Title:

Cluster-based approach to Coronavirus Disease 2019 (COVID-19) response in Japan—February–April 2020

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On February 25, 2020, Japanese Ministry of Health, Labour and Welfare (MHLW) established a Coronavirus Disease 2019 (COVID-19) cluster response taskforce designed to facilitate collaboration between governmental officials and non-governmental public health experts in Japan. The experts from multiple institutions were invited to support MHLW. The taskforce worked onsite at MHLW in Tokyo. It supported the Ministry's efforts toward the early detection of and appropriate care for severe cases, early identification of and response to case clusters, and promotion of behavioral change to increase physical distancing and avoidance of risky environments. The measures for establishing close collaboration was redesigned how the Japanese government and academics collaborate during health-related emergencies. We describe and reflect on the cluster-based prevention measures instituted in Japan against the spread of COVID-19 and provide insight into the next stage of response.

More than 150 confirmed COVID-19 cases had been reported in Japan as of February 25, 2020 (1), and the expert members of the taskforce analyzed part of these cases to determine characteristics of secondary transmission. Initial findings suggested that 80% of cases did not transmit the virus to others (2). Instead, most transmission was propagated by a small proportion of cases (3), often leading to cluster formations. Therefore, identification of a cluster by tracking the activity of cases backward is important (4) and the efforts to reducing opportunities for cluster formation could suppress COVID-19 transmission.

The taskforce next searched for common environmental and behavioral characteristics of clusters. Most transmission occurred in settings considered the "Three Cs": 1) closed spaces with poor ventilation, 2) crowded spaces with many people, and 3) close contact, such as from intimate conversations, loud cheering, singing, or exercise within a short distance from others. This indicated a need for physical distancing and suggested the "Three Cs" should be avoided to prevent transmission of severe acute respiratory syndrome-covonavirus-2 (SARS-CoV-2), a causative agent for COVID-19. The second public health measure reflected this finding by requesting that residents and visitors avoid environments related to the "Three Cs." In some cases, local jurisdictions also recommended closing venues with environments related to the "Three Cs."

In late March, there was an increase in the number of cases reported without an identified epidemiologic link, indicating that unrecognized chains of community transmission were occurring (5). The taskforce estimated that residents would need to reduce their number of close contacts by 80% to suppress transmission to the level that would allow for sustainable public health response (6). Consequently the third public health measure—a legally-based state of emergency—was declared in accordance with legislation developed following the H1N1 influenza pandemic of 2009 (7), which allows restricted use of high-risk venues. As of April 28, the Japan government was set to remain in a national state of emergency until May 6, and the taskforce would continue evaluating necessary public health measures and provide recommendations based on trends in incidence and other data.

To intensify the cluster response, the new technologies have been considered to be used. Random mutation analysis in the SARS-CoV-2 gene over time is also helpful in identifying the spread of the virus within the community; and has been applied to the epidemiologic investigations (8). The traditional resource-intensive contact tracing that forms the basis of cluster response may not be sustainable when incidence is extremely high (9); and may benefit from the support of newer technology such as the mobile phone applications for contact tracing and close-contact management (10).

Although the first COVID-19 case detected in Japan was identified less than one month after the disease was reported from China, a large increase in cases was initially averted. However, once disease spread reached pandemic proportions, residents returning to Japan from new COVID-19 epicenters sparked fresh domestic chains of transmission. As the local scale of the epidemic increased, the experts in the taskforce also assumed the role of risk communication, reaching out to the public to provide scientific-based message for the behavioral change and physical distancing recommendations announced as necessary to suppress SARS-CoV-2 transmission. As the pandemic continues, the taskforce will need to adapt its role and collaborate with decision-makers to find a sustainable balance between public health response and socioeconomic stability.

To conclude, this manuscript has described Japan's cluster-based approach to COVID-19 response and the contribution of this approach to national policies. The taskforce provided scientific evidence to decision-makers as public health measures were deliberated upon and implemented. This level of integration of non-governmental experts into the national COVID-19 response is unprecedented, paving the way for future synergistic collaboration among government, academia, and other sectors during public health emergencies. As the pandemic unfolds further and additional information about COVID-19 becomes available, the taskforce will continue providing expert opinions and timely analyses in support of public health response.

Appendix

The Experts in National COVID-19 Cluster Taskforce (a part of members, listed in alphabetical order)：

Andrei R Akhmetzhanov	Hokkaido University
Miki Ando	Okinawa Kyodo Hospital
Asami Anzai	Hokkaido University
Satoru Arai	National Institute of Infectious Disease
Yuzo Arima	National Institute of Infectious Disease
Akira Endo	London School of Hygiene & Tropical Medicine; The Alan Turing Institute
Hiroyuki Fujikura	National Institute of Infectious Disease
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Takeaki Imamura	Tohoku University
Kazuaki Jindai	Kyoto University
Sung-mok Jung	Hokkaido University
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Kazutoshi Nakashima	Daito Bunka University
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Takuri Takahashi	National Institute of Infectious Disease
Sayaka Takanashi	National Institute of Infectious Disease
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Atsuna Tokumoto	Consultant
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Yuuki Tsuchihashi	National Institute of Infectious Disease
Naho Tsuchiya	Tohoku University
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Ichiro Wada	Hanazono University
Koji Wada	International University of Health and Welfare
Kana Watanabe	National Institute of Infectious Disease
Yuuichiro Yahata	National Institute of Infectious Disease
Takuya Yamagishi	National Institute of Infectious Disease
Yichi Yang	Hokkaido University
Ikkoh Yasuda	Nagasaki University
Fujitani Yoshihiro	Osaka University
Keita Yoshii	Hokkaido University
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Conflict of interest:

Non declared

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