisol that is produced in response to stress primarily harms which part of the brain?**
  - a. Cerebellum
  - b. Thalamus
  - c. Medulla
  - d. Hippocampus

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