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Without training, N95 masks may not protect workers on the Covid-19 frontlines

By Joseph G. Allen *and* David Christiani

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A key strategy for protecting health care workers on the frontlines of fighting the highly transmissible novel coronavirus, SARS-CoV-2, is the use of personal protective equipment, including the type of face mask known as an N95 respirator or N95 mask. When used properly, these masks filter out *at least 95%* of airborne particles. But used without training, the masks could not only expose workers to

the virus but also lull them into thinking they are protected.

Firefighters aren't given a mask and helmet and sent into burning buildings without first being trained how to use the equipment to protect themselves. We should be doing the same thing for health care workers, but that doesn't seem to be standard operating procedure.

You can see this for yourself with a quick scan of videos or photos in media outlets showing first responders and hospital workers. Many aren't wearing their personal protective equipment correctly. For example, N95 respirators work only if there is a tight seal around the face, something that is not possible in someone with a full beard. For people with facial hair, the appropriate protection is a [positive pressure, full-face powered air-purifying respirator](#).

Health care workers are at high risk of contracting Covid-19 for several reasons: exposure to many patients with Covid-19 who are shedding the virus, lengthy exposure during extended shifts, and increased frequency of exposure because of repeated shifts caring for Covid-19 patients. This is compounded by a lack of capacity to treat all Covid-19 patients what are known as airborne infection isolation rooms. These are single patient rooms designed to contain airborne pathogens using ventilation control techniques.

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The overall result is that health care workers are relying on personal protective equipment as a strategy to prevent becoming infected with SARS-CoV-2. Much of the national attention has been focused on the shortage of respirators, like N95 masks (the 95 refers to the fact that these masks filter out 95% of the tiny particulate matter in the air), and this remains an area of deep concern. But the inappropriate use of N95 masks is also putting health care workers — and patients — at risk.

Lost in the discussion about personal protective equipment is that it should be used as a last line of defense. The National Institute for Occupational Health and Safety (NIOSH) uses what's known as the [hierarchy of controls](#) to rank the effectiveness of and preference for intervention strategies.

The first goal is to eliminate a hazard or substitute it out, neither of which are possible for health care workers treating patients with Covid-19.

Next come engineering controls, such as airborne infection isolation rooms, which constantly replace the air in the room with 100% outdoor or filter it for particulate matter like dust, viruses, and bacteria. CDC guidance recommends the use isolation rooms for patients using CPAP or BiPAP machines, which can push viral particles into the air, though many hospitals are converting other areas of hospitals into negative pressure spaces.

The second to last strategy includes administrative controls designed to reduce the overall duration and frequency of exposures. In normal times, this might include reducing the number of shifts a worker has on a Covid-19 floor. Given the surging caseloads that require all hands on deck, this isn't possible right now.

The control measure of last resort is personal protective equipment, including respirators. The occupational health and preventive medicine community has recognized for decades that, for respirators to be effective, frontline workers need to properly fit-tested for them and trained to use them. Yet only a small fraction of health care workers — those who normally treat patients with respiratory issues or who work with those who are highly infectious — get the proper training for using N95 respirators. And with nearly every health care worker being called to help treat Covid-19 patients, few receive this training.

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The training process to ensure the appropriate use of respirators can be done qualitatively or quantitatively. The qualitative approach is a quick pass/fail test. A user first tries different masks types and sizes to check the fit. After making a choice and being shown the right way to wear it, the user is then given a challenge: a sweet or bitter or irritating chemical is released into the air and the user sees if she or he can smell it inside the mask. If there's no smell, the mask is working.

The challenge is also made while the user moves his or her head from side to side, up and down, and while [reciting the Rainbow Passage](#) — a script designed to get the mouth and jaw moving in different ways. The goal is to test how the mask performs during simulated work activity that includes movement and talking.

The final phases of training involve the proper way to put the mask on and take it off and how to do a [user seal check](#) each time the mask is worn, and appropriate handling and care of the respirator. These procedures are not time-consuming — but they are essential and lifesaving.

Wearing a respirator incorrectly poses a dual risk. First, an incorrectly worn mask will fail to protect the user from respiratory hazards like SARS-CoV-2. Second, an improperly worn mask can give health care workers a false sense of security that they are being protected in a high-risk environment when they really aren't.

Of course, not all respirators are the same. N95s are certified and preferred (there are also [N99 masks](#) and [R and P designated respirators](#) that are even more effective). If N95 masks are not available, OSHA [released guidance on April 3](#) about the order of preferred substitutes. Respirators from other countries, excluding China, are the next preferred option (unless the respirator from China is manufactured by a company holding an NIOSH certificate). The next best would be respirators from China, for example those with a KN95 designation. The last resort is a surgical mask.

Simply delivering more respirators and personal protective equipment to the front lines is not enough to solve the crisis that health care workers face. We need to stop sending them into the health care equivalent of burning buildings without making sure they know how to properly use this protective equipment.

Their lives, and the lives of the patients they treat, are at stake.

Joseph G. Allen, D.Sc., is an assistant professor at the Harvard T.H. Chan School of Public Health, founder and director of the school's [Healthy Buildings Program](#), and co-author of "[Healthy Buildings: How Indoor Spaces Drive Performance and Productivity](#)" (Harvard University Press, April 2020). David C. Christiani, M.D., is a physician in the Division of Pulmonary and Critical Care at Massachusetts General Hospital, professor of medicine at Harvard Medical School, and professor of environmental health at the Harvard T.H. Chan School of Public Health. They direct the [Harvard Education and Research Center on Occupational Health and Safety](#).

About the Authors

Joseph G. Allen

jgallen@hsph.harvard.edu
[@j_g_allen](#)

David Christiani

dchris@hsph.harvard.edu
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