

Ineffectiveness of Surgical Mask in Preventing Transmission of COVID-19 from Index Hospitalization to Health Care Worker

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Abstract

CDC recommends the use of N-95 respirator or surgical mask (if N-95 masks are not available) when taking care of the COVID-19 suspected or positive patients. N-95 respiratory mask should be used instead of a face-mask when present or carrying out aerosol-generating procedures such as intubation, bronchoscopy¹. WHO has also recommended to wear a mask in simple encounters with COVID-19 patients and reserve the N-95 respirators for aerosol producing procedures². CDC reports that the spread of the virus is mainly from person to person in the form of respiratory droplets when the infected COVID 19 patient sneezes or coughs³. WHO reported the transmission of the virus between people through droplets and contact and not through airborne precautions⁴. However, there are recent experimental studies that suggest the plausibility of aerosol transmission of COVID-19. We describe a case of an emergency health care worker acquiring COVID-19 in a short encounter with an index COVID-19 positive patient (patient X) in the hospital despite the use of a surgical mask and gloves.

Abbreviations

WHO (World Health Organization)

CDC (Center for Disease Control)

SARS-CoV-2 (Severe acute respiratory syndrome coronavirus 2)

COPD (Chronic Obstructive Pulmonary Disease)

To the Editor,

CDC recommends the use of N-95 respirator or surgical mask (if N-95 masks are not available) when taking care of the COVID-19 suspected or positive patients. N-95 respiratory mask should be used instead of a face-mask when present or carrying out aerosol-generating procedures such as intubation, bronchoscopy¹. WHO has also recommended to wear a mask in simple encounters with COVID-19 patients and reserve the N-95 respirators for aerosol producing procedures². CDC reports that the spread of the virus is mainly from person to person in the form of respiratory droplets when the infected COVID 19 patient sneezes or coughs³. WHO reported the transmission of the virus between people through droplets and contact and not through airborne precautions⁴. However, there are recent experimental studies that suggest the plausibility of aerosol transmission of COVID-19. We describe a case of an emergency health care worker acquiring COVID-19 in a short encounter with an index COVID-19 positive patient (patient X) in the hospital despite the use of a surgical mask and gloves.

A 44-year-old nurse with no significant past medical history took care of Patient X with the preliminary diagnosis of acute COPD exacerbation in a non-isolation room, who later was diagnosed to be COVID-19 positive. The total encounter time between the nurse—who was working as a float nurse—and the patient X lasted approximately 20 minutes. Patient X was initially at a low suspicion for COVID-19 because there was no community-acquired case reported in the state at that time. Patient X and the nurse did not have any history of travel. Patient X had a surgical mask on but kept on taking it off during the encounter. The nurse had the gloves and surgical mask on before going into the room as a general precaution but did not wear the gown. He used 70% alcohol sanitizer to clean his hands before going in and after going out of the room. He applied oxygen to the patient’s face. He placed the EKG leads on Patient X and ran an EKG. Patient X received a bronchodilator treatment during his emergency room encounter. The nurse was not present during the treatment but took the nebulizer off the patient X when it completed. Patient X did not cough or sneeze during the encounter with the nurse. The nurse had disposed off the gloves and the surgical mask appropriately (untying from behind without touching his face) after going out of the room. After going home, he placed aside his scrubs from the other clothes and took a shower. After Patient X tested positive for COVID-19, the nurse was instructed to be in-home isolation. The nurse developed a dry cough with fever and shortness of breath in the next week after exposure to patient X and was tested positive for COVID-19. He did not encounter any other COVID-19 positive or person under investigation patients during this duration besides the index COVID-19 hospitalization. He was admitted to the hospital for observation for a day. He had crackles on lung exam, but the chest X-ray was clear, and he was saturating at 96% on room air. His clinical symptoms improved within a week of its onset. He subsequently tested negative for COVID-19. Patient X course, however, deteriorated and was admitted into the ICU. He was empirically treated with remdesivir, hydroxychloroquine, and lopinavir/ritonavir, however, his COVID-19 test was positive even after all these therapies. He was pronounced dead after a protracted 22 day-long period of intubation.

Patient X was the index case of community transmission in the state of Illinois. The nurse had the surgical mask on at all times. The nurse had gloves on during the encounter and used the 70% alcohol-based sanitizer after disposing off gloves. He subsequently took a shower and separated his scrubs after going home, which makes contact-based transmission less likely. In our case, the nurse took off the nebulizer when it finished. However, the UK National health sciences guidelines suggest medications via nebulization does not pose a significant infectious risk as the aerosol derived from a non-patient source does not carry patient-derived aerosol particles⁵. In a recent study, SARS-CoV-2 RNA was detected in more than 50% of air samples collected within the room and in the hallways around the COVID-19 patients⁶. In a study from Wuhan China, the researchers proposed the possibility of aerosol transmission of SARS-CoV-2⁷. The highest airborne concentration was noted when the patient was receiving oxygen through a nasal cannula; however, whether the airborne- viral shedding can cause viral infection is still being studied⁶. In another experimental study by Bae et al. on COVID-19 patients, three out of four patients wearing a surgical mask had detectable virus in the Petri dishes placed 20cm apart, and all the patients had virus detected on the outer surface of surgical masks suggesting the ineffectiveness of surgical mask in COVID-19⁸. They argue assuming the size of SARS-COV-2 is 0.06 to 0.14 μ m based on the size measured during the outbreak in 2002-2004⁹ and that surgical masks can not filter aerosols measuring 0.9, 2.0, and 3.1 μ m in diameter, surgical masks are unlikely to filter the virus¹⁰. Our case report, coupled with the previous experimental studies, provides preliminary evidence that surgical masks are unlikely to provide effective protection against COVID-19.

Conflict of interest

The author(s) declare that there is no conflict of interest.

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Informed Consent

Informed written consent was taken from the patient before writing down the correspondence.

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