Filtration Efficiency of Face Masks Used by the Public During the COVID-19 Pandemic

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In November 2020, the US was averaging more than 1 million new coronavirus disease 2019 (COVID-19) cases per week, an astounding number. To make progress against the pandemic, routine and universal use of face masks throughout society is essential.

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is “transmitted predominantly by respiratory droplets generated when people cough, sneeze, sing, talk, or breathe,” and masks “reduce the emission of virus-laden droplets” and “help reduce the inhalation of these droplets by the wearer.”1 In the face of severe shortages of medical-grade masks, public health officials have recommended that the general public wear consumer-grade face masks to protect themselves against COVID-19, such as “non-valved multi-layer cloth masks.”1 However, there has been considerable discussion and debate about the types of masks that would be best, especially because the shortage of medical grade masks is not as acute as it once was (N95 masks remain in much shorter supply).

In this issue of JAMA Internal Medicine, Clapp and colleagues,2 building on their earlier evaluation of hospital face mask alternatives,3 report on the fitted filtration efficiency of consumer-grade cloth masks and medical procedure mask modifications as personal protective equipment for the public. The filtration efficiency refers to “the protection that masks offer to the wearer when exposed to others who may be infected,” and was assessed with a test aerosol of sodium chloride particles that were slightly smaller than individual SARS-CoV-2 virions.3

In a laboratory atmosphere, with all tests performed on a single individual for consistency, Clapp et al2 found variable fitted filtration efficiencies against the test aerosol among the face masks that ranged from approximately 25% to 80%. Comparatively, a National Institute for Occupational Safety and Health–approved N95 respirator had a filtration efficiency of approximately 98%. Notably, the filtration efficiency of some of the consumer-grade masks, such as a washed 2-layer nylon mask with ear loops and an aluminum nose bridge (79.0%), exceeded that of a medical-grade procedure mask with ear loops (38.5%), and a surgical mask with ties (71.5%). Even a folded cotton bandana had approximately a 50% filtration efficiency, which was better than the procedure mask with ear loops. In general, improved fit between the mask and the wearer’s face increased filtration efficiency, such as through use of an aluminum nose bridge or by tying the upper and lower ear loops of a procedure mask to each other near the mask and then tucking the side pleats of the mask in against the cheeks.

Face masks are not perfect. They are one of a combination of measures, including physical distancing, hand washing, sufficient ventilation, and the avoidance of crowds and gatherings, that can reduce transmission of SARS-CoV-2. The face mask that one person wears to reduce the potential release of droplets that contain virus complements the mask that another person wears to reduce the risk of inhaling these droplets.1 The consistent, correct, and universal wearing of face masks increases the benefit for individuals, and for all. This is neither rocket science nor a political statement. It is common sense and responsible behavior.

Conflict of Interest Disclosures: None reported.


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Correction: This article was corrected on January 25, 2021, to fix the spelling of the author’s surname.