CHAPTER 2

Rebuilding Fallen Walls

SARS was a wake-up call for a venerable institution like ours. Over the years, I could detect a palpable desire to do it right the next time there was an outbreak. You've got to view things through the lens of preparedness to understand, for example, why we built an X-ray room in a carpark. Yes, preparedness was always one of the reasons we could use to justify expenses. What is impressive is that it's not just the doctors and nurses who think like that, but many of our executives also instinctively know this — that whatever we do, it's important to be nimble in an outbreak.

SARS VETERAN

14 remembering
A Straits Times Sars special July 22, 2003

DAYS OF FEAR

A day-by-day account of how Sars hit Singapore from March to May

MARCH 1 Patient No. 1 is hospitalised at Tan Tock Seng Hospital (TTSH). She had visited Hong Kong with two friends in February and stayed at the Metropole Hotel. All three fall ill, but her two friends recover quickly.

6 TTSH alerts Ministry of Health (MOH) to a rare infection that is not responding to usual antibiotics. Patient No. 1 is isolated, critically ill.

10 First patient's mother and a TTSH nurse fall ill.

11

12 World Health Organisation (WHO) issues global alert on an outbreak of atypical pneumonia, and recommends isolating infected cases.

14 First patient's father and four TTSH staff admitted. MOH advises against travel to HK, Hanoi and Guangdong. HK denies the outbreak.

15 WHO names the disease Severe Acute Respiratory Syndrome (Sars), reporting 150 cases worldwide. A Singapore Airlines (SIA) flight from New York is quarantined in Frankfurt; A Singaporean doctor on board is sick – he had treated Patient No. 1.

17 Changi Airport issues health cards to passengers from HK, Hanoi and Guangdong. MOH sets up Sars task force headed by director of medical services Tan Chorh Chuan.

20 Travel to Singapore hit, as ...

21 Reader Agnes Kwok writes ... reopening schools after March break. No need, say Health and Education ministries. Schools will reopen as planned on March 24.

22 Tan Tock Seng Hospital ... stops admitting new patients and scales down specialist clinics. Sars wards are off-limits.

24 Infectious Diseases Act invoked: 740 quarantined at home for 10 days. 400 are family/friends of Sars patients, 200 Pei Cai Sec students, the rest from Pat's Schoolhouse (Lim Ah Pei Bo). Schools hit as three siblings' mum is warded.

25 Singapore's first Sars death: Father, 50, of Patient No. 1. From now, no visitors allowed for Sars patients, except child patients. Staff must be gowned, gloved and masked. Non-Sars patients allowed three registered visitors.

26 Death 2: Pastor Simon Loh, 39, who visited Patient No. 1. More parents want schools shut. Rugby team goes to HK for Sevens. Chong Pei Ling, 29, returns from HK, Beijing sick, one of 7 who bring in Sars from abroad. Her mum takes her by taxi from Changi to SGH.

27 From now, those who die of Sars must be cremated within 24 hours. Muslims may be buried, but double bagged. All schools, from pre-school to JC, closed till April 6. More than 860 on home quarantine. WHO calls for all air passengers to be screened.

28 Hunt for Chong Pei Ling's taxi driver. Passengers leaving Changi screened, ground crew told not to wear masks. Sports groups cancel training, except S-League. Moby cancels gig, but HK stars to carry on. Qantas cuts flights, cruise lines skip Singapore.

29 Death 3: Patient Painah Abdullah, 52 – infected by TTSH nurse, passed it to 20 others. Bowen Sec's Chris (...) diagnosed with Sars. Dad, brother quarantined. Mum sick (later confirmed as probable Sars). Infected abroad, Catholic church sets rules for services.

30 Death 4: Woman, 90, at Orange Valley Nursing Home (classified Sars April 13). Nurses screen passengers arriving at Changi from Sars-hit countries. Chong Pei Ling's taxi driver is found.

31 Death 5: Madam Jamaliah Mat Saad, 44, who had visited a ward in TTSH, dies at National University Hospital (NUH). All clear at Bowen Secondary. From this point, there will be no new infections of TTSH patients or staff.

APRIL 1 Companies postpone or cancel business travel. Craig David and Santana cancel Singapore concerts.

