How to Safely Reopen Colleges and Universities During COVID-19: Experiences From Taiwan

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Reopening colleges and universities during the coronavirus disease 2019 (COVID-19) pandemic poses a special challenge worldwide. Taiwan is one of the few countries where schools are functioning normally. To secure the safety of students and staff, the Ministry of Education in Taiwan established general guidelines for college campuses. The guidelines delineated creation of a task force at each university; school-based risk screening based on travel history, occupation, contacts, and clusters; measures on self-management of health and quarantine; general hygiene measures (including wearing masks indoors); principles on ventilation and sanitization; regulations on school assemblies; a process for reporting suspected cases; and policies on school closing and make-up classes. It also announced that a class should be suspended if 1 student or staff member in it tested

positive and that a school should be closed for 14 days if it had 2 or more confirmed cases. As of 18 June 2020, there have been 7 confirmed cases in 6 Taiwanese universities since the start of the pandemic. One university was temporarily closed, adopted virtual classes, and quickly reopened after 14 days of contact tracing and quarantine of possible contacts. Taiwan's experience suggests that, under certain circumstances, safely reopening colleges and universities this fall may be feasible with a combination of strategies that include containment (access control with contact tracing and quarantine) and mitigation (hygiene, sanitation, ventilation, and social distancing) practices.

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Reopening colleges and universities during the coronavirus disease 2019 (COVID-19) pandemic poses a special challenge worldwide (1). At the start of the pandemic, Taiwan took proactive steps to contain the virus and implemented 124 action items in 5 weeks (2), resulting in only 446 confirmed cases, 7 deaths, and no domestic case for 67 consecutive days as of 18 June 2020 (3). To accomplish this, the Taiwanese government adopted the strategy of strict border control and containment in the crucial first 3 months of the pandemic. Early on 31 December 2019, the Taiwan Centers for Disease Control initiated health checks on-board flights from Wuhan, China. On 2 January 2020, it assembled a first response task force meeting, and on 20 January, the Central Epidemic Command Center (CECC) was activated. On 24 January, mask exports were suspended. On 27 January, CECC integrated travel history from the immigration and customs database into National Health Insurance records to alert providers at the point of care of patients coming from epidemic areas, and on 29 January, it started tracking the cellular signals of home-quarantined individuals. On 30 January, the government requisitioned masks for centralized distribution, and on 6 February, CECC began the mask quota system at pharmacies where residents could pick up their masks with National Health Insurance identification cards. Starting on 11 February, all passengers arriving in Taiwan were required to fill out a health declaration card; CECC restricted all foreigners from entry on 19 March and further restricted air flight transfers to Taiwan on 24 March. On 1 April, masks became mandatory on public transportation, and on 4 April, the first national alarm was issued, emphasizing social distancing (4, 5).

However, Taiwan's universities faced unusual challenges because many of their students came from China and had returned to campus after the Lunar New Year holidays in late January. According to the Ministry

of Education (MOE), 126 997 of around 1 200 000 college students were international students in 2018 in Taiwan; 23.6% came from mainland China, 6.4% from Hong Kong, and 3.7% from Macau (6). To prepare for their safe return, Taiwanese universities postponed opening by 2 weeks. To secure the safety of students and staff and to develop appropriate logistics for handling confirmed cases on campus, the MOE in Taiwan established a general guideline on 26 February 2020 in response to COVID-19 (7). The guideline delineated establishment of a task force at each university, general hygiene measures, principles on ventilation and sanitization, a process for reporting suspected cases, measures on quarantine, and policies on school closing and how to make up classes.

STRUCTURE AND PROCESS

Campus COVID-19 Task Force

According to the MOE guideline, the task force should be led by the vice president of the university. Task force members should meet regularly to discuss updates on the pandemic and amend or announce new measures as needed. The task force coordinates implementation of online learning, supervision of facilities for quarantine and isolation, and regulations on public assembly. It also ensures an adequate supply of personal protective equipment (PPE) and addresses any financial issues that may arise. The task force at the National Taiwan University (NTU), the largest and most prestigious university in Taiwan (8), is led by the president and has held a weekly meeting since 30 January 2020. At that

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time, only 8 imported cases of COVID-19 were diagnosed in Taiwan.

