

EDITORIAL

Infectious Disease

Mask effectiveness against viral illnesses in health care professionals

In their study, "N95 Respirator and Surgical Mask Effectiveness Against Respiratory Viral Illnesses in the Health Care Setting: A Systematic Review and Meta-Analysis," Collins et al. present a systematic review and meta-analysis of 9164 participants in 8 studies to evaluate the effectiveness of surgical masks and N95 respirator masks among health care workers to prevent infection by multiple respiratory viral infections (adenovirus, coronavirus, metapneumovirus, parainfluenza virus, respiratory syncytial virus, influenza, and rhinovirus-enterovirus).¹ The results of this study suggest that wearing a N95 respirator reduces the risk of infection with non-influenza respiratory viral infections. Specifically, for severe acute respiratory syndrome coronavirus (SARS-CoV)-1 and SARS-CoV-2, N95 use decreased viral infection by 17% compared with wearing a surgical mask.¹ There was not a statistically significant difference for infection with laboratory-confirmed influenza infections when wearing a N95 respirator compared with a surgical mask.¹

As with any systematic review and meta-analysis, the results are limited by the quality of the available evidence evaluated. However, these results can help inform the science of personal protective equipment (PPE), particularly in protecting front-line health care professionals, including emergency physicians and other emergency department staff during current and future pandemics, either of known or emerging, novel viral respiratory infections. Specifically, the results of this study can inform supply chain considerations to avoid the PPE shortages and crisis capacities that were a reality early in the COVID-19 pandemic, including the unprecedented decontamination and reuse of N95 respirators.^{2,3}

Over the course of the COVID-19 pandemic, recommendations regarding mask use have evolved along with our understanding of how SARS-CoV-2 is transmitted.⁴⁻⁶ Currently available evidence recognizes 3 main modes of transmission of SARS-CoV-2: (1) inhalation of virus, (2) deposition of virus on mucous membranes, and (3) touching mucous membranes with hands contaminated with virus.⁷ Consistently wearing face masks, whether surgical or N95, appears to decrease the spread of SARS-CoV-2 in both community⁸ and health care settings,⁹ particularly in high-risk venues such as the ED.¹⁰ The availability and use of different types of masks, in community and health care settings, to mitigate the spread of viral respiratory infections, engender considerations from a variety of perspectives—political,

economic, clinical, and supply chain—to name a few. Addressing each of these perspectives is beyond the scope of this editorial.

The scientific evidence is clear and convincing: consistent, proper use of appropriate masks is a critical component, along with other measures such as vaccinations, fastidious hand hygiene, and physical distancing, in reducing the spread of viral respiratory infections, including SARS-CoV-2.¹¹ Although not a replacement for other mitigation measures, masks alone can significantly reduce the spread of symptomatic infections, in both community and health care settings. A recent large, randomized trial showed that mask use in rural Bangladesh reduced symptomatic COVID infections by 9%.¹² In the United States, counties with school mask requirements have lower rates of pediatric COVID-19 cases than those counties without school mask requirements.¹³ A comparison of ≈ 1000 schools in Arizona revealed a 3.5 times higher odds of school-associated COVID-19 outbreaks in schools without a mask requirement compared to schools with a mask requirement.¹⁴

The result that N95 respirator use is protective for medical professionals and all health care workers who encounter non-influenza viral respiratory diseases, particularly compared with surgical masks, is not necessarily novel.¹⁵ Similar to prior studies, N95 respirators did not appear to confer greater protection than surgical masks against influenza.¹⁶ Rather than the results themselves, the novelty of Collins et al.'s work is in its application, particularly in the middle of a global pandemic caused by a novel viral respiratory infection. Surgical masks and N95 should both be part of a PPE plan and are important in reducing the spread of viral respiratory illnesses in both community and health care settings.¹⁷

Multiple medical organizations and professional societies have endorsed the availability of appropriate PPE, including N95 respirators, for front-line health care professionals.¹⁸⁻²⁰ The findings by Collins et al. can help to inform supply chain considerations for hospitals, health systems, nursing facilities, physician offices, clinics, and other health care facilities so that N95 respirators can continue to be prioritized to protect health care workers against non-influenza respiratory viral infections.⁵ Consideration should be made for the ideal type of mask, in part, based on the patient population and the clinical setting of care. For example, in a hospital ward caring for patients with confirmed influenza and without evidence of other non-influenza viral infections, surgical masks might be adequate to reduce the risk

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of influenza infections among health care workers. Conversely, based on the results of this and other studies, in an emergency department (ED) where patients have undifferentiated symptoms and are at risk for multiple viral respiratory infections, including SARS-CoV-2, N95 respirators should be considered as first-line masks to protect emergency physicians, nurses, and other health care professionals.

Finally, several caveats regarding the use of N95 respirators merit discussion. First, N95 respirators require proper fitting to be effective. For a variety of reasons, some individuals might not be able to achieve adequate seal to effectively be protected by a N95 respirator. Accommodations should be made for those individuals to provide protection against non-influenza viral respiratory infections. N95 respirators are potentially less comfortable and more irritating to the face and skin, particularly if worn for extended periods of time. Finally, from a systems perspective, N95 masks are more expensive and potentially more limited in supply compared to surgical masks. These are important considerations in building and maintaining a supply chain that meets the dynamic clinical needs of a pandemic response.

There is uncertainty with emerging infectious diseases, including respiratory viral infections. As the delta variant has emerged as the dominant strain of SARS-CoV-2 in the United States, reaffirming a multifaceted mitigation strategy that includes masks, physical distancing principles, fastidious hand hygiene, and universal vaccination is fundamental to reduce the spread of infections. Masks are necessary, although not singularly sufficient to curb the spread of SARS-CoV-2 infections and COVID-19 illness.¹⁷

Collins et al. help to provide additional evidence for future investigation into what masks, worn in what situations, best protect health care professionals. This question is particularly relevant in front-line settings, such as the ED, where seropositivity rates have been higher than in other health care settings.⁹ There remains an opportunity and need for well-controlled, prospective studies regarding the clinical and community situations that merit specific types of PPE, including masks and other equipment, to protect health care workers and patients from the continued spread of infections. In the interim, masking strategies for health care workers should be targeted above the minimum levels of protection required, based on the best available evidence regarding the characteristics of the infection, including molecular qualities and modes and methods of transmission.

CONFLICTS OF INTEREST

None.

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