Evidence of Short-Range Aerosol Transmission of Severe Acute Respiratory Syndrome Coronavirus-2 and Call for Universal Airborne Precautions for Anesthesiologists During the Coronavirus Disease 2019 Pandemic

To the Editor

The question of whether or not severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), the causative agent of coronavirus disease 2019 (COVID-19), has the potential for airborne transmission is an extremely contentious issue right now. Emerging evidence suggests that airborne transmission is possible. Inconsistent recommendations from the US Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) have caused confusion among health care providers regarding the appropriate level of precaution. CDC recommends airborne precautions when caring for any patient with known or suspected COVID-19,[1] whereas WHO recommends standard (contact) and droplet precautions for the care of COVID-19 suspected or confirmed patients, and airborne precautions only for aerosol-generating procedures.[2]

We are profoundly worried about restricting airborne precautions only to suspected or confirmed COVID-19 patients due to the potential for onward transmission to health care providers. In the absence of widespread testing for SARS-CoV-2, it is reasonable to suspect a large proportion of individuals with cases are undiagnosed. Furthermore, false-negative tests resulting from limitations of sample collection and kit performance[3,4] may misspecify a patient as negative when they are truly at risk of transmitting virus. Pre- or asymptomatic infection could be an important source of transmission to others, with symptoms of COVID-19 appearing a median of 5 days after exposure with likely transmission during the prodromal phase.[5] In fact, asymptomatic infection may account for over half of onward transmission.[6,7] Moreover, nonspecific symptoms means that patients may present for management of nonrespiratory symptoms (such as diarrhea[8] or nausea[8]) and thus would not necessarily be a suspected COVID-19 case.

We will outline the evidence to date that suggests airborne precautions should be implemented in the hospital setting. First, short-range aerosol transmission is an important mode of transmission for other respiratory viruses that share similar characteristics with SARS-CoV-2. These viruses include severe acute respiratory syndrome (SARS),[9] Middle East Respiratory Syndrome (MERS),[10] and influenza A virus.[11] Seasonal human coronaviruses (NL63, OC43, HKU1) also have the potential for aerosol transmission. In a recent study, viral RNA for seasonal human coronaviruses, influenza viruses, and rhinoviruses was found in exhaled breath and coughs of children and adults with acute respiratory illness.[12] It is thus reasonable to suspect aerosol transmission is also possible for SARS-CoV-2.

Second, a growing number of epidemiologic investigations point to airborne transmission during the presymptomatic period. In Skagit County, WA, at least 45 cases of COVID-19 have been linked to a 2.5-hour choir practice at which there were 60 attendees.[13] At the time of the gathering, no person was symptomatic, and the group observed infection control practices such as distancing and the use of hand sanitizer. It is suspected that forceful exhalation, especially in this instance in which people were also inhaling forcefully during singing, may have aerosolized SARS-CoV-2 and led to high levels of disease transmission.

Third, several observational studies of patients with COVID-19 provide evidence of airborne transmission of SARS-CoV-2. Santarpia et al[14] collected air and surface samples from individuals who were confirmed positive with COVID-19 infection. Many commonly used items, toilet facilities, and air samples had evidence of viral contamination. More than 60% of air samples collected from rooms and hallways in hospitals treating patients with COVID-19 were positive for SARS-CoV-2. A similar study performed in China also suggests aerosol transmission of SARS-CoV-2.[15]

Fourth, experiments conducted under controlled laboratory conditions provide further evidence of airborne transmission of SARS-CoV-2. One study used a 3-jet Collison nebulizer and fed into a Goldberg drum under controlled laboratory conditions to generate aerosols. Although not necessarily reflective of human cough conditions, experimentally induced aerosols were viable for up to 3 hours.[16]

These factors in combination build a strong case for airborne transmission of SARS-CoV-2. Universal airborne precautions are an appropriate recommendation[17] for a provider caring for any patient during this pandemic. However, the demand for N95 respirators has already outpaced their availability.[18] As such, anesthesiologists and other health care providers may find themselves without appropriate airborne protection during emergent surgery or

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contact with a patient. To ensure the safety of anesthesia providers, an N95 (or equivalent such as FFP2) respirator should be the minimum requirement for direct contact patient care. To conserve respirators, the CDC has recommended approaches for extended use and limited reuse of respirators.[19] CDC has also recommended broader hospital-based practices to conserve respirators for those at highest risk of coming into contact with COVID-19–positive patients.[19] It is imperative that international, national, and local authorities make every possible effort to greatly increase the supply of respirator masks and develop efficient workflows to maximize the respirators currently available.

Given the growing evidence that airborne transmission of SAR-CoV-2 and the known high risk of exposure to health care providers, hospitals must employ universal airborne precautions and enact policies for extended and reuse of respirators to protect the health and safety of the professionals working to save lives during the COVID-19 pandemic.

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