Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Perspectives

Recommendations on contingency operations for hospitals in response to COVID-19 cases identified in inpatients — Taiwan

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Coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first reported in Wuhan in December 2019[1] and has rapidly struck many countries worldwide. Threats of COVID-19 to healthcare workers (HCWs) and patients are recognized from reports regarding nosocomial transmission of SARS-CoV-2.[1,2] Patients with COVID-19 usually present with mild flu-like symptoms and it is difficult for the frontline HCWs to distinguish patients with COVID-19 from patients with other upper respiratory pathogens at initial encounters despite stringent history taking.[1,2] It is possible that patients with COVID-19 might only be diagnosed after hospitalized for several days.[3,4,5] This kind of situation endangers the safety of HCWs and patients due to the risk of accidental exposures to COVID-19 cases.

To limit the extent of COVID-19 nosocomial transmission arising from patients who are not recognized early at admission, Taiwan Centers for Disease Control (CDC) drew up a guidance on contingency measures[6] to help medical facilities respond promptly. Once a COVID-19 case (index case) was identified several days after admission, according to the guidance, the hospital should isolate the index case immediately and collaborate with public health departments to conduct contact investigation. "HCW close contact" is defined as HCWs who had cared confirmed case of COVID-19 within two meters without wearing appropriate personal protective equipment (PPE). Appropriate PPE refers to use of N95 respirator, face shield/goggle, gown, gloves, and cap (only required for aerosol-generating procedures). "Non-HCW close contact" is deemed care givers of confirmed cases, and patients and their care givers who shared the same patient room with confirmed cases. All close contacts would be subject to a mandatory 14-day quarantine after the last exposure to the index case at designated places and have to be screened with real-time reverse transcription-polymerase chain reaction (RT-PCR) for COVID-19 immediately regardless of whether they show symptoms or not. Close contacts who develop symptoms consistent with COVID-19 during the 14-day quarantine period should be notified as suspected COVID-19 cases to National Notifiable Disease Surveillance System (NNDSS) for further evaluation. In addition, a HCW close contact has to be tested for COVID-19 again after the quarantine ended and can return to work only if the second test also shows negative result.

Based on the screening test results of all close contacts and risk of nosocomial outbreaks, the guidance indicates a series of stepwise infection control measures, including management of person at-risk, closure of ward, and environmental cleaning and disinfection (Table 1). A Person at-risk is defined as an individual who stays in the same ward with non-isolated index case during the same period

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Table 1 Risk-based stepwise recommendations on infection control measures for hospitals in response to COVID-19 cases identified in inpatients.

Infection control measures	Numbers of close contacts in healthcare settings with positive screening test results for COVID-19 (person)		
	0	1	≥2
Management of person at-risk[a]	✓ Monitor for symptoms consistent with COVID-19 for 14 days after the index case appropriately isolated. ✓ Get RT-PCR tests for COVID-19 if showing suspected symptoms within the 14-day monitoring period.	✓ Get RT-PCR screening tests for COVID-19.[b] ✓ Monitor for symptoms consistent with COVID-19 for 14 days after the index case appropriately isolated. ✓ Be reported as suspected cases of COVID-19 to NNDSS if showing suspected symptoms within the 14-day monitoring period.	✓ Be regarded as close contacts and be subject to all relevant regulations, such as exclusion from work, quarantined at designated places, getting RT-PCR screening test for COVID-19, etc. ✓ Quarantine for 14 days after the index case appropriately isolated. ✓ Be reported as suspected cases of COVID-19 to NNDSS if showing suspected symptoms within the 14-day monitoring period.
Closure of ward	The suspension of admission/discharge process in the implicated ward can be lifted.	✓ Patients as person at-risk can be discharged after screening tests for COVID-19 of their own return negative results. ✓ The suspension of admission to the implicated ward can be lifted if COVID-19 screening tests of all persons at-risk return negative results.	The suspension of admission/discharge process in the implicated ward can be lifted after the implicated ward was evacuated followed by terminal cleaning and disinfection.
Environmental cleaning and disinfection	Terminal cleaning and disinfection for the **ROOM** to which the index case had been admitted after the index case was transferred to the isolation room.	Terminal cleaning and disinfection for the **ROOM** to which the index case had been admitted after the index case was transferred to the isolation room.	Terminal cleaning and disinfection for the implicated **WARD** to which the index case had been admitted after the implicated ward was evacuated.

COVID-19, coronavirus disease 2019; NNDSS, National Notifiable Disease Surveillance System; RT-PCR, real-time reverse transcription-polymerase chain reaction.

[a] Defined as an individual who stayed in the same ward with non-isolated index case during the same period irrespective of exposure conditions, including healthcare workers working for ≥ consecutive eight hours in the ward, other hospitalized patients in the ward, and care-givers of other patients spending ≥ cumulative eight hours in the ward.

[b] If there is any one screening tests for COVID-19 of persons at risk showing positive result, then the whole infection control measures should be upgraded to measures applying to the situation of ≥2 close contacts with positive screening test results for COVID-19.

irrespective of exposure conditions, including HCWs working for ≥ consecutive eight hours in the ward, other inpatients in the ward, and care-givers of other inpatients who spent ≥ cumulative eight hours in the ward. Before the screening test results of all close contacts return, new admission/discharge process in the implicated ward would be suspended.

In brief, when none of COVID-19 tests of close contacts returns positive result, suspension of admission/discharge process in the implicated ward can be lifted. All persons at-risk should be monitored for symptoms consistent with COVID-19 for 14 days after the index case appropriately isolated and have to be tested for COVID-19 if they show suspected symptoms within the 14-day period. If there is only one close contact with positive result of screening test, then all persons at-risk should get RT-PCR screening tests for COVID-19 regardless of whether they show symptoms or not. Persons at-risk who develop suspected symptoms within the 14-day monitoring period should be notified as suspected cases of COVID-19 to NNDSS. If there are ≥ two close contacts with positive results of COVID-19 screening tests, all persons at-risk would be treated as close contacts and be subject to all relevant regulations. The implicated ward should be evacuated, followed by terminal cleaning and disinfection considering the extent of the outbreak and risk of fomite transmission.

After the Taiwan first COVID-19 case imported on Feb 21, 2020, there have been five such events reported to Taiwan CDC as of May 1, including two nosocomial outbreaks.[7,8] In the larger one outbreak,[7] four HCW close contacts were found to be infected through screening tests which subsequently triggered the screening for persons at-risk and two additional confirmed cases were identified in persons at-risk. Only one close contact in the hospital in another outbreak and none of close contacts in hospitals in the rest three events was infected. The limited extents of

nosocomial transmission were probably attributed to good hand hygiene and universal use of face mask in hospitals.[5,6] Early identification of COVID-19 cases is paramount to prevent nosocomial transmission, while it might not be completely avoidable considering the characteristics of COVID-19. The guidance can help hospitals rationally and promptly respond to the precarious situation when COVID-19 cases were diagnosed unexpectedly during hospitalization.

Declaration of Competing Interest

None.

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