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The First 100 Days: Establishment and Effectiveness of Campus Protection Measures at a College during the COVID-19 Pandemic

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Abstract: To prevent transmission of the coronavirus, we established the campus protection measures for coronavirus disease 2019 (COVID-19) (CPMCV-19) and analyzed the effectiveness and cost in practice. This project was set in Taiwan. We organized an anti-epidemic task force team from multidisciplinary co-workers to establish the CPMCV-19. The essential components were as follows: no close contact communication, sterilization, temperature control, social distancing, activity restrictions, personal hygiene control, and situational awareness. During 100 days of operation, the mean time spent for frontal temperature measuring was 2.7 ± 0.3 s per person. The mean on-duty time for individual personnel to control the gate and measure temperature was 3.5 h per day. In total, 31 persons with loss of taste/smell or fever were detected on campus and sent to hospital for screening within 1 h. A total of 6 persons were instructed to observe self-health management due to possible contact or travel history, and none were diagnosed with COVID-19 infection. A total budget of USD 27,100 was used for CPMCV-19 in this period. The established campus protection measures for COVID-19 were practical and might be effective. They can be used as reference for schools in a pandemic, such as COVID-19.

Keywords: campus protection measures; coronavirus; COVID-19; pandemic; college; effectiveness

1. Introduction

The coronavirus disease 2019 (COVID-19) is a respiratory disease caused by the novel coronavirus, also known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was first detected during an investigation of an outbreak in Wuhan, China [1–5]. This infectious disease has been spreading worldwide, and the World Health Organization declared a pandemic on 11 March 2020 [6].

As of June 2020, a total of 921 million confirmed cases and 476 thousand confirmed deaths in 216 countries/areas were noted and continue to increase.

The COVID-19 pandemic has affected entire societies, including educational systems, in countries all around the world [7–9]. Since the first confirmed case of COVID-19 in Taiwan was officially announced on 21 January 2020 [10,11], the educational system has been challenged to decide the critical cut-off for closure of face-to-face courses in schools. Given that schools share the same responsibilities as the rest of society and need to take precautions during the outbreak of diseases, efforts to prevent transmission of this coronavirus are critically important. Towards this end, we established and began execution of campus protection measures for COVID-19 (CPMCV-19) on 26 January 2020, 5 days after the announcement of the first confirmed case in Taiwan.

This study was conducted in MacKay Junior College of Medicine, Nursing and Management, Taiwan. This school comprises about 4200 students aged between 16 and 20 years old. In the present study, we analyzed the effectiveness and cost in practicing the CPMCV-19 to provide informative statistics, as well as practical information, for other schools facing the challenges during the COVID-19 pandemic.

2. Materials and Methods

2.1. Organization for Multidisciplinary Task Force Team Managing COVID-19 Related Issues

The selection of team members was mostly accomplished using existing personnel and operation designations within the original school structure. All department principal supervisors and selected secondary supervisors, 30 persons in total, were recruited and assigned to various task groups. The organization chart of this multidisciplinary task team is illustrated in Figure 1.

