



# Covid-19: How Taiwan Grasped an Early Opportunity to Contain the Pandemic

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**Objective:** Since the first reported case of coronavirus disease 2019 (COVID-19) in Wuhan, China, in December 2020, the global epidemic has infected over 20 million people and claimed more than seven hundred thousand lives worldwide in just seven months. Compared with the rest of the world, the impact of the disease on Taiwan was relatively minor. The present study aimed at analyzing the public policies of Taiwan at both governmental and institutional levels that helped in containing the spread of the pandemic.

**Methods:** All available information issued by the Taiwanese Government in response to the essential events of the pandemic as well as the corresponding measures taken by our institute from January till July 2020 were summarized and analyzed.

**Results:** Reviewing of the information revealed a total of five steps were at both governmental and institutional levels in an attempt to stop the spread of the pandemic in Taiwan, namely, Step 1: Strict surveillance, import control, and immediate reporting; Step 2: Containment of infection and identification of infection source; Step 3: Minimizing risks of community-acquired infection; Step 4: Prevention of nosocomial infection; and Step 5: Eliminating risks of disease importation.

**Conclusion:** Following the Severe Acute Respiratory Syndrome (SARS) attack in 2003, important changes in governmental healthcare policies have been made that contributed to the rapid response at both governmental and institutional levels to the looming COVID-19 pandemic at the very beginning. Nevertheless, as the pandemic remains out-of-control worldwide, new strategies may have to be adopted to reinforce our defense against the disease.

**Key words:** COVID-19, Taiwan Centers for Disease Control, policy, surveillance, reporting

## Introduction

Since the identification of the first 41 cases of coronavirus disease 2019 (COVID-19) in Wuhan, China, at the beginning of January 2020,<sup>1</sup> the global number of confirmed cases

has exceeded 11 million in six months with ever-increasing mortalities. Although WHO made a strong statement prompting governments worldwide to implement robust containment and control measures,<sup>2</sup> over 210 countries and territories have been affected. One reason for the uncontrolled spread is a lack of a

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nationwide protocol to follow.

The Center for Systems Science and Engineering (CSSE) at Johns Hopkins University has tried to model the global spread of the acute respiratory syndrome coronavirus 2 (SARS-CoV-2) based on a stochastic metapopulation epidemic simulation tool<sup>3</sup> considering the global network of travels according to a mathematical model.<sup>4</sup> The model predicted Taiwan to be at second highest risk, only surpassed by Thailand, for estimated disease importation.<sup>3</sup> However, the number of cases in Taiwan with COVID-19 is relatively small for a population of 23.8 million according to the latest update (i.e., 449 patients with confirmed diagnosis and seven mortalities to date, mortality rate 1.6%) compared with the United States, European (e.g., Italy) and Middle Eastern countries (e.g., Iran), taking into account the earlier onset of the disease in Taiwan, its geographic proximity to China (i.e., Kinmen County, one of the Taiwanese islands, is merely 2.31 km away from Mainland China) and the high frequency and volume of travelers between Taiwan and Mainland China. Besides, of the 449 confirmed cases, 358 (79.7%) are imported and there is no large-scale community-acquired infection among the indigenous cases.

The relatively well-contained pandemic in Taiwan may be attributable to some important changes in governmental healthcare policies following the Severe Acute Respiratory Syndrome (SARS) attack in 2003. In addition to some of the reported key Taiwanese measures in response to the threat of COVID-19,<sup>5</sup> a review of all incidences of COVID-19 in Taiwan and the corresponding responses of the Ministry of Health and Welfare (MHW), Taiwan, revealed some essential steps and precautions that the Taiwanese government took at national and institutional levels.

## **Precautions at National Level**

### **1. Portable record of citizens' travel history**

The National Health Insurance Card, which all Taiwanese citizens possess for presenting to medical institutes on seeking medical help, contains not only records of medications and the sources of prescription but also detailed travel histories. It proved to be an effective screening tool for healthcare workers.