General Hygiene Measures

All schools should follow several general measures. Students and staff should avoid traveling abroad during the pandemic; all departments should have a sufficient stockpile of PPE, sanitizing materials, and thermometers; schools should encourage personal hygiene practices, such as washing hands frequently and not touching eyes, nose, or mouth; windows should be left open for air ventilation; social distancing of 5 feet indoors and 3.3 feet outdoors should be kept; students and staff should wear masks inside the classroom and while taking public transportation when social distancing is not feasible; food should not be shared; students and staff should seek medical help when they develop upper respiratory symptoms, fever, or headache; and schools should leave only 1 entrance open at each main building (such as libraries, dormitories, and cafeterias) and set up screening stations to check temperatures for everyone during work hours. For persons with fever, schools should monitor health status and report back to the MOE before noon each day. If an international student who lives in the dormitory develops fever, the school should promptly arrange 1 single room to isolate the student, and the health center should monitor the student's health status and seek additional care if necessary. Public facilities, such as classrooms, meeting rooms, dormitories, cafeterias, and libraries, should be sanitized at least twice a day. Last, schools should set regulations on public assembly to avoid clusters of infections.

Under the general rules, universities in Taiwan have taken various approaches to protect their students and staff. Compliance with the guidelines was left to the discretion of each university, with external oversight. The NTU has strict control of campus access embedded in campus identification cards; school is open only for students, faculty, and alumni; and body temperatures are checked daily. Those who are under home isolation (for COVID-19 contacts), quarantine (for returning travelers), or self-management of health (for persons reported and tested for COVID-19) and those who live with family under home isolation are forbidden from entering the campus for 14 days. This is particularly important for NTU as it is centrally located in Taipei where most confirmed cases were found.

Because approximately 40% of all university students stay in dormitories (for example, 37% at the NTU and 45% at the National Chengchi University), regulation of dormitories is mandatory. The NTU has 26 dormitories in total for domestic and international students. Single, double, and 4-bedded rooms are available, and most have shared public bathrooms. The campus has at least 20 cafeterias and convenience stores. Dormitory facilities also include study rooms, reading rooms, living rooms, beauty salons, laundry rooms, gyms, music rooms, vendors, and automated teller machines. All dormitories are cleaned with bleach twice a day. Entry and exit to each dormitory are restricted to a single checkpoint. The screening station outside the dormitory allows only resid-

ing students to enter. In the cafeteria, all staff are required to check their body temperature and wear a mask, and 1 dining table is for only 1 student to promote social distancing. For a student under quarantine, the school would arrange for a single room. Before the pandemic, a typical class at the NTU had an average of 35 students. Since the pandemic, NTU announced in advance that classes would become virtual if there were more than 100 students in the class on 6 April and further restricted to 60 students on 27 April 2020. Other universities have similar practices.

The National Taiwan University of Science and Technology put a transparent divider on each table of the cafeteria to prevent viral transmission when 2 students are facing each other during a meal.

Ventilation and Sanitization Practices

The guidelines also provided guidance on ventilation and sanitation practices. Every classroom or meeting room should leave front and rear doors open to keep ventilation, and carbon dioxide concentration should be used to check indoor air pollution, which should not exceed 1000 ppm.

Sanitation recommendations include detailed guidance on cleaning procedures. For example, when cleaning public facilities, staff should pay particular attention to floors, doorknobs, buttons, furniture, telephones, trashcans, washing tables, toilets, bathtubs, faucets, showerheads, drains, computers, keyboards, and fans. Floor sanitation should begin from the clean area with a mop soaked in bleach; the floor should be mopped again with clean water 10 minutes later. To clean toilets, staff should use bleach diluted in water and avoid discarding high concentrations of bleach in the toilet. Three days before a school reopens, authorities should repeatedly articulate the importance of personal hygiene, environmental sanitation, and indoor air ventilation.

Process for Reporting a Suspected Case

When a confirmed or suspected case is present on campus, the school's health center staff should promptly report it to the local health department to obtain further guidance on management. At the same time, the school should conduct contact tracing and monitor the health status of all on the contact list.

Role of the University Health Center

The university health center plays a pivotal role in campus health. It provides outpatient clinics, health check-ups, urgent and emergent care, psychological consultations, and infectious disease surveillance. The health center is usually staffed by physicians, nurses, psychologists, social workers, emergency medical technicians, and administration staff; it is usually paid for by the school, and its scale varies with the size of the university. For example, the NTU health center, the largest in the country serving approximately 41 000 students and faculty, has 2 full-time school physicians, 10 nurses, 2 pharmacists, 1 radiology technician, 1 physical therapist, 1 medical technologist, 2 emergency medical technicians, 2 administrative staff, and a physician in charge. The NTU also has a student counseling center.

At the beginning of the outbreak, the school physicians, who have a background in family medicine and public health, were responsible for screening the health status of students and faculty by checking their health insurance card for 14-day history of travel, occupation, contact, and cluster (TOCC) (that is, travel to any high-risk areas, occupational exposure, contact with any confirmed cases, and contact with clusters of symptomatic persons) to assess the need for home isolation, quarantine, or self-management of health for 14 days. For local students, this was done at home; the university helped foreign students arrange a location for quarantine.

