Controversy has arisen in both the medical and lay press regarding the possibility of SARS-CoV-2 airborne transmission via fine particle aerosols. Below is a synopsis of the available data, as well as an expert opinion rendered by the Penn Healthcare Epidemiologists Workgroup.

The recent media coverage of the scientists who petitioned the World Health Organization (WHO) to acknowledge that SARS-CoV-2 is transmitted via an airborne route has again led to many questions across our organization. On July 9, 2020, the WHO published an updated scientific brief on transmission of SARS-CoV-2 stating, in part:

- “Current evidence suggests that transmission of SARS-CoV-2 occurs primarily between people through direct, indirect, or close contact with infected people through infected secretions such as saliva and respiratory secretions, or through their respiratory droplets, which are expelled when an infected person coughs, sneezes, talks or sings.”

- “Outside of medical facilities, some outbreak reports related to indoor crowded spaces have suggested the possibility of aerosol transmission, for example during choir practice, in restaurants or in fitness classes. In these events, short-range aerosol transmission, particularly in specific indoor locations, such as crowded and inadequately ventilated spaces over a prolonged period of time with infectious persons, cannot be ruled out. However, the detailed investigations of these clusters suggest that droplet and fomite transmission could also explain the human-to-human transmission in these clusters.”

What “airborne” means to scientists studying the physics of exhaled air flow is very different than how we in healthcare use that term to describe the transmission of certain pathogens, and the isolation precautions we put in to place to prevent their spread. When lab scientists study airborne dispersion, they study particles of a certain size that remain suspended in air and travel on air currents, without correlating those results with clinical contagion.

For healthcare epidemiologists, the term airborne refers to pathogens (TB, measles, VZV) for which the primary mode of transmission from person-to-person is through small respiratory droplet nuclei (aerosols) that remain suspended in air and travel on air currents. Airborne Isolation precautions employ a specific set of controls to prevent the spread of these pathogens, including use of negative pressure rooms, and respiratory protection with N95 respirators or powered air purifying respirators (PAPRs).

Healthcare epidemiologists have long recognized that some respiratory viruses, like influenza and SARS-CoV-2, can have a spectrum of transmission, with the overwhelming majority of transmission being through large droplets, and a small minority through aerosols. Since the COVID-19 pandemic began, we have recognized the risk of airborne transmission associated with high-risk aerosol generating procedures and have consistently recommended a higher level of respiratory protection when aerosol-generating procedures are likely.
It is also important to acknowledge that the likelihood of transmission of infection depends not only on the size of the droplets and whether or not they are small enough to remain suspended as an aerosol, but also on other important factors such as:

- Size of inoculum
- Duration of exposure
- Immune system of susceptible persons

The studies cited by the scientists who petitioned WHO demonstrate theoretical evidence of aerosol (airborne transmission) in controlled laboratory experiments. These studies have NOT demonstrated actual clinical evidence of airborne transmission. Studies have shown that:

- Speaking and coughing produce both larger (droplets) and smaller (aerosols) in a mix of sizes that can travel up to 27 feet
- SARS-CoV-2 can remain suspended in the air as detectable viral RNA
- Poor ventilation indoors can prolong the time that droplets can remain airborne

There is extensive published evidence from across the globe that demonstrates the overwhelming majority of transmission of SARS-CoV-2 is via large respiratory droplets. We can state this conclusively based upon evidence from contact tracing studies, conclusions of various cluster investigations, the lack of spread of the infection in hospital settings with universal masking of staff, and the low estimated R₀. The R₀ or “R naught” is the number of people that one infected person can secondarily infect. The R₀ for COVID-19 is estimated to be between 2-3 – meaning 1 infected person will transmit their COVID-19 infection to 2-3 others. This is in contrast to infections such as measles, where the R₀ is 15-18.

Summary Conclusions:

1. Scientists studying the physics of air flow have demonstrated evidence supporting the possibility of aerosol transmission
2. The epidemiologic evidence to date overwhelmingly supports that the mechanism of COVID-19 transmission from person-to-person is through droplets encountered during close contact
3. Transmission via airborne aerosols is not supported by epidemiologic evidence outside of known aerosol-generating procedures
4. Current isolation precautions in use for COVID-19 are appropriate and have been highly effective in preventing healthcare personnel infections
5. Ventilation systems in healthcare settings are effective. We anticipate more research and guidance from air flow scientists to address whether improving ventilation systems in indoor spaces in the community can make a difference in preventing spread of SARS-CoV-2.