### **2. Assigning responsible medical institutes for management of possible endemic and quarantine of patients**

Following the previous assault of SARS, MHW assigned the responsibilities of endemic control to 134 medical institutes nationwide with facilities considered adequate for this purpose. The list is renewed every three years based on the results of assessment. Despite variations in their strategies adopted, these medical institutes form the basis of responses at the institutional level following changes in government policies as disease progresses (Table 1).

### **3. Establishment of a central command post governing all epidemic-related measures**

The Taiwan Centers for Disease Control (TCDC) (<https://www.cdc.gov.tw/En>) is a branch of MHW overseeing the prevention, surveillance, and screening of infectious diseases in the country. It also governs the establishment of legislation regarding the standard operating procedures to be adopted by governmental bodies and medical institutions on encountering potential infection threats. After 2003, the Taiwanese government realized the need for organizing a central command post in response to a nationwide threat of infection for monitoring and controlling disease spread through effective communications between the central government and different regions in the country. The Central Epidemic Command Center (CECC) has a fixed location fully equipped with personnel as well as communicating software and hardware to allow round-the-clock information updating and timely

Table 1. Steps taken at government and institutional levels in Taiwan in response to the coronavirus disease 2019 (COVID-19) pandemic

Step (Date)	Strategy	Governmental level	Healthcare institutional level
Step 1 (From January 15, 2020)	Strict surveillance, import control, and immediate reporting	<ul style="list-style-type: none"><li>• Trigger event:<ul style="list-style-type: none"><li>(1) WHO disease outbreak new on January 12, 2020 (<a href="https://www.who.int/csr/don/12-january-2020-novel-coronavirus-china/en/">https://www.who.int/csr/don/12-january-2020-novel-coronavirus-china/en/</a>)</li><li>(2) One week before Chinese New Year, an expected period of busy air traffic between Taiwan and mainland China</li></ul></li><li>• TCDC defined the diagnostic criteria<sup>a</sup> for “Severe Pneumonia with Novel Pathogens” (SPNP) and announced its being included as one of the infectious diseases that has to reported to TCDC (January 16, 2020)</li><li>• TCDC reinforced screening for SPNP at airports and borders of the country as well as on board screening for passengers from Wuhan, China</li><li>• Establishing “Central Infectious Disease Command Center”</li></ul>	<ul style="list-style-type: none"><li>• History taking for patients at emergency department or outpatient clinics emphasising on travel, occupation, contact, and cluster</li><li>• Physicians required to report patients fitting the diagnostic criteria to TCDC within 24 hours</li><li>• Organizing “Infection Control Response Unit” at tertiary referral centers comprising members of governance, infection control physicians, and representatives of maintenance and engineering departments</li></ul>
Step 2 (From January 21, 2020)	Containment of infection and identification of infection source	<ul style="list-style-type: none"><li>• Trigger event: The first patient with confirmed diagnosis on January 21, 2020.</li><li>• Updating and revision of diagnostic criteria<sup>b</sup> for SPNP</li><li>• National Health Insurance Administration provided identities of passengers from Hubei province, China, for physicians through logging onto a cloud server</li><li>• WHO officially named the disease “coronavirus disease 2019 (COVID-19)” (February 11, 2020)</li></ul>	<ul style="list-style-type: none"><li>• Setting up checkpoints at hospital entrances with card readers and infra-red temperature sensors. Assigning personnel at checkpoints responsible for (1) diversion of patients visiting outpatient clinics and emergency department according to travel history record in their National Health Insurance cards, and (2) restriction of number of visitors.</li><li>• Allocating isolated spaces with negative pressure or good ventilation for examining outpatients and emergency patients. Patients with suspected SPNP were admitted to isolation wards with negative pressure.</li></ul>
Step 3 (From February 15, 2020)	Minimizing risks of community-acquired infection	<ul style="list-style-type: none"><li>• Trigger event: The first mortality with confirmed diagnosis without travel history. Cluster infection of the patient’s family was also confirmed. The source was found to be a merchant from mainland China. Of the 248 individuals with potential contacts, four had confirmed diagnosis.</li><li>• TCDC announced “Guidelines on community reporting, testing, and management of individuals suspected of COVID-19” including those with history of travel or contact with possible infected individuals in recent 14 days and present with fever or symptoms of upper respiratory tract infection, those having received antibiotics treatment for three days without improvement, those with possible cluster infection as well as healthcare personnel with pneumonia. All such patients should be subject to oropharyngeal swap sampling and reported to TCDC.</li></ul>	<ul style="list-style-type: none"><li>• Mandatory inclusion of travel, occupation, contact, and cluster during physicians’ history taking. Consultation with experts (e.g., infection control physicians, pulmonologists) for suspected cases that did not meet the reporting criteria.</li><li>• Changing quarantine ward to single rooms to reserve negative pressure isolation rooms for patients from possible community-acquired infection.</li></ul>

