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COMMENTARY

SARS-CoV-2: how safe is it to fly and what can be done to enhance protection?

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With lockdown restrictions over coronavirus disease 2019 being relaxed, airlines are returning to the skies. Published evidence of severe acute respiratory syndrome (SARS) coronavirus 2 transmission on aircraft is limited, but in-flight transmission of respiratory infections such as tuberculosis, influenza and SARS has been well described. Risk factors include proximity to index patients and sitting in aisle seats. Personal protection on aircraft could be enhanced by always wearing a well-fitting face mask and face shield or sunglasses, wiping surfaces and hands with alcohol-based sanitizers, not touching the face, not queuing for washrooms, changing seats if nearby passengers are coughing and choosing a window rather than an aisle seat.

Keywords: air travel, COVID-19, face masks, SARS-CoV-2

One of the many consequences of the coronavirus disease 2019 (COVID-19) pandemic has been a dramatic reduction in international and domestic air travel. With lockdown restrictions now being relaxed in many countries around the world, airlines are starting to return to the skies. However, a key question remains: how safe is it to fly? Surprisingly, there are few published scientific papers on this subject and a lack of evidence-based recommendations to enhance passenger protection on an aircraft.

Epidemiological data suggest that transmission of the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is primarily through respiratory droplets expelled during face-to-face exposure during talking, coughing or sneezing.[1] Infection can be spread by asymptomatic, presymptomatic and symptomatic carriers. Prolonged exposure to an infected person (being within 6 ft for at least 15 min), briefer exposures to infected persons who are coughing and touching surfaces contaminated with the virus are important risk factors for transmission. There is speculation that transmission can also occur via aerosols, but it is unclear whether this is a significant source of infection in humans outside of laboratory settings.[1]

Most commercial aircraft have intrinsically clean air. This is collected from outside the aircraft, normally through the engine, mixed with recycled air in the cabin in a ratio of 1:1 and passed through high-efficiency particulate air filters.[2] The flow of air, which is vertically downwards from above a passenger's head to below his/her feet, is designed to minimise the risk of infection and limit the propagation of infectious particles in the air. However, the flow of air can be disrupted by passengers leaving their seats to check the overhead bins or visiting the lavatory or cabin crew moving up and down the plane attending to passenger requests and serving drinks and meals.[3] During a commercial flight, individual contacts tend to be greatest for those in aisle seats, less so in middle seats and least in window seats.[3] Additionally, there is substantially more passenger movement on long international flights compared with short-hop flights.[3] These movements and person-to-person contacts during a flight can facilitate infectious disease transmission.

Since 1946, outbreaks of infectious diseases have been reported aboard commercial airlines.[2] Tuberculosis (TB) transmission during a long airplane flight occurred when one passenger with infectious multidrug-resistant disease infected six other passengers who had no other risk factors for TB: all six had sat in the same section of the plane as the index patient.[4] Passengers seated within two rows of the index patient were significantly more likely to have positive tuberculin skin tests than those in the rest of the section (30.8% versus 3.6%, rate ratio 8.5 [95% confidence interval {CI} 1.7 to 41.3]). A systematic literature review identified 14 peer-reviewed publications documenting 163 (7.5%) secondary cases of influenza-like illness among 2165 traceable passengers, all arising from index cases

with influenza-like illness on board aircraft.[5] Of these secondary cases, 42% were seated within two rows of the index patient compared with 6% who sat elsewhere (risk ratio 7.0 [95% CI 5.3 to 9.1]). After one flight carrying a symptomatic person with SARS, 22 persons developed SARS (16 laboratory-confirmed and 6 with probable disease).[6] SARS developed in 31% of persons seated in the three rows in front of the index patient compared with 11% of persons seated elsewhere (risk ratio 3.1 [95% CI 1.4 to 6.9]). A model simulating outbreaks of in-flight infections showed that close contact (passengers sitting within two rows of the index patient) contributed 70% of influenza transmission while airborne, close contact and fomite routes contributed 21%, 29% and 50%, respectively, of SARS-CoV transmission.[7] Aisle seat passengers were more likely to have a higher infection risk than non-aisle passengers through the fomite route.

To date, there are few publications of SARS-CoV-2 transmission during flight. There was one probable aircraft transmission in flight from the Central African Republic to France.[8] One passenger who was seated near four infected persons developed COVID-19 from a flight from Singapore to China.[9] Two passengers probably developed COVID-19 from a flight from Israel to Germany, both of them seated within two rows of an index case.[10] However, given the infection potential associated with TB, influenza and SARS, all largely spread through respiratory droplets, the risk is there and precautions need to be taken.

The US Department of Health and Human Services air medical evacuation teams repatriated >2000 individuals who were either exposed to or had confirmed/suspected COVID-19 on 39 flights without any crew getting infected.[11] This was attributed to face masks being worn by everyone (including N95 masks for known positives), safe work practices and high-grade personal protection equipment for the crew. There are significant associations between the use of face masks (especially N95 masks rather than disposable surgical masks), eye protection with a face shield and physical distancing of ≥1 m and reductions in SARS-CoV-2 transmission.[12]

In May 2020, the International Civil Aviation Organization (ICAO) released helpful guidance on air travel during the COVID-19 public health crisis,[13] and passengers would do well to read this guidance prior to flying. To maintain physical distancing on a commercial aircraft, middle seats should be blocked out, but economic considerations by airlines may preclude that from happening. What therefore can individual passengers do? Based on our review of the current literature and ICAO guidance, we suggest the following: wear a well-fitting face mask throughout the flight and a face shield or eye glasses (e.g. sunglasses); take alcohol-based sanitizers to wipe nearby surfaces and regularly clean your hands; avoid the temptation to touch your face; avoid congregating at specific areas, such as queuing for washrooms; request to change seats if a passenger in adjacent rows is coughing or symptomatic; and choose a window seat rather than an aisle seat. If feasible, passengers would also do well not to eat or drink during the flight, as they would not be wearing a face mask and aircraft utensils and cups may be infected through fomites.

Flying involves not only sitting on an airplane, but spending time in transit to and from the airport; queuing for check-in, emigration and security at the departure airport; and queuing for possible health checks, immigration, luggage collection and customs at the arrival airport, possibly in another country. All of these bring passengers into close contact with one another and with contact surfaces that may be riskier than the inside of the airplane cabin. Continued use of face masks, eye shields, alcohol-based sanitizers and physical distancing will therefore be required.

Before leaving home, potential travellers will also need to consider other issues, including the amount of COVID-19 transmission at their destination, the need for quarantine at their destination and when they return back home, whether they have been in contact with any person with COVID-19 in the previous 2 weeks and whether they feel any illness on the day of travel. If in doubt, it is best to stay at home!

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