

Respiratory Protection for the Public and Workers Without Respiratory Protection Programs

Respiratory hazards associated with recent disasters—like wildfires, catastrophic weather events, and the COVID-19 pandemic—have highlighted the need for greater focus by health care providers on respiratory protection for their patients. Exposure to such respiratory hazards as airborne infectious agents, wildfire smoke, and mold spores cause a substantial burden of disease both in the United States and globally. Some individuals, including children, the elderly, and people with underlying health conditions, are at heightened risk of adverse health outcomes associated with respiratory hazards.

When other control methods are inadequate for protecting workers from a respiratory hazard, an employer is required to establish a Respiratory Protection Program (RPP) as defined by the Occupational Safety and Health Administration (OSHA). RPPs in the workplace provide access to protective devices and education and training on appropriate use of these devices. Respiratory protection can also help protect both the public and workers whose jobs do not typically involve exposure to respiratory hazards against these threats, but many may not know how to select appropriate protective devices and when and how to use them effectively. For example, an individual may be exposed to wildfire smoke while running errands, to an airborne respiratory virus while working as a grocery store clerk during a pandemic, and/or to high concentrations of mold spores while doing construction work in a water-damaged building. As trusted advisors, health care providers can support their

patients by improving their own knowledge of respiratory protection and providing the information patients need to make health-protective decisions.

UNDERSTAND THE STATE OF THE SCIENCE ON RESPIRATORY PROTECTION AND BE PREPARED TO INFORM PATIENTS' SELECTION AND USE OF THE DEVICES

Effectively communicating the nuances of respiratory protection to patients requires health care providers to have a clear understanding of the purpose and use of respiratory protection. This includes knowing

- the factors that impact the effectiveness of a device used for respiratory protection (e.g., fit and filtration),
- which available devices (see Figure 1 for examples) are appropriate for specific hazards, and
- how to correctly put on and wear a specific type of device.

Support Patients in Correctly Using Appropriate Devices

Respiratory protection is effective when the right device is worn correctly and available research suggests that improper use of devices is common. For example, one study conducted prior to the COVID-19 pandemic observed that only 24% of untrained individuals were able to correctly put on and use a filtering facepiece respirator. Common mistakes observed included failing to tighten the nose clip, putting straps in the wrong



FIGURE 1 Examples of respirators, masks, and face coverings.
SOURCES: Photo of powered air-purifying respirator provided courtesy of 3M. Photo of barrier face covering provided courtesy of Puraka Masks, www.purakamasks.com.

DESCRIPTIONS OF RESPIRATORS, MASKS, AND FACE COVERINGS

Respirators, such as N95 filtering facepiece respirators (FFRs), are personal protective devices worn on the face that cover at least the nose and mouth and are designed to reduce the risk of inhaling hazardous airborne contaminants by removing them from the air or by supplying clean air from a safe source. These devices are approved by the National Institute for Occupational Safety and Health (NIOSH) for use in workplace respiratory protection programs but may also be used by members of the public and workers not covered by such programs. In addition to providing personal protection for the wearer against particulate respiratory hazards when fitted properly, N95 FFRs can also function as source control to reduce the spread of airborne infectious agents to others. Some types of respirators, such as elastomeric facepieces and powered air-purifying respirators, can be cleaned and reused over long periods of time.

Surgical or medical masks are unfitted, Food and Drug Administration–regulated devices worn on the face and covering the mouth and nose that are designed to reduce the release of infectious agents from the wearer (i.e., source control)

and may also provide some protection against splashes and droplets. Medical and surgical masks exhibit variable filtration efficiency and poor fit, which reduces overall effectiveness as compared to tight fitting respirators.

Face coverings are devices that cover the nose and mouth and may be mask–style, but do not conform to any specific standard and do not provide a known degree of protection against respiratory hazards. Face coverings made from common cloth or fabric materials generally do not achieve the level of filtration efficiency provided by FFRs. For many types of ambient air pollution, including wildfire smoke, face coverings often have low filtration efficiency and therefore offer little to no protection for the wearer.

Barrier face coverings are face coverings that are designed and manufactured to comply with the ASTM F3502–21 standard, and are intended to provide source control for airborne infectious agents and a measured degree of particulate filtration.

RESOURCES FOR HEALTH CARE PROVIDERS

General Information on Respiratory Protection NIOSH

Respiratory Protection Information Trusted Source
https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/respsource.html

Three Key Factors for a Respirator to Be Effective
<https://www.cdc.gov/niosh/npptl/images/infographics/KeyFactorsRequiredRespLG.jpg>

OSHA

Respiratory Protection General Guidance
<https://www.osha.gov/respiratory-protection/general>

COVID-19 and Other Airborne Infectious Agents CDC

Types of Masks and Respirators
<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/types-of-masks.html>

Wildfire Smoke

EPA

Protect Your Lungs from Wildfire Smoke and Ash
<https://www.airnow.gov/sites/default/files/2021-12/protect-your-lungs-from-wildfire-smoke-or-ash.pdf>

Note: These are examples of select resources currently available, but this content will not remain static over time. As knowledge gaps are addressed and new respiratory hazards emerge these resources will be updated and new tools and information published.

place, or wearing the device upside down. Therefore, educating patients about how to select the right device and to put it on and use it correctly is essential.

