

Public health recommendations around face shields should change

Written by Dr. Mary Fernando on October 21, 2020 for CanadianHealthcareNetwork.ca



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There's a saying: if you're the smartest person in the room, you're in the wrong room. I recently found myself in the right room—a masked, backyard get-together with close friends.

My husband mentioned he'd added a face shield to his mask in indoor public places, to protect his eyes during the second wave of COVID-19. One of our friends, Brian Foody, said that using a face shield with a mask wouldn't protect eyes from airborne COVID-19 but goggles would.

This statement was very surprising. Public health experts have been clear, given the airborne transmission of COVID-19, that face shields and goggles protect the eyes equally.

For the public, Dr. Anthony Fauci said in an interview, ". . . you should protect all of the mucosal surfaces, so if you have goggles or an eye shield, you should use it."

In healthcare settings, face shields are irreplaceable to protect against splatter during procedures, but face shields and goggles are recommended by public health as interchangeable eye protection.

For protection during aerosol-generating medical procedures, Canadian Public Health recommends, "eye, nose and mouth protection (mask and eye protection, or mask and face shield, or mask with attached shield) that fully covers the eyes, nose and mouth and ensures that no part of the face is exposed."

The CDC states, "The PPE recommended when caring for a patient with suspected or confirmed COVID-19 includes the following . . . Put on eye protection (i.e., goggles or a face shield that covers the front and sides of the face) upon entry to the patient room or care area."

If face shields don't protect the eyes from airborne COVID-19, the definition of "adequate PPE" changes and this may save lives. A large study of healthcare workers showed that they accounted for 10% to 20% of COVID-19 infections and, even more worryingly, "even among frontline healthcare workers reporting adequate PPE, the risk for COVID-19 was increased . . ."

Given the importance of this issue for the public and for healthcare workers, I interviewed Brian Foody, president and chief executive officer of Iogen Corporation and an MIT-educated mechanical engineer, who specializes in fluid motion.

The movement of COVID-19 infected air is at the heart of this issue.

"Imagine two people wearing face masks, one has on a face shield and the other is wearing goggles, walking into a closed room where the ambient air contains COVID-19 infected aerosols," Foody explained. "Whose eyes are better protected? For our wearer of the face shield, with every breath, the clean air behind her face shield is ventilated and exchanged with the contaminated ambient air. Because of this ventilation, the air behind the face shield will have the same concentration of aerosols as the rest of the room within a matter of minutes. On the other hand, for our goggle wearer, the clean air behind her goggles is sealed off from the ambient air."

The mixing of air behind a face shield is based on the basic scientific principles of fluid dynamics: if there are COVID-19 particles, they'll be drawn into the face shield and up to the eyes.

This behaviour of aerosols is supported by a 2014 study. "Face shields can substantially reduce the short-term exposure of health care workers to large infectious aerosol particles, but smaller particles can remain airborne longer and flow around the face shield more easily to be inhaled," it noted.

A review of the literature in March, 2020 stated that, "There is a lack of research on the effectiveness of different forms of eye protection."

And yet, certainly the public health recommendations consider goggles and face shields as equivalent.

I am reminded of the early days when many of us recognized the pattern of airborne transmission of COVID-19 infections and advocated for masks, contradicting public health recommendations. Now the widespread use of masks is recognized as an important tool to limit COVID-19. This information on face shields is just as important: face shields protect from splatter but do not offer eye protection and public health recommendations for the public and healthcare workers must change.

Then Brian asked a crucial question: "What are the chances of getting infected through your eyes?"

To begin to find my way through this issue, I had to enter the right room, so I unabashedly called my friend, Dr. Sherif El-Defrawy, at his cottage on Thanksgiving.

Dr. Sherif El-Defrawy is an ophthalmologist who's chair of the Department of Ophthalmology at the University of Toronto, before which he held a similar position at Queen's University. He's also president of the Canadian Ophthalmological Society and of the Association of Canadian University Professors of Ophthalmology.

In short, Dr. El-Defrawy knows eyes.

"If COVID-19 infects the conjunctiva of the eye, it could travel to the nose via the nasolacrimal duct and colonize the nose or throat," he explained. "However, we would expect to see conjunctivitis. I find it highly unlikely that there would be enough COVID-19 to cause illness without seeing conjunctivitis."

He explained that the number of COVID-19 infected patients with conjunctivitis wasn't that large but it was unclear how many patients were checked for this. Finally, he expressed surprise that goggles were not universally recommended in healthcare settings along with face shields.

So, first things first, I'm not a fan of primate studies but there was one that answered many questions about COVID-19 infection via the eyes, so with great regret I present it here.

Three rhesus macaques were infected with COVID, two via their conjunctiva and one via intratracheal route. The conjunctival swabs were positive for the first day only, "indicating that the inoculated virus may transfer from conjunctiva to respiratory tract and other tissues . . . specific IgG antibodies against SARS-CoV-2 were detected in the rhesus macaques, indicating that the animal was indeed infected with SARS-CoV-2 [showing] that conjunctiva is a route of SARS-CoV-2 transmission."

A literature review concluded, "The overall prevalence of ocular symptoms in patients with COVID-19 was 11.2%, which is not a common finding. Nevertheless, this reported prevalence might be an underestimation because patients with COVID-19 present with life-threatening clinical scenarios, which may preclude a detailed ocular examination or relevant history."

Speaking of ophthalmologists, we should acknowledge with deep gratitude that it was the ophthalmologist, Li Wenliang, who was one of the first people who warned the world about the new disease we now call COVID-19.

He later succumbed to the disease after contracting the virus seemingly from an asymptomatic glaucoma patient in his clinic.

So, how does eye protection play out on the ground in healthcare settings? Here I turned to information from Dr. Rick MacDonald, a community paediatrician on staff at Halton Healthcare hospitals where he takes call seeing paediatric patients and works in the NICU.

When many other physicians' offices were largely doing virtual visits, "we decided early on that if we were going to be a useful resource for our paediatric population. . . .We needed to see patients [and] to provide this service, PPE is the most important first step without which it could not be done."

Dr. MacDonald spent hours sourcing PPE for his office, opting for an N95 and a face shield but now also wears goggles as well. "To [keep our office open] we need full protection. No skimping, no cheating, full attention to detail. . . . Overkill is better and no government official or cloistered ID staff will convince me otherwise."

He's correct: protection, including eye protection, is crucial. Doctors are often in closed examining rooms, crowded emergency departments or intensive care units, with potentially large volumes of COVID-19 aerosols. So are nurses, paramedics, respiratory therapists and many others.

Certainly, we could benefit from research on the fluid dynamics of COVID19 aerosols with people wearing face shields and masks. However, we are in the second wave of this pandemic and there are a frightening number of infections in the public and healthcare workers.

I'm asking public health, in light of the basic science of fluid dynamics of aerosols, to change their recommendations:

The public should wear eye protection if they are indoors with others.

Healthcare workers working with patients that are potentially COVID-19 positive, should use face shields for splatter alone. Goggles are the only safe eye protection for aerosols.
