Title: The Flight Evacuation Mission for COVID-19 from Wuhan, China to Tokyo, Japan from 28 January to 17 February 2020

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Summary

Though multiple countries reported their evacuation missions to repatriate their citizens with this emergence of COVID-19 from China in early phase, a paucity of data existed on how operationally to optimally execute an evacuation with balancing the risk of transmission during the flight, while avoiding the spread to their home countries. We described the collective findings of the flight evacuation mission from Wuhan, China to Tokyo Japan from 28 January to 17 February, 2020. The evacuation team established the evacuation processing flow, including focused health questionnaire, temperature monitoring, ticketing and check-in, and boarding procedure planning. Evacuees were seated according to pre-planned zones. Additionally, to facilitate triage of the evacuees for the medical needs, we conducted in-flight quarantine to determine the disposition of the evacuees. All evacuees, regardless of their health condition, were required to perform rigorous hand hygiene frequently, and to wear surgical masks throughout the flight. We implemented strict infection prevention and control throughout the mission including in-flight quarantine. The pre-planned protocol and vigilant observation during the flights were crucial elements of this mission. Our experience is of value to develop to more refined plan for the next outbreak.
Due to the outbreak of coronavirus disease 2019 (COVID-19), Chinese authorities enforced lockdown of Wuhan, Hubei Province, on 23 January 2020. Non-Chinese citizens had limited flights from Wuhan to return to their home countries. In response to this calamity, the Government of Japan deployed five chartered flights to evacuate 828 Japanese nationals and their family members in Wuhan from 28 January to 17 February, 2020. Among all repatriated, 14 returnees diagnosed as positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection within 2 weeks of their arrivals, including 8 symptomatic and 1 asymptomatic evacuees identified upon entry (Table 1)(1-3). Among 14 returnees, five were negative at the entry and subsequently turned to be positive. This is the first time in history the Government of Japan coordinated a large-scale overseas evacuation for the infectious diseases outbreak. Though multiple countries reported their evacuation missions to repatriate their citizens with this emergence of COVID-19 in Wuhan(4-8), few data elaborated the process of evacuation while hedging the risk of transmission during the flight and avoiding the spread to their countries. We described the process and lessons learned from the missions.

The medical and quarantine team consisted of at least 4 members, including one physician, nurses, and administration staff. The mission was planned to evacuate only asymptomatic and mildly symptomatic individuals, who passed the quarantine by the Government of China at the Wuhan airport. Those considered to be ill were instructed to remain in Wuhan for treatment. The operational aspect of the plan was expeditiously developed shortly after the lockdown in Wuhan. Dedicated efforts to collect information
on the mode of transmission, local epidemiology, and clinical features continued up until boarding of the flights. A symptomatic case was defined as an individual with a fever of 37.5 °C or higher, or exhibiting respiratory symptoms. As the route of transmission has been assumed to be contact or droplets, our basic personal protective equipment (PPE) for the mission participants comprised of surgical masks and gloves. Additional equipment such as N-95 masks, face shields and disposable surgical gown were prepared for high risk procedures of such as medical examinations and procedures for sick individuals.

After the team members were granted custom, immigration, and quarantine clearance at Wuhan Tianhe International Airport, the team encountered the evacuees at the check-in counter. The team quickly determined the operational flow: conducted concise health inquiry; temperature measurement with non-contact thermometer; check-in/ticketing process; and flow planning for boarding. The evacuees were instructed to form a queue for the initial health inquiry and temperature measurement with a good distance behind the person in front of you. After initial triage, those with mild symptoms and those with use of antipyretic were separated to avoid contact with other evacuees. They boarded the plane before other asymptomatic passengers, and were seated in the Red Zone in the rear part of the plane (Figure 1). Other asymptomatic evacuees were seated on the front seats in the Green Zone. The evacuation team members were seated in Yellow Zone, between symptomatic and asymptomatic passengers, keeping distance from symptomatic evacuees by at least 2 meters or two to three rows. All evacuees, regardless of their health condition, were encouraged to perform frequent
hand hygiene with alcohol hand sanitizer as many as possible, and to wear surgical masks throughout the flight. Hand hygiene with alcohol hand sanitizer was mandated at least at the checking-in counter and upon boarding. To reduce the risk of infection for cabin crew, in-flight services were made unavailable and they had limited access to the red zone.