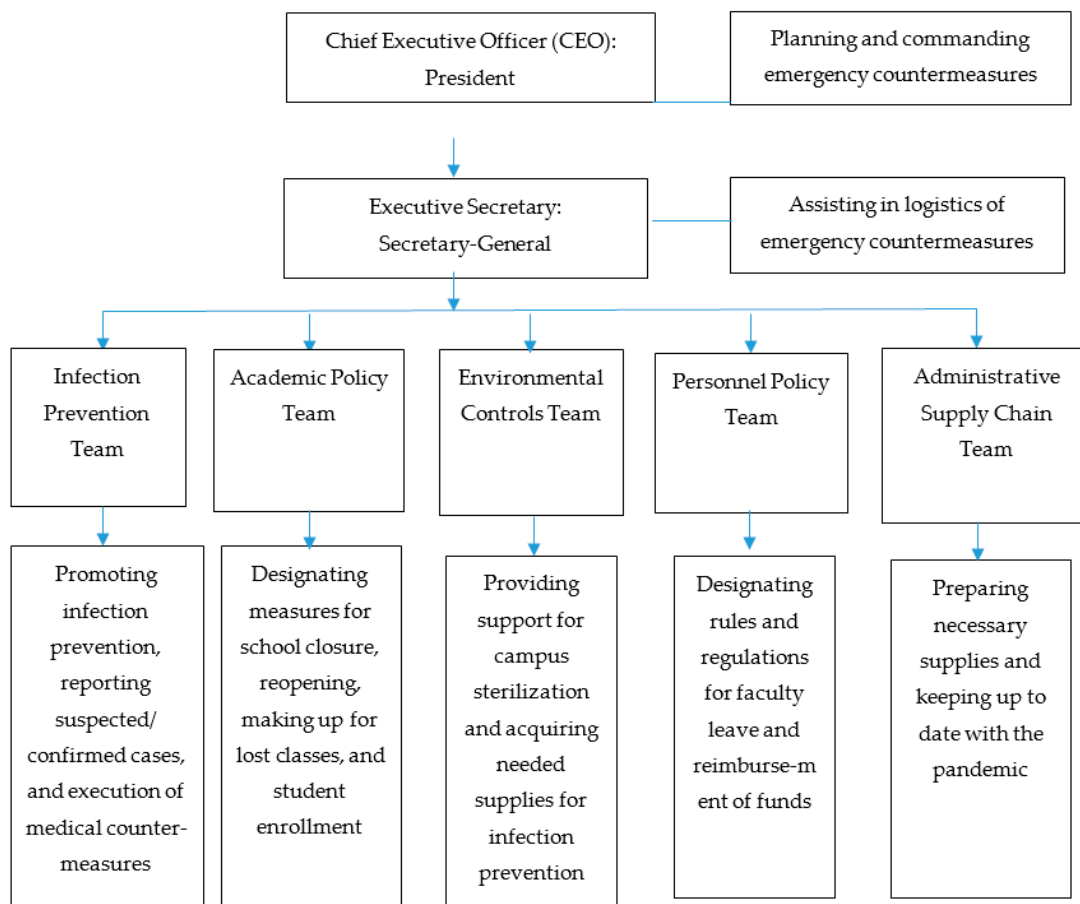


Figure 1. Organization of interdepartmental task force team in a college.

The investigation was carried out following the rules of the Declaration of Helsinki of 1975. All the 30 persons involved had been informed of this study and manuscript, and their signed consent was obtained.

2.2. Establishment of Campus Protection Measures for COVID-19 (CPMCV-19)

The task team members established the campus protection measures according to the guidelines from Taiwan Centers for Disease Control (CDC) with timely updates. The details were further customized by team members from each unit. All protection measures were adjusted through a rolling correction mechanism. Team discussions were conducted through mobile application LINETM (LINE Corporation, Tokyo, Japan), institutional e-mail system, teleconferences, or face-to-face meetings.

2.3. Decision-Making Algorithm in Managing Suspected Infection on Campus

Event simulation was conducted for the development of countermeasures including detected fever, reported symptoms related to COVID-19, confirmed case on campus, and others. In order to efficiently and appropriately cope with the situation, we set up a decision-making algorithm including criteria for a 14-day school closure when 2 confirmed cases are reported within a 14-day period, as shown in Figure 2. When students are unwell or have abnormal body temperature measurement, they must first seek medical attention, and then choose hospital isolation, home isolation, home quarantine, or self-health management according to the doctor's instructions and government regulations. The task team members established the campus protection measures according to the guidelines from Taiwan CDC with timely updates. The details were further customized by team members from each unit. All protection measures were adjusted through a rolling correction mechanism. Although a zero COVID-19 case record noted in campus cannot be entirely attributed to the performance of measures, we proposed that the established protection measures on campus might be useful and practical.

