SARS @ TTSH (Part 9)

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Editorial note:
The following article was submitted on 11 November 2003. Contents are current at the time of submission.

I had left off discussion of events in the last article on Tan Tock Seng Hospital (SARS @ TTSH – Part 8) on the day Singapore was declared SARS free on 31 May 2003.

For the next one week, there was much in the press, both local and foreign, that in one way or another was related to SARS. The Straits Times front page highlighted the Transport Minister announcing that almost one third of the flights cancelled after the SARS outbreak were being restored and that the Singapore government was funding airlines with $10 million in incentives to bring more passengers and flights to Singapore. Then there were reports about the Outram campus of Singapore Health Services being reorganised and regrouped, as well as CEO, Singapore Health Services becoming concurrently the Acting CEO of Singapore General Hospital (SGH). He was made CEO SGH on 1 November 2003. On Channel 5 and Channel 8 news were reports that our anti-SARS measures were here to stay as lessons of Toronto had to be taken seriously. Temperature checks would continue in schools, markets, government buildings, construction sites and hotels. Also on Channel 5 was the first programme in a series "True Courage", dramatising Singapore's first SARS case as a "super-infector", relating the prejudice and pain she endured as she realised she had infected more than 100 people directly or indirectly.

The buoyant mood swept through Singapore's struggling shopping centres as the World Health Organisation's (WHO) announcement coincided with the start of the six-week Great Singapore Sale. People were out in force, with a triple increase in sales and traffic at Takashimaya compared to the month before. Traffic at Wisma Atria jumped 22% in one week from 49,000 shoppers. Life seemed to have returned to normal for most Singaporeans with crowds flooding to libraries and shopping malls.

But Singapore, now declared SARS-free, was not letting down its vigilance. Singaporeans continued to take precautions by consistently taking their temperatures and exercising personal hygiene. The Minister of Trade and Industry was reported by AP as saying that even though Singapore might have defeated its SARS outbreak, it had not let down its guard and was prepared to act in case the disease resurfaced. The Minister of State for Health said that it was important for Singapore to become a SARS-resistant country. This meant that even if someone with SARS came to Singapore, Singapore would have in place measures for detection and the prevention of an outbreak.

It was also reported that some Singaporeans raised concerns that some medical facilities located near public housing estates could pose a danger to the community in the event of a SARS outbreak. The Minister of State for Health gave his assurance that there was no danger to the community because SARS could only spread through close contact with a SARS patient and healthcare facilities were located several hundred metres away from housing estates. He also stressed that the battle against SARS was "really a long haul battle" and that the government would need the support of Singaporeans and their understanding to have anti-SARS measures in place, particularly in the healthcare system. An unusual feature of the SARS outbreak has been the spread of SARS within the hospital setting and within healthcare facilities with healthcare workers sharing in the death toll of the disease.

This brings me now to the focus of this article, which is how TTSH is to be prepared for any SARS outbreak in the future. So let me state a few principles up front as lessons learnt.

LESSONS LEARNT

Firstly, TTSH cannot be allowed to forego its general hospital status and become totally committed to the care of patients with SARS (or whatever new disease may come along). With the busiest Emergency Department in Singapore and 1,064 beds in the main building, this huge loss of resources created tremendous pressure on all other public healthcare facilities. These other hospitals had to cope with their normal loads, plus redirected loads from TTSH. In addition, they had to guard against any likely SARS patients who did not seek help at TTSH for whatever reasons. (This was not always the fault of the patients as clinical presentations of diseases could be atypical.)

Secondly, TTSH in its brand new facility (we moved over in April/May 1999) was not built to handle outbreaks of infectious diseases. The new building is a general hospital. Isolation rooms are built two to each ward and are meant to handle cases with MRSA, TB, and so on. Also, there are only 28 such isolation rooms. Further, it proved almost impossible to direct traffic flow of public and staff into and out of the hospital as there were many entrances and exits (for the convenience of all). This is unlike the old Middleton Hospital with one gate and a guardhouse.

Thirdly, all staff have a role to play. There are just insufficient resources to ask, for example, only the doctors in the Division of Medicine to care for all the inpatients. Besides doctors, other staff had to be quickly trained and redeployed. New jobs were created. Contact tracing, surveillance telephone calls, daily reports to the Ministry of Health (MOH), and so on, needed lots of staff. Suddenly, clinical epidemiology in real-time became

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paramount and critical if every contact had to be traced, served quarantine orders and monitored for compliance. Rostering changed overnight. Hours per shift were longer. If teamwork was one of the most critical factors for success, this was ably demonstrated. And so, if rewards and recognition were subsequently handed only to a few, if judgements of who was to be awarded what were perceived as less than fair, then teamwork would suffer.

