Special Article

In A Pandemic: How to Safely Use Public Transportation

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On the New Year's Eve 2019, when China reported a cluster of cases of pneumonia in people associated with the Huanan Seafood Wholesale Market in Wuhan, Hubei Province, who would happen to know that later becomes the beginning of the Pandemic. In January 2020, when Thailand announced the first COVID-19 case in the country and outside of China, no one expected the enormous impact worldwide afterward. However, on March 11, 2020, when the World Health Organization (WHO) declared COVID-19 a pandemic, the world we were familiar with has changed ever since.

In order to contain the spread of disease, many measures have been applied: stay-at-home and no gathering orders, physical distancing, travel restriction, mandatory masks, hand hygiene and respiratory etiquette. A "lockdown" refers to a restriction that allows only essential businesses to remain open while schools, universities, recreation facilities, and other non-essential affairs are closed has been implemented in numerous countries and territories around the world to limit contact between people. This unprecedented situation occurs probably once in a lifetime that we hear this word and be a part of it. We have experienced the time that we are not able to go many places we want or do many things we like. Staying at home and physical distancing makes travel, particularly by public transportation, inevitably difficult.[1-3]

Applying from WHO pandemic phases, we are all looking forward to seeing "the post-pandemic period" that the extent of the disease has returned to the seasonal level in most countries, and we are able to ease most of the restrictions. Until that day comes, we all know our life must go on. The negative impact of physical distancing and movement restrictions to the business and economy can be apparently seen. While it is impossible to do the lockdown permanently, we must learn how to negotiate with the pandemic when the thing is reopening. Nowadays, as the number of vaccinated population and people with acquired immunity is rising, the world is likely on the way into a "new normal". After all, life is coming back to the days before COVID-19 pandemic. However, some precautions should be taken for a considerable period.

In order to return to school, university, work, or travel in the context of pandemic, particular safety measures must be strictly maintained. When routine activities resumed, social contact and public transportation are unavoidable. Even though public transportation serves as the principal mode of travel for many people, the demand has been decreasing tremendously because of acclimatization in work practices to home office and fear of encounter with a transmittable case and contaminated surrounding. With a proper conscientious precaution and appropriate measures, the public transportation can be cautiously used.

Risk of virus transmission

A case-control study performed during the 2008/2009 influenza season indicated statistically significant association between acute respira-

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tory infection and bus or tram use in the five days before symptom onset. For COVID-19, some studies have demonstrated disease occurring related to bus travel, and a strong, significant association between COVID-19 and either travel by train or airplane. Literature exploring the transmissions of COVID-19 on Diamond Princess Cruise found that the mean reproduction number (R0) was much higher than that estimated from the community-level transmission. From these pieces of evidence, it is reasonable to believe public transportation and terminal stations are reservoirs of the virus during the pandemic.[4-6]

Droplets and close contact are the main routes of transmission of the SARS-CoV-2. Not merely can symptomatic patients be the source of infection, an individual without any symptoms can also spread the virus. Risk of virus acquisition while using public transport depends on disease (prevalence, infectivity), environment (indoors vs. outdoors, poorly vs. well ventilated), and human (level of occupancy, contact time, activity, face covering) factors. Several components make public transportation high risk for COVID-19 spreading, including, but not limited to:

- A confined area that makes physical distancing difficult or impossible
- An indoor and poorly ventilated environment
- A high level of occupancy
- Frequently touch shared surfaces: seats, doors, and handrails
- Limited capacity to detect or screen sick passengers

Nonetheless, there are many ways to minimize the risk associated with these factors.

Prevention and control strategies

To confine the transportation-related transmission, both institutional and individual level of measures must be utilized. Required procedures should include management plan, disinfections, environment hygiene, personal protection, and health promotion.

1. Institutional requirements

Management plan should be established quickly and effectively. Emergency measures are sometimes necessary.

1.1 Formulating guidelines and strengthening cooperation

Specific guidelines should be developed according to public transportation use behavior, building/vehicle layout, characteristics of each transport, and passenger station. To encourage cooperation, the importance of individual and community safety should be emphasized.

1.2 Training and health education

Staff training, work supervision and inspection at passenger terminals and vehicles can improve awareness and ability of front-line staff to comply with the guidelines and respond to the emergency. Video training, billboards, electronic screens, and nowadays, social media should be used to popularize the knowledge on infection prevention for both staff and passengers.

1.3 Reserving materials and implementing safeguards

Adequate supplies of disinfectants, masks, gloves, temperature monitoring equipment should be provided to front-line workers. Hand sanitizer should be sufficiently prepared in the passenger terminals and vehicles. Transport vehicles should be maintained in good condition.

1.4 Passenger management

Transportation departments should conduct a comprehensive analysis on demand for transportation and provide adequate service in order to minimize the risk of overcrowding while enabling negotiable operational costs for ridership. Passenger flow, waiting areas, and ticket sales should be managed to allow physical distancing and contactless interactions as much as possible.

1.5 Environmental management

1.5.1 Enhance ventilation

A case report from an outbreak at a restaurant in China suggested that the transmission pattern was consistent with the transient indoor localized ventilation airflow pattern. Subsequent analyses indicated a low transmission rate if the environment is well ventilated, people wear face coverings and remain silent when contact time is short. If possible, the ventilation power of air conditioning should be increased. Filters should

be cleaned or replaced regularly in a relatively confined environment. Windows should be opened to improve the air exchange.

