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## Commentary

## Elastomeric respirators for all healthcare workers

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The COVID-19 pandemic continues to spread rapidly. Critically, there have been failures in worker protection causing avoidable infections among front line healthcare workers and other essential workers.<sup>1</sup> Substantial evidence is amassing that the inhalation of respirable aerosols is a dominant route for COVID-19 transmission. Respirators are required to effectively interrupt this transmission route and protect healthcare workers.

Disposable N95 filtering facepiece respirators (FFRs) are the most common type of respiratory protection in healthcare settings. Limitations in supplies led the Centers for Disease Control and Protection (CDC) to allow less protective options, including noncertified respirators and rationing through reuse, extended use, and decontamination.<sup>2</sup> A few healthcare employers have implemented reusable respirator options, such as powered air-purifying respirators (PAPRs) and elastomeric respirators. While there has been some acceptance of the merits of powered air-purifying respirators in healthcare for nonsurgical aerosol-generating procedures and as an alternative to fit-testing, implementation of elastomeric respirators has been less widespread.

Common in industrial workplaces for hazardous airborne exposures, elastomeric respirators are reusable, with a durable rubber or silicone facepiece and replaceable filter cartridges. They offer several important advantages in healthcare settings and during a pandemic.

1. *Half-facepiece elastomeric respirators provide respiratory protection equal to and often more consistent than N95 FFRs.* The sturdy flexible facepiece has multiple features, including adjustable straps

and a stabilizing head harness, that make it easier to obtain a good fit initially and with repeated use. N95 FFRs are not designed to last indefinitely; donning more than 5–10 times can result in lower fit and higher face seal leakage, decreasing overall protection for the wearer.<sup>3</sup>

2. *Elastomeric respirators are well-documented to be safely reusable.* Elastomeric respirators can be worn many times and are easily cleaned and decontaminated. In healthcare settings, filter cartridges will last a long time at typically low aerosol concentrations. Most cartridge designs include a cleanable plastic cover, which limits external filter contamination. Elastomeric respirators, unlike N95 FFRs, have well-established cleaning and disinfection protocols.
3. *Every healthcare employee can receive their own, personal re-useable respirator, eliminating the need to supply respirators at every point of care.* The initial higher cost of an elastomeric respirator (\$20–50 each) would be easily realized in the reduced need for on-going purchase of many N95 FFRs (\$2–4 each). Within 1 month, 1 healthcare network reduced its use of N95 FFRs by 95%. Cost savings of 90% in the first month continued to accrue with each subsequent month.<sup>4</sup> As well, every healthcare worker can be guaranteed access to a personal, fit-tested respirator whenever need arises.
4. *Supplies of N95 FFRs could be freed up for use in lower risk healthcare settings and in other workplaces.* Many of these, essential to the continuity of societal infrastructure, continue to experience high worker infection and mortality rates. As well, there would be more FFR supplies for the perioperative environment to ensure protection of the surgical field.

Some argue that elastomeric respirators cannot be used in healthcare settings during the COVID-19 pandemic because exhalation valves are suspected to release potentially infectious aerosols generated by the wearer. Data characterizing particle release through exhalation valves are presently lacking; it is our opinion that such release will be limited by the complex path particles must navigate

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through a valve. We expect that fewer respiratory aerosols escape through the exhalation valve than through and around surgical masks, unrated masks, or cloth face coverings, all of which have much less efficient filters and do not fit closely to the face. A surgical mask over the exhalation valve of an elastomeric respirator, however, may assuage concern and is unlikely to disrupt the face seal of the elastomeric respirator.

Surgical masks do not meet NIOSH or OSHA standards for respiratory protection, offering no protection from aerosol inhalation. Before contingency and crisis measures are implemented, CDC recommends the use of alternatives to N95 FFRs, including “other FFRs, elastomeric respirators, and powered air purifying respirators.”<sup>2</sup> This means that healthcare organizations must make every attempt to obtain alternative respirators for workers before resorting to practices such as extended use or reuse of FFRs, use of expired or non-certified respirators, or FFR decontamination.

CDC COVID-19 guidelines have not changed from early recognition that person-to-person spread could occur as a result of talking and inhalation of infectious aerosols, requiring the use of airborne isolation rooms and respiratory protection.<sup>2</sup> Because transmission can occur from asymptomatic patients and workers, we urge CDC to recommend that healthcare organizations provide respirators to all healthcare workers with patient contact, not just those caring for suspected or confirmed COVID-19 patients. Elastomeric respirators have a role to play for all healthcare workers, not just those caring for COVID-19 patients, as well as for other aerosol transmissible infectious respiratory diseases such as tuberculosis, influenza, and future novel organisms. Additionally, the experience of high burn rates of disposable PPE during crisis conditions such as the COVID-19 pandemic can be significantly reduced by using reusable elastomeric respirators.

We strongly encourage NIOSH, OSHA, and CDC to expand their support for the use of elastomeric respirators in healthcare settings and to perform additional research to measure particle emissions from respirator exhalation valves. In the interim, we recommend that NIOSH issue a policy statement that would allow the use of a surgical mask (or similar) over an elastomeric exhalation valve without negating respirator certification.

Elastomeric respirators offer an immediate important opportunity for improving and ensuring on-going healthcare worker protection with benefits far outweighing the postulated emission of infectious aerosols through the exhalation valve from an asymptomatic wearer. In 2019, a National Academies of Sciences committee investigated

and recommended elastomeric respirators in healthcare for routine and surge use.<sup>5</sup> We are aware of several healthcare settings where elastomeric respirators have been used successfully to protect employees from infectious respiratory diseases, including tuberculosis, H1N1 influenza, and COVID-19.<sup>4,5</sup> The minimum level of respiratory protection for OSHA compliance officers during COVID-19 inspections is a fit-tested half-mask elastomeric respirator with an N95 filter.<sup>6</sup>

Employers with comprehensive respiratory protection programs already in place for N95 FFRs can readily adopt elastomeric respirators, with the addition of procedures for inspecting, cleaning, and disinfecting elastomeric respirators between uses and shifts. Such procedures are not any more complex than those required for reprocessing N95 FFRs. As with N95 FFRs, training is crucial and must include hands-on practice with donning and doffing. We encourage healthcare organizations to work with employees and their representative organizations to determine together the best approaches for a program that ensures respirators are used effectively.

The COVID-19 pandemic has highlighted many deficiencies in our approach to protecting healthcare workers and other essential workers from infectious diseases. Let us embrace new strategies that help our most highly exposed and crucial workers perform their work – taking care of and serving the rest of us – safely.

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