Address Differences in Personal Protection Versus Source Control

Also of critical importance is the need for health care providers to address the functional differences between source control and personal protection with their patients. For example, respirators, barrier face coverings, and surgical masks can all be used as source control to reduce the quantity of infectious particles released by the wearer (e.g., during coughing, talking, or sneezing) and thus help to protect those nearby. However, for other hazards like wildfire smoke, the use of devices for source control purposes is not relevant and the focus must be on personal protection. For populations facing multiple types of hazards, communicating these essential differences is critical to ensuring that patients have the tools needed to protect themselves and others.

Use Trusted Resources on Respiratory Protection

Many resources for expanding knowledge about respiratory protection already exist (e.g., from NIOSH, the Centers for Disease Control and Prevention, and the Environmental Protection Agency). The resources listed above can be used by health care providers to examine the current state of the science about respiratory protection and inform discussions with patients on its selection and use in different scenarios.

CONSIDER NEEDS OF SPECIFIC PATIENT POPULATIONS

Health care providers need to know which patient populations (e.g., children and people with certain health conditions) may require specialized information regarding the use of devices for respiratory protection. Chronic health conditions may interfere with patients' ability to use respiratory protective devices (see box below). Complicating this issue further, many chronic health conditions that interfere with a person's ability to use respiratory protection also make them more vulnerable to respiratory hazards that such devices are meant to protect against. For example, patients with

HEALTH CONDITIONS AND RESPIRATORY PROTECTION

Two main factors contribute to health risks from use of respiratory protection: increased breathing resistance and the “dead space” inside the device where a portion of each breath is retained and does not participate in gas exchange. Because of these factors, workers who are part of a workplace respiratory protection program are required to be medically cleared prior to using a respirator. However, there is no such system in place for the public or workers without respiratory protection programs. Health care providers must use their clinical judgment and patients’ medical histories to advise on the relative risks and benefits of respiratory protection in consideration of other strategies that could be used to reduce or limit exposure to the hazard. Evidence suggests that respirator use is well tolerated by healthy individuals, including pregnant people and children, as well as many with chronic health conditions—a group that likely would benefit

the most from respiratory protection against respiratory hazards. The potential risks of using respiratory protection for people with some serious chronic health conditions are not currently well understood. Conditions that might lead to reduced tolerance of or difficulty using respiratory protection include

- Obstructive lung diseases (e.g., chronic obstructive pulmonary disease, asthma)
- Restrictive interstitial lung diseases (e.g., pulmonary fibrosis, sarcoidosis)
- Respiratory muscle weakness and chest wall deformities
- Some forms of cardiovascular disease (e.g., congestive heart failure)
- Physical or mental disabilities

severe asthma are more susceptible to air pollution and wildfire smoke and older adults with chronic cardiopulmonary disease are more susceptible to infection and air pollution, but both of these groups may also be less tolerant of respirators with a high resistance to airflow.

Children may not have access to specific types of respiratory protection that correctly fits their faces and may therefore receive less protection from devices than adults because of poor fit. Currently no NIOSH certified respirator is specifically designed to fit the face of young children, though adult devices may fit the faces of some children (e.g., have no leaks around the edges of the device).

Proactively Discuss Risk and Protective Strategies with Patients

Health care providers, as primary sources of medical information to individuals, need to be proactive in discussing the risk posed by different respiratory hazards and advising their patients on whether to use devices for respiratory protection based on their health conditions and risk of exposure. Providers should also counsel patients on alternative strategies to protect themselves from respiratory hazards by avoiding or decreasing exposures, such as moving to or creating a cleaner indoor air space to decrease exposure to wildfire smoke or other sources of air pollution.

Stay Up To Date as Research and Respiratory Protection

Evolves

Many knowledge gaps remain related to the use of respiratory protection by the public, in particular. For example, research is ongoing related to the use of various types of respiratory protection by individuals with underlying chronic conditions who may be most susceptible to respiratory hazards, yet less able to tolerate prolonged respirator use. Innovation is needed to ensure that populations have access to devices that fit their faces and other specific needs (e.g., respirators that fit the faces of young children). Therefore, health care providers will need to stay up to date with ongoing innovations in respiratory protection technology and research that may allow for a wider selection of better fitting and more comfortable devices for young children, older adults, and others who may have challenges with using existing types of respiratory protection safely.

FOR MORE INFORMATION

This Consensus Study Report Guide was prepared by the Board on Health Sciences Policy based on the Consensus Study Report *Frameworks for Protecting Workers and the Public from Inhalation Hazards* (2022).

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This Consensus Study Report is available from the National Academies Press (800) 624-6242 | <http://www.nap.edu> | <http://www.nationalacademies.org>

To read the full report, please visit
<http://www.nationalacademies.org/respiratory-protection>

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