1.5.2 Clean the environment

Wet clean to remove dust, garbage classification and regular trash removal, frequent restroom and floor cleaning should be performed.

1.5.3 Preventive disinfection

Passenger terminals, waiting rooms, and public restrooms should be cleaned and disinfected daily. The inner surface of the vehicles needs to be cleaned and disinfected after each transport. The area of high touch should be disinfected more frequently.

1.6 Management of an emergency

Specific areas such as three rows of planes, buses, trains, or waiting rooms at passenger terminals should be prepared for temporary isolation in case of an emergency. The flow of patient transportation should also be arranged to minimize contamination.

2. Personal protection

Based on routes of transmission of SARS-CoV-2 and standard precautions, three major procedures must always be emphasized: wearing masks, hand hygiene, and keeping a safe distance (at least 6 feet). Staff and passengers should ensure they are in good health during the time for working and transportation.[7]

The effectiveness of these measures has been evident in many countries in Asia, where social contact and businesses have gradually recovered since early 2020 with population movement across the country. However, to date, no cluster transmissions of COVID-19 caused by public transportation identified.

For the passengers, the principles, evidence, and recommendations regarding public transportation use based on the type of vehicles or service are described below.

Recommendations for all types of transportation

- **Stay home when possible:** particularly when you are sick. If you are at risk for developing severe disease, non-essential travel should be postponed.
- **Wearing masks:** bring your mask to wear at all times.
- **Physical distancing:** as much as possible, ideally at 6 feet (2 arm lengths)
- **Practice hand hygiene:** wash your hands with soap and water for at least 20 seconds or use hand sanitizer with at least 60% alcohol.
- **Avoid touching the surface:** to minimize the risk of contamination that might lead to virus entry if hands contact with the mucosa.
- **Respiratory etiquette:** cover your mouth and nose with a tissue when you cough or sneeze. Throw used tissues in the trash and sanitize your hand immediately.
- **Have adequate supplies:** always prepare enough hand sanitizer, napkins, alcohol wipes for any travel and ensure they are ready and easy to use.
- **Avoid eating, drinking, and talking too much while using public transportation:** to reduce the risk of acquisition and transmission of the virus.

Airplanes

Air travel seems to be the perfect environment for the transmission of COVID-19 since it packs an abundance of people into a confined space, often for an hour or more hours at a time. But presently, almost all airplanes have excellent high-efficiency particle air (HEPA) filters that capture more than 99 percent of particles, including viruses in the air. The air-circulation system in most commercial airplanes brings in outside air in a top-to-bottom direction about 20 - 30 times per hour, resulting in a 50 - 50 mix of outside and recirculated air which reduces the potential for airborne spread of the respiratory virus. Nowadays, all the airlines require a face mask/covering during the flights except for mealtimes, and some are blocking off middle seats to allow more distancing between people. Cleaning procedures between flights have also been attempted. These commitments can reduce the risk of transmission with highly evident recommendations. Although physical distancing is almost impossible on the flight, wearing masks, minimizing talking, eating/drinking, and hand hygiene are the foremost effective manners.

Subways and trains

Compared with airplanes, subways and trains have more space allowing physical distances. However, remain in a limited capacity and depend on how crowded they are. Hand hygiene is even crucial in the setting of potential frequent contact

with high-touch surfaces such as ticket machines or handrails. Sanitizing hands before and immediately after each ride is highly recommended.

Buses

Many buses have HVAC (Heating, ventilating, and air-conditioning) systems similar to those on subways and trains, with one additional factor: buses are more likely to have open windows and allow fresh air to enter the vehicle. Buses make frequent stops which allow outside air to flow in every time the doors open. Even though the ventilation seems better, in a case study of a bus in China, a passenger with COVID-19 was able to infect many other passengers, including those are sitting in to seven rows inside. Looking for a well-ventilated area is always helpful in addition to standard measures, which are wearing masks, physical distancing, and hand hygiene.

Taxis

There was a report on a Thai taxi driver who felt ill and tested positive for COVID-19 after driving some Chinese tourists who had had frequent coughing but wore masks. This was believed mainly from close contact in a poor ventilation environment. Reliable data on the frequency of COVID transmission in cars is still lacking. Keeping the windows open and making sure the air system well ventilates should reduce the risk. Wearing a mask for both drivers and passengers and keeping conversation to a minimum also help to reduce releasing the infected droplets. If the rate of community transmission is low, the chances are that taking the occasional taxi is not a considerable risk.

Shared automobiles/rental cars

Clean and disinfect with alcohol wipes, bleach, or other disinfecting solutions frequently touched surfaces, e.g., steering wheel, gear shift, door handles, radio/temperature control knobs/buttons, locks, and seatbelt buckles, before every use should be emphasized.[8-13]

Discussion

In a pandemic, we all undoubtedly know that the risk of disease infection while using public transportation remains not zero. Strictly following these proposed measures can certainly minimize the possibility of transmission. Responsible action from both institutional and personal levels is crucial to prevent and control the dissemination of the disease and keep the community safe and healthy.

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