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Transforming Schools into Pre-designed Alternative Care Sites as Part of Preparedness Plan for Pandemic H5N1 Influenza

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It is impossible to anticipate when the next pandemic might occur or how severe its consequences might be. In the 20th century, the pandemic of 1918 is estimated to have killed more than 40 million people; the other pandemics were milder but healthcare resources were nevertheless strained.¹ If an influenza pandemic similar to the one that struck in 1918 were to appear again, even taking into account the advances in medicine since then, an unprecedented toll of illness and death could be expected. Air travel would hasten the spread of a new virus and decrease the time available for preparing interventions. Although it is not feasible to halt the spread of a pandemic virus, it should be possible to mitigate its consequences through regional and national preparedness measures to meet the challenge.²

In the post-SARS era, Taipei has established an integrated system for responding to emerging infectious diseases such as pandemic H5N1 influenza. A stepwise approach will be implemented for active surveillance,³ epidemiologic contact tracing, and containment of cases within special isolation hospitals.⁴ In phase 6 of the WHO pandemic alert where there is efficient and sustained human-to-human transmission, there may be an

upsurge in the number of patients seeking medical assistance and existing medical facilities may become overwhelmed. The strategy will then be shifted to disaster response and impact minimization to maintain social order and integrity of the healthcare system.⁵

In Taipei, there is a design of citywide traffic control with task forces formed by special isolation hospitals acting as contaminated hospitals.^{4,6} However, the number of influenza patients may still exceed the capacity of the assigned isolation hospitals and flood into general clean hospitals, which would jeopardize the fundamental medical structure. Therefore, establishing alternative care sites (ACS) as part of the surge capacity of isolation hospitals has long been a concern.^{7,8} Recently, several articles have raised the pros and cons of a stay-home policy as a replacement for ACS.⁹ However, "expect the unexpected" being the principle of crisis management, we should never give up on ACS. In the incidence action plan of Taipei, ACS has been integrated into phase 6 of pandemic response with the module of traffic control bundle,⁶ while the concept of zones of risk has evolved into contaminated special isolation hospitals. For each working group, a contaminated hospital is

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surrounded by five ACSs, each with 300–500 bed capacity. There are nine such assigned as part of the disaster response surge capacity in Taipei.

Choosing School as ACS

There were debates about the best mode to construct an ACS. Based on experience from 1918, sports stadiums became the initial model for ACS,⁹ which was also adopted in Taiwan. However, during serial drills, several pitfalls became obvious. In a stadium, there is only one large open space, which made traffic control difficult and cross transmission among patients more likely. Patients from all over the city converging on one location (the stadium) also caused traffic jams instead of traffic control.

Although there are other designs that created ACSs from churches, aircraft hangers, hotels, recreation centers, military facilities, shuttered hospitals and stadiums,¹⁰ Taipei has chosen schools as ACSs due to the benefits detailed below.

Accessibility

When there are patients who may experience rapid clinical deterioration on the way to medical aid, accessibility should be the priority. Schools are evenly distributed throughout the city, and they can play the role of first responder as a community screening station, where initial assessment can be provided with timely medical response.

Availability

As schools have always been the epicenter of viral respiratory illness outbreaks,¹¹ in early phase 6, schools will be closed and temporarily replaced by online e-learning to reduce transmission. As such, the government can recruit vacant schools without disrupting citizens' daily lives. Schools' existing interior software facility and hardware can be transformed directly into ACSs.

Safety

When available negative-pressure isolation rooms (NPIRs) are fully occupied, the open space of a

school's architecture without NPIR has been questioned. However, during the SARS epidemic in Taipei and Hanoi, Vietnam, zones of risk were successfully integrated into the design of isolation ward without standard NPIR.^{6,12} The separated buildings, floors and classrooms already in place make planning of traffic control and zones of risk convenient, and the large open space of the gymnasium or athletic field can be assigned as the step-down general ward before discharge. A real-life scenario is the Children's Hospital No. 1 in Ho Chi Minh City, Vietnam. It was constructed to appear exactly like a school without jeopardizing the safety of medical personnel and patients.

Expandability

When further isolation hospitals or ACSs are needed, these transformed schools can be replicated in spite of the differences among schools. Therefore, in addition to the pre-selected 45 schools in the current plan, all other schools may be used, if necessary, to meet the requirement of structural surge capacity.

Template of Traffic Control Bundle in ACS

Dispatch and transportation to ACS

As people ordinarily can choose where to seek healthcare, changing people's behavior with a designed process of dispatch during an epidemic is crucial. Through effective communication and transportation, three categories of patients will be received at the community screening station of an ACS: those who come from home by themselves; those sent by emergency medical services; and those referred from outdoor screening stations located at general hospitals.⁴ All patients are to be assessed at the screening station located at the school's athletic field where open ventilation is adequate and space is wide enough to avoid cross transmission.

Triage into ACS

For those with mild flu symptoms, they will be sent home with medication including Tamiflu.