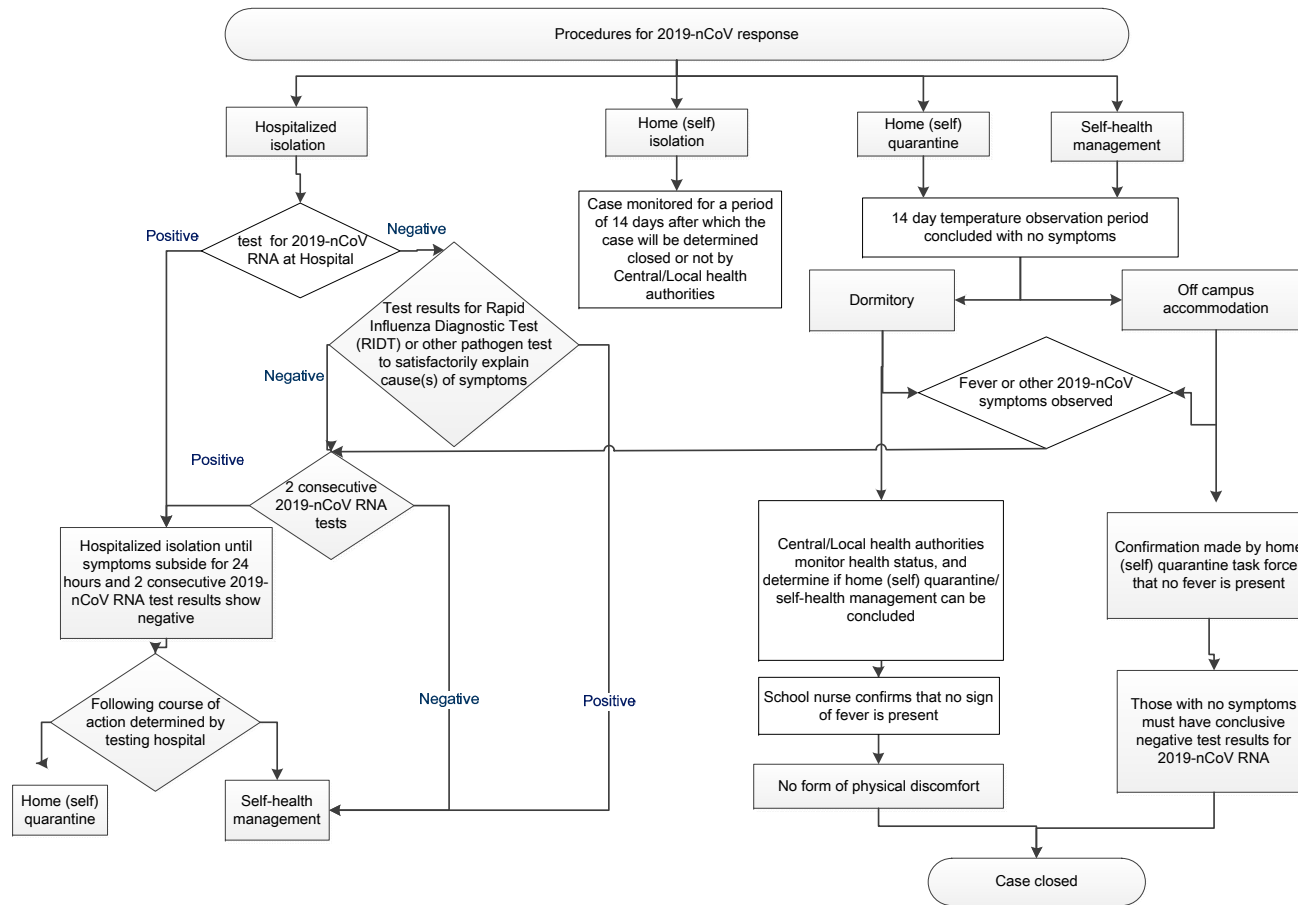


Figure 2. Decision-making algorithm flowchart for the coronavirus disease 2019 (COVID-19) pandemic in a college.

2.4. Practical Measures in Executing CPMCV-19

As shown in Table 1, the essential components in established measures were as follows: no close contact communication (team telecommunication by using mobile application LINETM, administrative teleconference using Microsoft Teams (Microsoft Co., Redmond, WA, USA), teleteaching simulation by TronClass platform (Wisdom Garden Co., New Taipei City, Taiwan)), daily campus sterilization on workdays via 0.05% (500 ppm) sodium hypochlorite (cleaning and disinfection of environmental surfaces in the context of COVID-19: Interim guidance, 15 May 2020, World Health Organization), school gate control with daily temperature measuring (cut-off 37.5 °C by frontal temperature), social distancing (1.5-m indoors and 1-m outdoors), activity restrictions (100 persons indoors and 500 persons outdoors), personal hygiene control (facemasks, handwashing education, desktop sneeze guards in classrooms and restaurants), and situational awareness (regulations and standard operating procedures, as well as execution analysis). Official announcements to students and parents were promptly posted on the school website. An example is listed in Appendix A.

Table 1. Essential components in established measures.

Essential Components	Established Measures
No close contact communication	1. Team telecommunication by using mobile application LINE 2. Administrative teleconference using Microsoft Teams 3. Teleteaching simulation on TronClass platform
Sterilization	Campus sterilization on school days
Temperature control	School gate control with daily temperature measuring < forehead 37.5 °C/inner ear 38 °C
Social distancing	1.5-m indoors and 1-m outdoors
Activity restrictions	<100 persons indoors and <500 persons outdoors
Personal hygiene control	Facemasks, handwashing education, desktop sneeze guards in classrooms and restaurants.
Situational awareness	Regulations and standard operating procedures, as well as execution analysis.

