Advocating for Better PPE for Nurses:
Elastomerics and PAPRs

It is of the utmost importance that nurses and other health care workers caring for COVID-19 patients and possible COVID-19 patients (persons under investigation/PUIs) have optimal personal protective equipment (PPE). The highest standard of PPE for COVID-19 includes a powered air-purifying respirator (PAPR), coveralls that are impervious to viral penetration, head and shoe coverings, and gloves.

However, many health care employers have ignored the growing scientific evidence underlining the need for optimal protections for nurses and other health care workers. Employers have cited supply shortages to rationalize their rush to the lowest possible PPE standard, such as rationing N95 respirators, using surgical masks instead of respirators, instituting dangerous reuse and extended use programs, and investing in systems to "decontaminate" N95 respirators. These are unacceptably low standards that leave nurses, other health care workers, and their patients unprotected. N95 respirators are single-use devices and should be the minimum level of respiratory protection for COVID-19.

The minimum standard of PPE for COVID-19 patients and PUIs is a single-use N95 respirator, eye protection (goggles or face shield), isolation gown, and gloves.

If N95 respirator supply is inadequate to meet need, health care employers should look to another type of reusable respirator that can provide a higher level of protection — elastomeric respirators and PAPRs.

Elastomeric Respirator FAQs

» What are elastomeric respirators?

Elastomeric respirators are a type of reusable respirator. The facepiece is constructed of rubber or synthetic rubber and can often achieve a better and more comfortable fit for many workers compared to single-use N95 filtering facepiece respirators. Filters are attached to the front of the facepiece. When the wearer breathes in, air is pulled through the filters and cleaned. When the wearer breathes out, the air goes out the exhalation valve.

» Do elastomeric respirators provide similar protection to N95 respirators?

Different types of filters can be used with elastomeric respirators. If an N95-type filter is used, then the elastomeric provides similar protection to a single-use N95 filtering facepiece respirator. If a P100-type filter is used, then a higher level of protection is provided. P100 filters are commonly used with elastomeric respirators.

» Are elastomeric respirators safely reusable?

Yes. Elastomeric respirators are designed to be disassembled, cleaned, disinfected, and reassembled to ensure safe reuse. Employers are responsible for creating and implementing cleaning procedures. Often in health care, there are two types of cleaning procedures: how nurses will remove possible surface contamination between uses on a shift (e.g., wiping down the respirator's exposed surfaces) and how the employer will ensure the respirator is fully disassembled and all parts are cleaned and disinfected (e.g., between shifts). OSHA's Respiratory Protection Program Standard has explicit requirements that employers must follow to ensure that elastomeric respirators are safely cleaned and maintained.[1]

» Who usually uses elastomeric respirators?

Elastomeric respirators are commonly used in other industrial settings, such as construction, painting, and asbestos removal.

» Have elastomeric respirators been used in health care settings?

Yes. Several hospitals have implemented elastomeric respirator programs. For example, one hospital system in Pennsylvania wrote an article describing the implementation process at multiple facilities.[2] NNU nurses who are using elastomeric respirators report positive experiences and feeling safer than with N95 respirators.

» Is my employer required to provide any training on elastomeric respirators?

Yes. OSHA's Respiratory Protection Program Standard requires that employers provide effective training to employees who are required to use a respirator. This training must include how to inspect, put on and remove, use, and check the seals of the respirator, what procedures are for maintenance and storage of the respirator, and other important topics.[3] Employers are responsible for making sure nurses understand how to use an elastomeric respirator before requiring them to use one.

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» How often do filters need to be changed?

Employers must ensure that filters are changed regularly per the manufacturer's recommendation (often about once a month), whenever the filter becomes wet or contaminated, and if the filter becomes difficult to breathe through.

» How can I prevent splashes and sprays from reaching the elastomeric respirator?

Wearing a face shield in combination with an elastomeric respirator can reduce the possibility of splashes and sprays contaminating the filters or other parts of the elastomeric respirator. For COVID patients and PUIs, the eye protection offered by a face shield is an important part of preventing exposure to nurses and other health care workers.

» Are elastomeric respirators expensive?