• Family cluster infection was evident as half of the cases with confirmed diagnosis were known to be infected through family contacts with recent travel history. TCDC issued the “COVID-19 Patient Risk Assessment Form” ([https://www.cdc.gov.tw/File/Get/tqZ0SYvAQAm\\_D05OwqMKGA](https://www.cdc.gov.tw/File/Get/tqZ0SYvAQAm_D05OwqMKGA)) for easy identification of high-risk patients by healthcare providers.

Step 4 (From February 28, 2020)	Prevention of nosocomial infection	<ul style="list-style-type: none"><li>• Trigger event: First confirmed nosocomial cluster infection in Taiwan</li><li>• Confinement of hospital personnel to specific working areas to avoid intra-hospital spread of infection which would impede the operation of the whole institute</li><li>• Prohibition of travel for all hospital personnel</li><li>• Submission of space allocation plan for the treatment of patients with COVID-19 and the records of all drills at the hospital to TCDC as required</li></ul> <ul style="list-style-type: none"><li>• Allocation of designated space for the treatment of patients with suspected COVID-19 infection at medical institutes with capabilities for patient quarantine and management</li><li>• Assigning a public hospital in each city and province exclusively to the treatment of patients with COVID-19 in preparation for the upcoming waves of infection</li></ul>
Step 5 (From March 19, 2020)	Eliminating risks of disease importation	<ul style="list-style-type: none"><li>• Trigger event: Dramatic increase in the number of confirmed COVID-19 cases from 59 to 100 (mainly from Europe) in just two days and worsening spread worldwide</li><li>• Re-allocation of hospital resources to cater for the increasing number of patients with suspected COVID-19 infection</li><li>• Country knockdown: Mandatory 14-day quarantine for non-Taiwanese are banned from entering the country.</li><li>• Mandatory oropharyngeal swap sampling for hospital personnel entering the Taiwan after March 3, 2019</li><li>• Mandatory self-quarantine for Taiwanese and non-Taiwanese who entered the country after March 3, 2019</li><li>• Contact tracing with cellphones for those subject to mandatory self-quarantine and interventions for possible violations</li></ul>

WHO: World Health Organization; TCDC: Taiwan Centers for Disease Control. <sup>a</sup>Diagnostic and reporting criteria (initial): Clinical criteria namely, (1) Fever ( $\geq 38$  degree Celsius) and acute respiratory symptoms, or (2) clinical, radiological or pathological presentation of pneumonia; Laboratory criteria: (1) Viral isolation from respiratory secretions, or (2) clinical specimen showing viral positivity; Epidemiological criteria: (1) History of contact without precaution with probable infected individuals or those with confirmed infection within 14 days, or (2) history of staying in or traveling via Wuhan, China. Reporting to TCDC for individuals fitting (1) clinical and epidemiological criteria, or (2) laboratory criteria; <sup>b</sup>Diagnostic and reporting criteria (modified): Reporting criteria same as above, plus the inclusion of “diagnosis of pneumonia with viral RNA positivity”.



decision making.