Fourthly, the lesson to learn, and learn again, is effective, sincere, and timely communication. If well done, it breeds credibility and confidence. If poorly done, it leads to distrust and disdain. Staff want to know the truth, the true situation, the risks and the battle score. And they want the information before it reaches the media and the public.

The last lesson I wish to highlight is that there should be sufficient resources – human capital as well as equipment (Personal Protection Equipment, or PPE, in particular), and that these be effectively utilised. All bodies should participate and share the load. Otherwise it will be difficult to preserve the camaraderie and teamwork so characteristic of TTSH staff. As for equipment, rational and proper use is essential. In Taiwan, nurses refused to work possibly because they had insufficient protection. Conversely, in Toronto, staff were allowed to wear concurrently two gowns, or two gloves, or two masks (surgical over N95). This also does not make sense.

Let me return to the first two lessons regarding facilities and modus operandi.

MIDDLETON HOSPITAL

This facility began in 1907 as a quarantine camp for the isolation and treatment of cases of smallpox, cholera and plague which were prevalent at that time. The government's view then was dangerous infectious diseases were to be managed by the Municipality. So it isolated a piece of land at Moulmein Road for this purpose (and a highly valued piece of real estate today, being located in prestigious District 2). The Municipality put up the buildings, many of which exist today as low rise pavilion type wards akin to those in old TTSH. This took from 1907 to 1931 to complete. Wards and staff quarters were also built. The government gave provision, drugs and met public utility changes, while the Municipality took care of all other expenses.

With the subsidence of smallpox, cholera and plague, patients with other types of infectious diseases began to be admitted. Smallpox has been eradicated from the world. Cholera is still here with us and a new strain, the El-Tor strain has since emerged. Plague is gone from Singapore, but in 1997, there was an outbreak in India and we had to be prepared to receive cases imported into Singapore but none materialised. Of the new admissions, the prevalent diseases were diphtheria, typhoid, poliomyelitis and dysentery. We remember the bed with a hole in it for the buttocks so that diarrhoeal stools could be accurately measured and adequate fluid/electrolyte replacements given to the dehydrating patients. This bed is still preserved in our TTSH museum for all to view. Then, there was the iron lung for the unfortunate polio victims who could not breathe at all.

From its modest beginnings, this isolation camp developed over the years into a hospital for the treatment of infectious diseases. Its construction milestones were as follows:

1. The kitchen was expanded and modernised in 1954.
2. Changing rooms and a staff canteen were added in 1955.
3. The first cubicle ward was opened on 11 October 1956.
4. The mechanised stream laundry became operational in 1956.
5. A new dysentery ward was constructed in 1956.
6. The disinfecting station was improved in 1957.
7. The laundry with new equipment was enlarged in 1967.
8. A new administration block with storerooms was constructed in 1967.

Not long thereafter, as a fourth year medical student, I set foot on this campus, then called Middleton Hospital after its first Municipal Health Officer, Dr WRC Middleton. Dr Leong was then the Chief Medical Officer on the grounds and our lectures on infectious diseases were held under a big tree near the main administration block, which you could drive around in a car. It is central and faces the main gate. Dr Monteiro, who still works at the CDC today, was also there on its staff. To many Chinese, this hospital was known as "Or Sai" or "black lions", as there were indeed two black lion statues at its gate on either side of its pillars. (These have since been removed.)

DCD

On 1 January 1985, Middleton Hospital merged with TTSH and was renamed the Department of Communicable Disease (DCD), on par with its other departments like Surgery and Medicine. It had 272 beds and is mainly a clinical facility catering to the care of patients – in and outpatients with communicable disease, human immunodeficiency virus (HIV) and other outbreaks (e.g. chickenpox, measles.) With the birth of HIV in the 1980s, MOH had decided to centralise all such patients at DCD and this policy continues to this day. A special operating theatre was purpose built for HIV patients. Surveillance of HIV is also carried out by staff here. A Straits Times report on 22 September 1987 mentioned that there were then nine known HIV carriers in Singapore and only one had developed full blown AIDS.