The in-flight quarantine was conducted during stable cruising portion of the flight. All evacuees were requested to report their identification, and health condition over the two previous weeks on the disembarkation card. During the 3.5 hour-flight from Wuhan to Tokyo, we monitored the temperature and scrutinized symptoms of all passengers at least once; and we encouraged them to report their symptoms when they became sick. We recognized some developed respiratory symptoms and others developed fever during the flight (Table 1). They were moved to the Red Zone accordingly. At Tokyo International Airport, asymptomatic evacuees disembarked from the plane first, followed by cabin crews, then symptomatic evacuees. Passengers with symptoms were directly admitted to medical institutions designated for specific infectious diseases by Act on the Prevention of Infectious Diseases and Medical Care for Patients with Infectious Diseases (the Infectious Disease Control Law) for further medical management, while the remaining were transported to tertiary medical center for further assessment. All passengers were examined by PCR testing for SARS-CoV-2 as the entry screening, then quarantined for 14 days and retested before discharge. The health surveillance period completed with all evacuees have returned home.
The Japanese government completed the large-scale evacuation mission over a period of ~3 weeks from Wuhan using charter flights. Through this operation, we successfully executed the multifaceted evacuation strategy of in-flight quarantine, and accomplished infection control and prevention practice throughout the mission. Infection control and prevention practices included zoning, flow planning, strict hand hygiene, and universal mask usage. Our operation resulted in minimizing the spread of COVID-19 upon arrival in Japan(9); and facilitated swift and safe transition to further care in Japan.

Among those presented at the airport in Wuhan, eight did not meet the Chinese exit quarantine criteria (people with body temperature $\geq 37.3 \, ^\circ C$ were restricted from leaving the country)(10). Therefore, 828 were evacuated from Wuhan to Japan. We identified 17 symptomatic evacuees after they passed the Chinese quarantine at the airport; and identified additional 17 evacuees who were asymptomatic at the airport but developed fever or other symptoms during the 3.5-hour-flight. Vigilant and repeated observations during the flight were crucial elements of this mission; and we should take such cases into account for planning evacuation mission. Of note, if the flight time had been longer than that in current mission, it would have been extremely difficult to follow such strict infection prevention and control practice during the flight.

To conclude, COVID-19 is a novel emerging infectious disease with many uncertain characteristics especially at the early stage of the outbreak. The operational team should be organized in such a way to maximize flexibility in order to respond to any unexpected event. Although we had intended to evacuate more individuals through
each flight, we were obligated to focus on the safety of the evacuees by ensuring adequate space for zoning to prevent potential spread of infection during the flight via implementation of infection prevention and control, hence, to prevent further spread of infection in Japan through quarantine operation. This evacuation mission might be a meaningful model for not only Japan but also the other countries to conduct similar missions in the future.

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The opinions expressed in this article are that of the authors and do not reflect the official policy of Japanese Ministry of Health, Labour and Welfare.

Conflict of interest
All authors have no conflict of interest to declare.
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Figure 1. Airplane seat map with zoning. Green zone was for the asymptomatic individuals; Yellow zone was for the evacuation teams; and Red zone was for those with symptoms. Of note, those with symptoms were instructed to use the restrooms within the red zone. The seat map was provided by ALL NIPPON AIRWAYS CO., LTD and modified by authors.
Table 1 The number of evacuees and PCR positive for SARS-CoV-2 during Japanese evacuation mission between January 28, 2020 and February 17, 2020

<table>
<thead>
<tr>
<th>Charter Plane</th>
<th>Departure</th>
<th>Arrival</th>
<th>Total Evacuees</th>
<th>Symptomatic returnees</th>
<th>Asymptomatic returnees</th>
<th>Chinese Quarantine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 28, 2020</td>
<td>Jan 29, 2020</td>
<td>206</td>
<td>5 (2)</td>
<td>201</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive at the entry</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive within 2 weeks ( ^a )</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Jan 29, 2020</td>
<td>Jan 30, 2020</td>
<td>210</td>
<td>13 (4)</td>
<td>197</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive at the entry</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive within 2 weeks ( ^a )</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Jan 30, 2020</td>
<td>Jan 31, 2020</td>
<td>149</td>
<td>9 (7)</td>
<td>141</td>
<td>7</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>PCR Positive at the entry</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive within 2 weeks ( ^a )</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Feb 6, 2020</td>
<td>Feb 7, 2020</td>
<td>198</td>
<td>4 (3)</td>
<td>194</td>
<td>0</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive at the entry</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive within 2 weeks ( ^a )</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Feb 16, 2020</td>
<td>Feb 17, 2020</td>
<td>65</td>
<td>2 (1)</td>
<td>63</td>
<td>0</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive at the entry</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive within 2 weeks ( ^a )</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive at the entry</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive within 2 weeks ( ^a )</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>828</td>
<td>34(17)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>PCR Positive at the entry</td>
<td>9</td>
<td>1</td>
</tr>
</tbody>
</table>

\( ^a \) PCR Positive within 2 weeks refers to individuals who tested positive for SARS-CoV-2 within 2 weeks after arrival.
| PCR Positive within 2 weeks \(^a\) | 14 | 2 | 12 | - |

( ): Onset in Flight

\(^a\) It includes the number of PCR positive at the entry

\(^b\) Those who did not meet the exit quarantine criteria in China.

The result of PCR testing at the entry and within 2 weeks were obtained from MHLW official websites.

Abbreviations: PCR, polymerase chain reaction