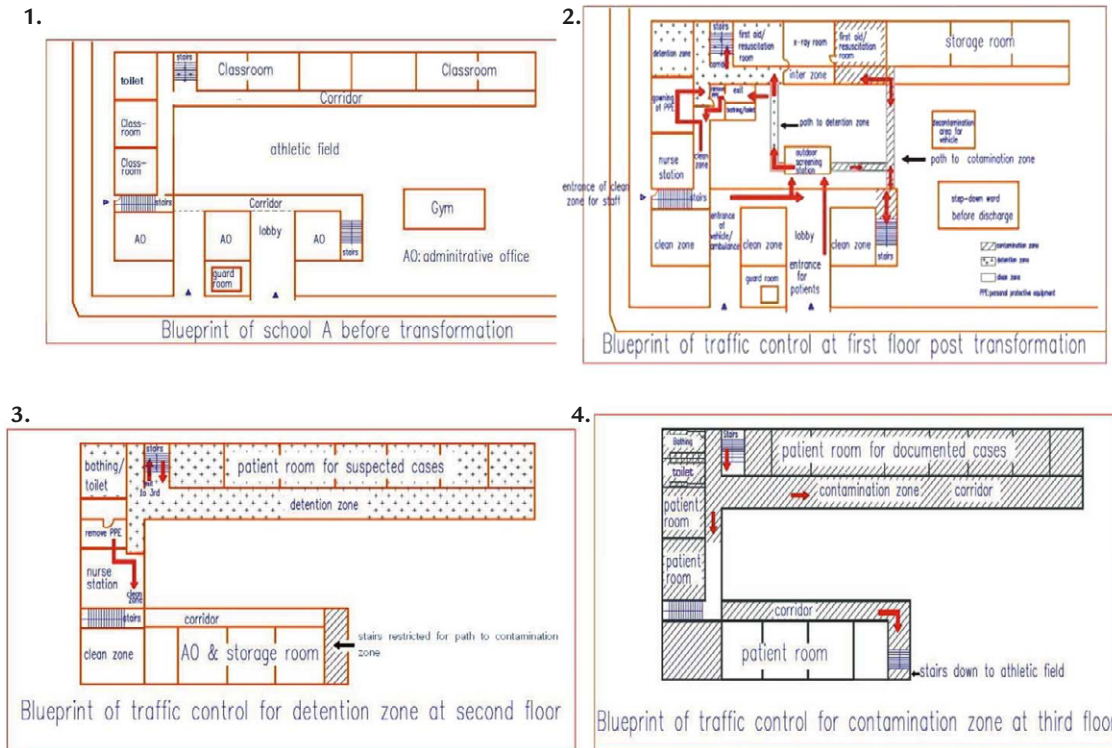


Figure. Blueprint of school transformed into alternative care site with traffic control bundle.

No definite diagnosis of H5N1 is required because we do not have mass screening technology with sufficient sensitivity. For those with moderate respiratory symptoms that require admission to the ACS, patients will be further classified into documented cases and suspected cases. Documented cases are patients placed in the contamination zone due to positive rapid flu A test and epidemiologic link to high risk exposure and clustering. Suspected cases are placed in the detention ward while polymerase chain reaction or further documented test is pending.³ Special isolation hospitals nearby will be the referral hospital for patients who are clinically deteriorating.

Zones of risks

Risk zones (Figure) are designed according to traffic control bundle with the following principles. Next to the screening station located at the entrance of the ACS, there are the gymnasium, decontamination station, X-ray facility and first aid station. Zones of risk can be distributed in separate buildings or on different floors of the same building with the clean zones on the ground floor, the

detention zone hosting suspected cases located at the level above, and the contamination zone for documented cases at the highest level. There should be separate paths for healthcare workers and patients, and also separate entrances and exits between zones. Within each zone, classrooms can be transformed into patient rooms with six beds in each room for the contamination zone and four beds in each room for the detention zone. Six student desks are assembled into one bed with cross wall steel wire to hang IVs and separation curtains. Open windows will provide ventilation. Alcoholic disinfectant dispensers are set up in each classroom and checkpoints are established at 12-meter intervals. Decontamination facilities are also in place at the inter-zones of each floor.

Conclusion

In addition to medical support, many things should be included in a successful design of ACS. The school's public address and information

technology system, in addition to mobile phones, can be used for risk communication in the ACS between nursing stations, patients, and families. Facility and construction security, including electrical safety, fire control and environmental protection should be checked in advance and validated. Finally, a shortage of medical personnel to run an ACS can be expected because the absenteeism rate may be as high as 30–40%.¹³ A well-planned training program for surge capacity of human resources that includes retired medical personnel, medical and nursing students, and paramedics may provide a pool of extra personnel. ACS can play a vital role in the consolidation of an infection control network and enhance our capability for prevention and control of emerging communicable diseases.

Acknowledgments

I would like to thank Dr Chia-Ching Wang for her assistance in manuscript editing and preparation.

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