CDC – PRE SARS

In 1992, with the restructuring of TTSH, two long established sections of Tuberculosis Control and Epidemiology were merged with the DCD to form the Communicable Disease Centre (CDC), which reported directly to the MOH. That is, from 1985 to 1992, they were part of TTSH, but from 1 February 1992, they were removed from TTSH and put directly under MOH. A major renovation was done to upgrade its physical infrastructure and facilities. The administration block was also improved to house administration, finance, personnel as well as public relations and payment departments.

The Trafalgar Home at Lorong Buangkok was closed and its patients transferred to a newly renovated 24-bed "C" class on 24 December 1992. In 1993, two B1 beds at Ward 76 were converted into four B2 beds so that four classes of

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wards were now available. A new lecture hall and meeting room were added on the grounds.

In April 1995, the CDC was removed from direct command of MOH into the restructured TTSH administration under its CEO Dr Judy Lim. So two departments were born – the Department of Infectious Diseases and the Department of Clinical Epidemiology, both under the Division of Medicine. Today, there are five wards at CDC with 123 beds and 37 isolation rooms/single beds in single storey buildings over 90 years old. Even before TTSH relocated to its present new facility, plans were on the drawing board for the redevelopment of the CDC. However, this has taken some time to bear fruit.

After the Nipah outbreak in 1999 and now SARS in March 2003, plans have had to be revisited and revised yet again. In 2000, two isolation rooms were commissioned for the isolation of patients with airborne infection, with optimal engineering requirements of negative pressure, HEPA filters and UV treatment.

CDC – POST SARS

One great lesson learnt from the SARS outbreak was the need for isolation facilities in Singapore. CDC had only 151 beds, many in open dormitory style. For isolation policy, the requirements are as follows: "Isolation of all suspected/probable cases in negative pressure isolation rooms with HEPA – filtered air (continuous monitoring.) Separate bathrooms and ante room (two down separating patients from the rest of the hospital). This is ideal, but if not available, as is the case in many hospitals, a single room with an extractor fan appears to be satisfactory. The central air-conditioning should be turned off. Where single rooms are not available, cohort nursing is practised but the space between the beds should be at least two metres and very strict droplet and contact precautions observed at all times." It was therefore obvious that Singapore did not have sufficient, high quality isolation rooms.

So the decision was taken to take back from Ren Ci Hospital the old TTSH ward block situated next to the new TTSH building. This used to house Wards 41-46 and Wards 51-56, the Training and Education Centre, and the old Emergency Department. It had been renovated by the Ren Ci management into a Community Hospital but had not begun operations. Several times in 2002, an operational date was set but nothing materialised. So when SARS broke out, this facility was still in mothballs. MOH spent close to $30 million to ready TTSH for any SARS outbreak by adding 64 new isolation rooms, 18 ICU rooms and an operating theatre in this facility, now re-designated CDC 2. *(Straits Times, 24 July 2003, pg H2, col 5-6.)* So CDC 1 and CDC 2 were born.

CDC 1

By 4 May 2003, CDC had completed renovation and rebuilding. As CDC 1 had lots of empty grounds, two new wards were created using containers and pre-fabricated building materials. They are Wards 91 and 92, each containing 20 isolation rooms. Each isolation room is equipped with an individual air-conditioning system, attached shower and toilet facilities, medical gas supplies, nurse call bell and intercom, telephone and TV ready infrastructure. Attached are the nurses' station, staff rest and doctor call rooms. Besides these 40 isolation beds, a screening centre was built with the following facilities: triage and registration counter, consultation and examination room, X-ray rooms, a laboratory, a pharmacy, and rest and shower facilities for staff.

By 20 May, another 40 isolation rooms were fully renovated and constituted Wards 93 and 94. Thus, CDC 1 in total now has 80 isolation rooms.

CDC 2

The shell of the old hospital was retained. Renovations created the 64 isolation rooms by partitioning the wards of the original six-storey block. Plumbing was revamped to put toilets in all rooms. The other two blocks have new layouts to facilitate the handling of high and low risk patients, including the addition of triage stations where the initial history and vital signs are taken. Air-conditioning systems had to re-routed to ensure a one-way circulation of air in the whole facility so that staff and patients get fresh and not stale air. These measures are to prevent the spread of the infectious SARS virus. So operationally, should there be any patients thought to have SARS, they would be managed at CDC 2. This would allow TTSH proper in the new main building with 1,064 beds to carry on its usual function, as well as allow National Neuroscience Institute (or NNI, which is housed in the same building) to be operational during any SARS outbreak. So the 200-bed Ren Ci Community Hospital never functioned. Instead, on 16 August 2003, it opened as CDC 2 with a very much reduced bed complement and patients from TTSH were transferred across to free TTSH of beds meant for the care of acute medical and surgical non-infectious patients.