To reduce possible risk for spreading the infection, the health center at NTU decided to temporarily suspend its dental clinic, preventive services (such as health education seminars), and cardiopulmonary resuscitation lectures. It also shut down its services to nearby residents.

Even before the official MOE guideline, the NTU health center repeatedly sent e-mails through its list-serv to inform campus affiliates about the pandemic, and it has given them advice on prevention strategies since late January. The NTU constructed an infection control website and asked all members of the school to register and fill out an online health survey; if respondents had any relevant TOCC history or respiratory symptoms in the past 14 days, school physicians would assess them and refer them for reliable and convenient viral testing if needed. The NTU also requested that each department designate a contact person to monitor the health status of its members. Approximately 380 designated contact persons report to the school physicians if there is a suspected case in their department. They formed a group on the app LINE where questions would be answered promptly by the school physicians.

Principles on Closing School

If there is 1 confirmed case of student or staff, all of that person's classes should be suspended. If a university has 2 confirmed cases, it should be closed and online courses should be initiated for at least 14 days.

Guidance for Students Who Missed Classes

Some students may not be able to return to school as expected for various reasons, such as border control of the country they are from or if they are being quarantined. Measures exist to remedy the situation: Students can apply for delayed registration or tuition payment due to the pandemic, apply for return of tuition due to the pandemic, apply for online courses if they cannot attend in person, turn in project reports in lieu of actual examinations in some cases, or apply for suspension of school and return of tuition if they cannot return to class within 6 weeks after school reopening; the university may also give an extension to fulfill requirements for graduation.

Implementation of Quarantine

For international students who have no relatives in Taiwan and need to be quarantined, the universities are responsible for transporting students via private ve-

hicle from the airport to the quarantine location (independent dormitory or other location) and providing a private room for each student in quarantine. Students should report to the dormitory managers to receive a package of information and PPE, including masks, a thermometer, rubbing alcohol, and sanitizing water. They should be confined to the room for 14 days and should check their body temperature twice a day and record it online. Meanwhile, the school should provide water, meals, and trash collection in addition to psychological counseling. Quarantined students may live at home if they have a single room and private bathroom; however, if elderly residents, persons with chronic disease, or children are in the household, the student would need to move to a designated hotel for quarantine (9).

OUTCOMES

With proactive containment efforts and comprehensive contact tracing, the number of COVID-19 cases in Taiwan remained low: The country has not had any domestic case for 67 consecutive days, and there is no community outbreak at present. Nationwide, approximately 6000 polymerase chain reaction tests for COVID-19 are done each day.

Since the outbreak, approximately 1100 students and staff at the NTU have been placed under quarantine or self-management, and no case has been reported. As of 18 June 2020, there have been 7 confirmed cases in 6 Taiwanese universities. One university was temporarily closed, adopted virtual classes, and quickly reopened after 14 days of contact tracing and quarantine of possible contacts.

COST OF DEPLOYMENT

The cost of reopening a school includes overtime pay for additional staff time, a quarantine fee, and fees for PPE and sanitizers. In Taiwan, the overtime is paid for by the school, quarantine fees vary with school policies, and PPE is basically provided by the MOE.

The NTU reported an increase in overtime manpower over the 1-month period around the time of school reopening that includes 2 hours per day for 14 dormitory staff, 3 hours per day for 5 health center staff, 2 hours per day for 8 staff in the student safety center, 3 hours per day for 2 student affairs staff, 1 hour per day for 6 staff in the overseas students division, and 3 hours per day for 5 executives. The NTU is responsible for the overtime pay. In addition, the cost of quarantine locations, transportation to and from these locations, and meals provided during quarantine vary. At the NTU, the costs of quarantine locations and transportation were paid by the school; however, students had to pay half of the meal fee, whereas at the National Chengchi University, the school was responsible for all quarantine fees up to a set limit. Universities are currently debating the cost of continual surveillance and who should bear that cost (that is, universities, students, or government).

IMPLICATIONS

The safe reopening of colleges and universities this fall may require a combination of strategies, such as active campus-based screening and access control; school-based TOCC screening and quarantine protocols; student and faculty quarantine when warranted; mobilization of administrative and health center staff; regulation of dormitories and cafeterias; and reinforcement of personal hygiene, environmental sanitation, and indoor air ventilation practices. These measures were successful in Taiwan likely because of low numbers of cases in the country as a whole. Whether these measures will be sufficient to prevent and contain viral spread on campus may depend on the incidence and prevalence of disease in a school's location.

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