3. Results

3.1. Establishment of Regulations, Standard Operating Procedures, and Decision-Making Algorithms

As shown in Table 2, when our school faced the outbreak of COVID-19, the epidemic prevention measures and actions taken, with a total of 21 regulations, standard operating procedures, and decision-making algorithms were established. After rolling corrections, the finalized decision-making algorithms are shown in Figure 2.

Table 2. Regulations, precautions, and standard operating procedures (SOPs).

Item	Date Since First Confirmed Case	Description of Item	The Name of the Team
1	6	Establishment of school's Infection Prevention Task Force	Infection Prevention Team
2	14	Establishment of school's COVID-19 Infection Prevention Plan	Academic Policy Team
3	14	Letter published to all parents informing details of the COVID-19 Virus and school's countermeasures	Infection Prevention Team
4	36	Establishment of COVID-19 protocols for school closure, reopening, and making up for lost classes	Academic Policy Team
5	37	Schedule set for periodical sterilization of campus grounds	Environmental Controls Team
6	45	Precaution notification of COVID-19 related false information and fake news	Administrative Supply Chain Team
7	50	SOP for students on campus with a fever	Administrative Supply Chain Team
8	50	SOP for ill dormitory boarders	Infection Prevention Team
9	50	SOP for dormitory boarders' infection prevention	Infection Prevention Team

Table 2. Cont.

Item	Date Since First Confirmed Case	Description of Item	The Name of the Team
10	58	COVID-19 transition procedures for Taiwanese students studying abroad to repatriate and continue schooling	Infection Prevention Team
11	60	Faculty required to have temperature taken before boarding school bus	Infection Prevention Team
12	60	Establishment of dormitory boarders' environment sterilization protocols and health guidelines	Environmental Controls Team
13	64	Dormitory personnel infection prevention training and event simulation	Personnel Policy Team
14	67	Classroom infection prevention guidelines during COVID-19 pandemic	Academic Policy Team
15	70	Student self-moderation guidelines for off-campus accommodation	Infection Prevention Team
16	77	Faculty school bus infection prevention guidelines	Infection Prevention Team
17	86	Sterilization records for April, Guandu Campus	Environmental Controls Team
18	86	Sterilization records for April, Sanzhi Campus	Environmental Controls Team
19	96	Promotion of MOE's School Dormitory Infection Prevention Guidelines	Infection Prevention Team
20	127	Sterilization records for May, Guandu Campus	Environmental Controls Team
21	127	Sterilization records for May, Sanzhi Campus	Environmental Controls Team

3.2. Effectiveness of CMPCV-19

During the 100 days of operation (from 26 January to 5 June 2020), the mean time spent for frontal temperature measuring was 2.7 ± 0.3 s per person. The mean on-duty time for individual personnel to control the gate and measure temperature was 3.5 h per day. In total, 31 persons with loss of taste/smell or fever were detected on campus and sent to the hospital for screening within 1 hour. A total of 6 persons were instructed to observe self-health management due to possible contact or travel history, and none were diagnosed with COVID-19 infection. Cancellation of 32 school activities with teleconferences held as alternatives successfully avoided physical contact for 14,400 person-times.

3.3. Cost and Time for CMPCV-19 Performance

A total budget of USD 27,100 was used for CMPCV-19 in this 100-day period. This budget was mainly used to purchase items needed for epidemic prevention including forehead temperature detectors, masks, alcohol, detergents, disinfectants, and the like. The administrative teleconferences using Microsoft Teams were held 3 times, for an accumulated time of 7 h in total. The teleteaching simulations by TronClass platform were performed twice, with a combined time of 6 h.

4. Discussion

The timely established campus protection measures for COVID-19 in an approximate 5000-person college were effective and practical. They can be used as reference for schools in a pandemic, such as COVID-19.