No. Elastomeric respirators range from about $10-$100, depending on make, model, and type of filter. A hospital system in Pennsylvania reported that after just one month, using only elastomeric respirators and PAPRs was ten times cheaper than an N95 reuse and decontamination program would have been.[4] N95 reuse and decontamination programs have proven to be expensive. Florida closed their Battelle decontamination facilities because it was costing $98 to decontaminate each N95.[5]

Elastomeric Respirators Protect Nurses and Patients

Hospital infection control may state that elastomeric respirators pose an infection control risk and that it would be better for nurses to wear surgical masks or reused/decontaminated N95 respirators when caring for patients. This is not true.

Currently, there is no science on exhalations from respirators with exhalation valves, like elastomeric respirators. No one has studied this question before. However, there are several things that we do know based on decades of research:

» Exhalations from elastomeric respirators are partially filtered.

There are four mechanisms that are used to filter particles out of the air: impaction, interception, diffusion, and electrostatic attraction. At least two of these are at play in an elastomeric respirator (impaction and interception). The air flow out of the exhalation valve is so complex that some particles will be trapped within the facepiece and on the exhaust valve itself. Think about riding a roller coaster with no seat belts — with each curve or abrupt change of direction, some riders (or particles) will be thrown from the roller coaster (or air flow).

» Surgical masks and cloth masks do not effectively filter all particles emitted by a person who is infectious.

Often, hospitals say it would be better if everyone wore a surgical mask or a cloth mask than to have elastomeric respirators. But surgical masks and cloth masks are at most only partially effective at blocking exhalation of large infectious particles. Some masks may not block any emissions.

- Surgical masks and cloth masks are made of material that are not effective at filtering particles. One study found that materials commonly used to construct cloth masks were ineffective at filtration — letting through 56 to 97% of particles.[6] Another study found that many surgical masks are also made of materials ineffective at filtration, with some models letting through up to 88% of particles.[7]
- The loose fit of surgical and cloth masks also decreases the amount of particles stopped by these masks.[8] Air will take the easiest path available, which is most often around the edges of a loose-fitting mask rather than through the material.

» Reused and decontaminated N95 respirators do not provide effective protection and may be only as effective as a surgical or cloth mask.

Hospitals may also say that a reused or decontaminated N95 respirator is better than elastomeric respirators. But reused N95 respirators can become loose after multiple uses, decreasing filtration. Decontaminated N95 respirators also do not provide effective protection and chemical residues may pose an additional hazard to the wearer (see NNU's new white paper at bit.ly/decon_report).

» Ultimately, better protection for health care workers will mean fewer transmission events in the facility.

Protecting health care workers will better protect patients and reduce the chances of transmission within the facility. Elastomeric respirators are better protection than reused or decontaminated N95 respirators or surgical masks. Some hospitals that have switched to elastomeric respirators have chosen to place a surgical mask over the exhalation valve of the elastomeric respirator.

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1 • OSHA's Respiratory Protection Program Standard (29 CFR 1910.134): https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134

2 • Chalikonda, Sricharan et al., "Implementation of an Elastomeric Mask Program as a Strategy to Eliminate Disposable N95 Mask Use and Resterilization: Results from a Large Academic Medical Center," JACS, June 11, 2020, https://www.journalacs.org/article/S1072-7515(20)30471-3/fulltext.

3 • OSHA's Respiratory Protection Program Standard (29 CFR 1910.134): https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134

4 • Chalikonda, Sricharan et al., "Implementation of an Elastomeric Mask Program as a Strategy to Eliminate Disposable N95 Mask Use and Resterilization:Results from a Large Academic Medical Center," JACS, June 11, 2020, https://www.journalacs.org/article/S1072-7515(20)30471-3/fulltext.

5 • DeFede, Jim, "Exclusive: Florida Kills Mask Decontamination Unit," CBS Miami, May 29, 2020, https://miami.cbslocal.com/2020/05/29/exclusive-florida-spends-589-to-clean-8-masks/.

6 • Rengasmy, Samy, Benjamin Eimer, and Ronald E. Shaffer, "Simple Respiratory Protection — Evaluation of the Filtration Performance of Cloth Masks and Common Fabric Materials Against 20–1000 nm Size Particles," Annals of Work Exposures and Health, 2010, 54(7): 789-98.

7 • Rengasmy, Samy, et al., "Filtration Performance of FDA-Cleared Surgical Masks," J Int Soc Respir Prot, 2009, 26(3): 54-70.

8 • Oberg, Tara and Lisa Brosseau, "Surgical mask filter and fit performance," American Journal of Infection Control, 2008, 36(4): 276-82.