#### **4. Ensuring accuracy of information to the public**

Not only does CECC act as a central commanding post and a bridge between the central government and local governmental units but it also ensures the accuracy and transparency of health-related information when confronted with severe health threat; there are three separate webpages for public access titled “Public newsletters”, “Information clarification”, and “Letters to medical professionals” that are kept updated to eradicate possible misinformation. Besides, updated information on the pandemic is constantly being sent to the general public whose smart phones have established links to MHW.

#### **5. Making rolling plans**

Instant reviewing and updating of existing plans at governmental level are mandatory to keep pace with the latest development regarding the extent and pattern of infection spread, both locally and internationally. There have been five steps taken starting from January 15, 2020 in response to major trigger events, including: Step 1: Strict surveillance, import control, and immediate reporting (Trigger event: WHO disease outbreak new on January 12, 2020); Step 2: Containment of infection and identification of infection source (Trigger event: The first patient with confirmed diagnosis on January 21, 2020.); Step 3: Minimizing risks of community-acquired infection (Trigger event: The first mortality with confirmed diagnosis but without travel history); Step 4: Prevention of nosocomial infection (Trigger event: First confirmed nosocomial cluster infection in Taiwan); and Step 5: Eliminating risks of disease importation through lockdown (Trigger event: Dramatic increase in the number of confirmed cases mainly from Europe).

#### **6. Ensuring constant communication**

#### **between health administrative departments and healthcare institutes**

Daily and unscheduled communications between infection control departments of the government at regional level and the personnel in the frontline (e.g., infection control physicians) of the assigned medical institutes are important for the central government to close the gap between policy and the ever-changing clinical situation as well as to re-allocate medical resources in the country.

#### **Precautions at Institutional Level**

Basically, the assigned medical institutes reacted to the evolving crisis in pace with the changes in government policies. There are variations in strategy at different medical institutes according to the number of confirmed cases being treated and the resources available. The common strategies are listed in Table 1 and summarized as follows:

##### **1. Strict surveillance and immediate reporting**

Setting up checkpoints at hospital entrances for screening patients and visitors (i.e., body temperature, travel history, respiratory symptoms) is found effective for diversion of patients to receive management at different levels of precautions to avoid nosocomial infection. History taking for patients at the emergency department or outpatient clinics should emphasise on travel, occupation, contact, and cluster for early screening of imported cases. Immediate reporting of suspected cases to TCDC is also critical for preventing disease spread and limiting the number of contacted individuals who could be timely traced and isolated.

##### **2. Early organization of “Infection Control Response Unit”**

A sustained coordinated effort involving all levels of a medical institute (e.g., governance, physicians, engineers, and maintenance

staff) is essential to reaching consensus regarding the allocation of resources (e.g., personnel) and taking effective measures against the spread of infection (e.g., planning spaces for quarantine).

### 3. Rolling plans in pace with government policy

Stricter policies than those announced by the government are adopted by the medical institutes which are the last line of defense (e.g., prohibition of travel for all hospital personnel). Rolling planning is also crucial to the decision of re-allocating hospital resources (i.e., humans and materials) to cater for the increasing number of infected patients.

### 4. Compliance with government policy and timely reflection of difficulty

Adopting a synchronised approach by all the medical institutes in the country together with unobstructed communications with the government is necessary for early identification of possible pitfalls of a policy and arriving at a practical solution.

## Conclusion

Despite differences in culture, healthcare policies and resources, the Taiwanese strategies against the COVID-19 pandemic may be of reference value for other countries. Provided that not a single country can stay isolated from the rest of the world, fortifying one's own defense against a spreading global infection is merely

building a crumbling fortress. Strictly disciplined, watertight, and coordinated international efforts following the same protocol may be mandatory for achieving positive outcomes.

## Author Contributions

I-Ting Tsai and Cheuk-Kwan Sun conceived of the article. I-Ting Tsai reviewed and summarized relevant information. Seng-Feng Jeng, Jiun-Nong Lin, and Chun-Kai Huang were responsible for literature review. Cheuk-Kwan Sun drafted the manuscript. Yuan-Kun Tu proofread and amended the manuscript. All authors participated in discussion, read the manuscript, and approved of its submission.

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