In CDC 2, there are 18 ICU beds (level 1), 13 single isolation rooms per floor from levels 2 to 5 (52 beds), as well as 12 rooms on level 6 (24 beds), giving a total of 76 beds.

Therefore, for CDC 1 and CDC 2 combined, there are new facilities to isolate 156 patients and care for another 18 ICU patients. Added to this are the old CDC 1 Wards 72, 73 and 74, which together have another 48 isolation/cohort beds. We now have a grand total of 222 beds.

THE NEW CDC

We moved into the new TTSH building, built on the original TTSH football field, in 1999 in time to tackle the Y2K bug, which turned out to be a non-event. It took some 15 to 20 years of planning before the hospital was finally built. The topping out ceremony took place on 24 May 1997, and having 13 levels above ground and four below ground, this meant work had started some four years earlier. There was a private bet between two senior doctors in 1990 that we would not have moved into the new building by 2000. Well, we just made it before year 2000 dawned upon us. So, how long now for the new CDC to be built?

Soon after TTSH plans for rebuilding were approved, thinking started regarding what to do with CDC at Moulmein

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Road. Its present land plot is very large and commercially valuable. As mentioned earlier, the old Middleton Hospital began in 1907, and it appears it will last 100 years before a new replacement will take over. In today's globalised world where an outbreak of one infectious disease has the potential to very quickly spread to every country in the world, how should we handle such a situation in very small Singapore where air travel is rapid and efficient? Is a quarantine centre concept viable? Can we "catch" people who are infected, fast enough to quarantine them somewhere before the community is exposed to the infection and infected? And if quarantine is feasible, then where? St John's island? If unlike SARS (where droplet spread and contact are the modes of disease transmission), it is an airborne infectious disease or some act of biological terrorism, then what?

Is the current infrastructure, now that we have CDC 1 and CDC 2 operational (and $35 million spent in a hurry to have these up and running), adequate to effectively handle another SARS outbreak? Hopefully, the answer is yes. But what about a different infection, with larger numbers infected and in need of isolation? Would 222 isolation beds be enough? Singapore is a small nation but densely populated. Is a centralised outbreak management an effective strategy? Maybe it was for the Nipah outbreak (a zoonosis) and SARS (a nosocomial infection). So how should we plan to handle control, prevention, detection and management of infectious diseases? There is a small plot of land reserved next to TTSH and facing the Ministry of Home Affairs (our very own twin towers along Irrawaddy Road) for a new CDC. How should we proceed?

Should the new CDC handle the bioterrorism threat as well? There are eight important respiratory agents that have been or could be used in bioterrorism. These are: anthrax, tularaemia, pneumonia plague, brucellosis, Q fever, smallpox, ebola haemorrhagic fever and coccidioidomycosis. Most of us doctors have never seen a case in Singapore. In the past, bacillus anthracis, francisella tularensis, variola major, yersinia pestis and ebola virus have been evaluated and/or used as biological weapons. These organisms can be spread by aerosol dispersal, and under ideal meteorological conditions, could infect thousands of individuals. Smallpox, ebola haemorrhagic fever, and plague can also be transmitted by person-to-person contact. All of these diseases can cause significant morbidity. However, only anthrax, smallpox, plague and ebola haemorrhagic fever are highly lethal. Vaccines are available for smallpox, anthrax and plague. Vaccines have also been developed for tularemia, Q fever, and brucellosis but they are not readily available. Antimicrobial treatments are available for anthrax, plague, tularaemia, Q fever, brucellosis and coccidioidomycosis. However, drug resistant strains of F tularensis and B anthracis could make treatments ineffective. Supportive care is the only treatment available for smallpox and ebola haemorrhagic fever. (Online resources available for bioterrorism can be found at www.bt.cdc.gov; www.idsociety.org; www.hopkins-biodefense.org and www.niaid.nih.gov) ■

Note:

Part 9 will be continued in the next issue of SMA News.