Since the 2003 outbreak of severe acute respiratory syndrome (SARS) in Taiwan, the medical and educational institutions have established various strategies for preventing outbreaks of infectious diseases and proposed response mechanisms for distributing resources efficiently during management operations [12,13]. The experience in responding to SARS with a 17-year interval aided the rapid response to cope with the COVID-19 pandemic in educational institutions. However, the viral characters of COVID-19 are distinct to SARS. For instance, the longer latency made campus protection from case clustering a vigorous challenge. Notably, a longer incubation time for SARS-CoV-2 infection with mean time 5.2 days (95% confidence interval (CI), 4.1 to 7.0) and the 95th percentile of the distribution at 12.5 days [14], indicated a need to adjust screening and control policies. It was suggested that potentially exposed subjects are required to be isolated for 14 days to avoid the risk of further transmission. As

for symptoms/signs other than fever, loss of taste or loss of smell with severity greater than moderate were reported in 37.2% of patients positive for COVID-19 [15]. Taken together, we established the campus protection measures for COVID-19 by combining the experience from SARS and updating the information for COVID-19.

The major value of this work is to provide a timely reference for schools with similar scale to establish their own campus protection measures for the COVID-19 pandemic. The limitations of this work are that no actual positive COVID-19 cases were detected in the campus and no long-term follow-up data could be provided. The uniqueness of this work is the combination of global COVID-19 situation, government infectious disease control policy, and college campus environment to establish protection measures that are timely and practical for execution. To the best of our knowledge, no such timely and well-organized measures have yet been published about the COVID-19 pandemic. To assess the execution efficiency of the campus protection measures, the following must be considered: efficacy, time consumption, costs, and labor. The performance of CPMCV-19 resulted in avoidance of physical contact in a significant quantity and rapid processing for fever or symptom-detected individuals by spending reasonable costs of budget, time and labor, indicative of effective and practical measures for campus protection. These execution results not only provide physical protection but also psychological disburden for campus crisis and human stress [16–18].

5. Conclusions

The established campus protection measures for COVID-19 was practical and might be effective. However, it may need adjustments according to local culture and social characteristics. It may serve as a useful template for other colleges and small institutions that have limited resources.

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Appendix A MacKay Junior College of Medicine, Nursing, and Management, Important Information in Response to Severe Acute Respiratory Syndrome Coronavirus 2

The COVID-19 virus has become a global pandemic with an infectious incubation period of 14 days. With confirmed foreign and domestic cases rising daily, our school faculty has established a dedicated task force and prepared related supplies for use when needed. School grounds are also sanitized on a regular basis.

To ensure the health and well-being of our students and faculty, please adhere to the following regulations while this pandemic is in force:

1. Follow procedures and regulations set by the Taiwan Centers for Disease Control:
 - A. Inform the school and observe a 14-day home quarantine if you have recently traveled to Hubei Province, China.
 - B. If you have recently traveled to Mainland China (including Hong Kong and Macau) and have a fever or respiratory symptoms, please call the Disease Prevention Hotline 1922 and see a physician as soon as possible. If the physician deems no further medical action is necessary, please conduct self-health management for 14 days and refrain from leaving your home.
 - C. Further regulations and amendments set by the Taiwan Centers for Disease Control should be followed.

2. Temperature should be taken daily. If your temperature exceeds the limit (forehead 37.5 °C/inner ear 38 °C), please visit a physician immediately. To prevent cross infection at school, abide the physician's orders for home rest or self-observation if needed.
3. Take your temperature daily; wash your hands often; do not talk while eating. It is also recommended that you have an extra surgical mask with you at all times.
4. Avoid public places and hospitals if possible. Wash your hands often with either bar or liquid soap for a duration of 20 s or more each time.
5. To properly prevent the spread of the virus and protect the health of our students, students are required to have their temperature taken once they arrive at school. If the temperature is under the limit (forehead 37.5 °C/inner ear 38 °C), the students are required to record the results on the class chart. If a student's temperature exceeds the limit, they will be asked to rest in an isolation area for a short period of time before their temperature is taken again. If the temperature is still too high, his/her parents will be notified to pick up their child, and a physician visit will be strongly recommended. Sorry for any inconvenience, and we appreciate your understanding.
6. All visitors (including parents) will be required to have their temperature taken, hands sanitized with alcohol, and have a mask on. Noncompliance, a temperature greater or equal to the limit (forehead 37.5 °C/inner ear 38 °C), or any respiratory symptoms will be cause for banning entry to the school.

If you have any questions, please contact our school's Environmental Safety and Health Center at +886-2858-4180 (ext. 2153).

We sincerely hope that each of our students and faculty can get through this pandemic safely. Working together, we can help to insure the health of our children and the public. Thank you for your understanding and compliance.

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