

# SARS-CoV-2 and the nose: Risks and implications for primary care

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### INTRODUCTION

To date, more than 1000 healthcare workers have died from COVID-19, the disease caused by SARS-CoV-2. Initially, the highest incidence of nosocomial infection was in otolaryngologists in China. More recent data suggests the highest number of physician deaths have been general practitioners and emergency physicians (42.5%). This is likely due to the volume of COVID-19 patients seen by these specialties and limited availability of personal protective equipment (PPE).

### CORONAVIRUSES

Human coronaviruses resemble the solar corona, hence the name 'coronavirus'. Coronaviruses are enveloped RNA viruses surrounded by spike-shaped glycoproteins (Figure 1). Seven coronavirus species are known to cause disease in humans: HCoV-229E, HCoV-OC43, HCoV-NL64, HCoV-HKU1 cause the common cold in immunocompetent individuals. The other three strains, SARS-CoV, Middle East Respiratory Syndrome (MERS) and SARS-CoV-2, cause more severe illnesses. Human coronaviruses are thought to originate in animals and infect humans via an animal intermediary. It is not known in which animals SARS-CoV-2 originated, however, bats are the most likely reservoir.

### SARS-COV-2 AND THE NOSE

SARS-CoV-2 enters the cell via the angiotensin converting enzyme-2 (ACE2) receptor and binds with 10-20-fold greater affinity than SARS-CoV. Unlike SARS-CoV, SARS-CoV-2 can infect and reproduce in the upper respiratory tract. The nasopharynx has the highest viral load in the respiratory tract and the load in asymptomatic patients is similar to that in symptomatic patients. The viral load is also highest in the early phase of the illness. Shedding of the virus in the nose precedes lower respiratory tract (LRT) shedding. Further, shedding in the upper respiratory tract (URT) may continue after the virus is no longer detectable in the LRT and also after recovery. It is thought that the major mode of transmission of SARS-CoV-2 is via the URT. As 90% of inspiration is via the nose, this may

partially explain the high transmission rate of SARS-CoV-2.

### COVID-19 AND THE NOSE

Surprisingly, there is a paucity of sinonasal symptoms associated with COVID-19. However, sudden onset of olfactory and gustatory dysfunction have been described in up to 85.6% and 94.8% of patients with COVID-19 respectively. Many of these patients had few, if any other symptoms. In fact, olfactory dysfunction was the presenting symptom in up to 26.6% of patients. Olfaction usually starts to recover after 5-10 days and most recover fully. Sudden loss of smell or taste may therefore, be a marker of COVID-19 and should be part of any screening protocol.

### DROPLET AND AEROSOLS

A sneeze can generate approximately 46,000 large droplets, and up to 1,100,000 small droplet nuclei, travelling at anywhere from 4.5m/s to 100m/s. Each droplet contains up to 200 million virus particles. It is unclear whether SARS-CoV-2 is transmitted via aerosol, droplet or direct inoculation via fomites. However, all three routes are possible. Aerosolised viable SARS-CoV-2 has been noted to remain airborne for up to 3 hours and viable virus can survive on surfaces such as plastic and stainless steel for up to 72 hours. Aerosolised SARS-CoV-2 RNA has been detected up to 4 metres from a patient. Sneezing and spraying the nose generates a significant and equivalent number of airborne aerosols. Also, whilst attenuating airborne aerosols, surgical masks still permit a significant amount of aerosol escape. N95 respirator masks successfully attenuate aerosols to background levels.

### THE RISK AND IMPLICATIONS FOR PRIMARY CARE

The initial high infection rate amongst ENT surgeons in China was due to lack of awareness of SARS-CoV-2, lack of appropriate PPE, direct contact with patients' URT mucosa and aerosol or droplet-generating diagnostic and therapeutic procedures frequently performed during ENT examinations. However, with increased awareness and use of PPE, this infection rate has dropped dramatically.

Children with COVID-19 are often asymptomatic. Studies from China found that 94% of children had no, mild or moderate symptoms and 55% will demonstrate no or very mild symptoms only.

Therefore, healthcare workers should exercise caution when performing aerosol generating procedures (AGP), when examining the URT and when examining children. Commonly performed AGPs and devices include: nasal prong oxygen, spraying the nose, nebulisers, nasogastric tube insertion, positive airway pressure devices (CPAP etc), nasendoscopy, bronchoscopy, spirometry, intubation and gastroscopy. Appropriate PPE should be worn during these procedures and the number of staff exposed should be kept to a minimum.

The risk for each practitioner will vary depending on the prevalence of COVID-19 in their patient population. Appropriate PPE for AGPs includes a surgical or N95 mask, goggles or a visor, a waterproof gown with full length sleeves, gloves and a head cover. Disposable raincoats are an alternative to a waterproof medical gown. Appropriate ventilation may remove up to 60% of airborne droplets with each air exchange. A surgical mask and goggles, as a minimum, should be worn when taking a history from a patient due to the aerosols generated from speech and gloves should be added when examining the nasal or oral cavity. Asking patients to wear a mask is also an option, particularly while taking a history. Surfaces should be cleaned with either 2%-3% hydrogen peroxide, a hospital-grade anti-viral disinfectant, 2-5g/L chlorine solution or solutions containing a minimum of 75% alcohol. Soap and water is the most effective method for hand washing, however, if using hand sanitiser it is recommended that a formula with a minimum of 60% alcohol be used. The World Health Organisation recommended formula contains 80% ethanol or 75% isopropyl alcohol. Many healthcare workers change clothes before entering the home and place them in a plastic bag. Shoes are left outside. They shower as soon as they arrive home and wash their clothes in hot water.

### CONCLUSION

The sinonasal cavity is an important route of entry and infection for SARS-CoV-2 and carries the highest viral load in the respiratory tract. Sudden onset of anosmia or hyposmia is a specific indicator for COVID-19 and should be included in any screening protocol. Finally, particular care should be taken when examining the URT, particularly in children, during the COVID-19 era.

The recommendations in this paper should not replace those of your governing health authority.

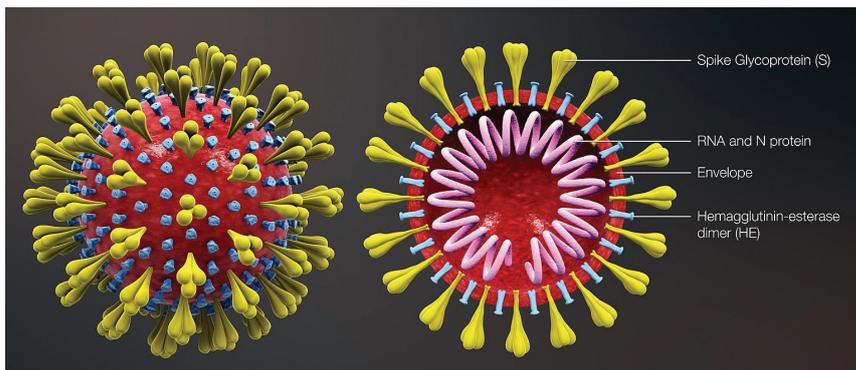


Figure 1: Coronaviruses are enveloped RNA viruses surrounded by spike-shaped glycoproteins.

References available on request.