2 Ngee Ann Poly closes for three days after victim Jamaliah Mat Saad's son, Fairuz Abu, 20, a student, is infected. WHO says to avoid HK and Guangdong.

3 Death 6: TTSH patient Seah Kuay Chee, 79, who may have been infected by a nurse. To protect public transport system, ambulances will take suspected Sars cases to hospital no charge. Doctor who was sick in Frankfurt returns, well.

4 Death 7: Patient Chong Pei Ling, 29.

5 Singapore General Hospital (SGH) hit; 20 nurses and one doctor down with suspected Sars. KK Women's and Children's Hospital midwife also down with Sars. School closure extended, to reopen in phases.

6 ... patients (wards 57 ...) TTSH. Task force ... set up ...

7 Deaths 8 and 9: TTSH doctor Ong Hok Su, 27, and mother of Patient No. 1. Seven new cases. Male nurse at Orange Valley home ill. Health declaration cards for air, sea passengers. PM Goh Chok Tong cancels China trip, carries on with India visit.

8 Death 10: Brendan Loo, 51, who visited a patient later diagnosed with Sars. WHO official concerned about SGH outbreak. Seven now diagnosed with Sars. Therapist at TTSH rehabilitation centre ill.

9 JCs reopen but students who visited Sars-hit countries during school closure stay home. Some MPs stop shaking hands at constituency functions and Meet-the-People sessions. SIA, which has cut 125 flights a week, says it may have to retrench workers.

10 Death 11: Male SGH patient, 68. First-quarter growth of 1.5 per cent below original estimate of 2.7 per cent. Surveillance cameras to be placed in all homes on quarantine.

11 China cancels all tours to Malaysia, Thailand and Singapore. Singapore, Malaysia cooperate on cutting border transmissions. Courage Fund launched. Mobile thermal scanners installed at Changi.

12 Deaths 12, 13, 14: Vegetable wholesaler Tay Swee Chia, 64, whose brother brought Sars to SGH, and two male SGH patients, 65 and 69. Those who flout home quarantine will wear electronic tags. Superstar Virgo quarantines crew of 1,350 after two fall ill.

The lessons from SARS are seared on the the memories of many SGH staff. This newspaper clipping from 2003 was contributed by a staff who had kept it all these years.

Source: The Straits Times.

remembering 15

July 22, 2003 A Straits Times Sars Special

APRIL 13 SGH closes urology and radiology centres. 120 staff and 279 patients quarantined. Another SGH ward, 55B, affected. Cruise ship crew cleared of Sars.

14 Secondary schools reopen. Star Cruises says it is staying out of the region until July.

15 Deaths 15, 16, 17: Uncle of Patient No. 1; mother of Dr Ong Hok Su; Madam Lim Guat Lan, 67, later known to be Sars. Over 200 SGH staff quarantined. Shops, restaurants hit as Singaporeans stay home and tourism slumps. MPs eat out to show it's OK.

16 Death 18: Mother of discharged Sars patient who broke quarantine twice. National Cancer Centre shuts radiology unit. MOH takes back premises given to Ren Ci Hospital at TTSH to convert to isolation wards. Primary and pre-schools reopen.

17 DPM Lee Hsien Loong announces $230 million help for transport and tourism sectors. Government to donate $1 million to Courage Fund and match donations.

18 SGH restricts visitors to one per patient. Another SGH ward, 74, affected; 55 patients moved to TTSH. Cabbies to have daily temperature checks.

19 Death 19: Indian cabby, 43, who drove infected man from Pasir Panjang Wholesale Centre. Centre shut; 5 cases linked to it. Ministerial 'combat team' led by Khaw Boon Wan convened to look into controls at borders, in hospitals and homes.

20 Pasir Panjang market closed for 10 days, later extended to 15 days. Vegetables fly off the shelves at supermarkets and other markets.

21 Doctors not allowed to move across hospitals. Comfort tells its 24,000 drivers to issue receipts to make it easy to locate passengers. SIA International Cup 2003, a horse-racing event with $3 million prize, dropped.

22 Death 20: Dr Alexandra Chan, 37, dies of Sars at SGH – he had been treated for dengue fever. PM Goh writes open letter, points to irresponsible behaviour, urges all to act responsibly, warns of stern action.

23 Death 21: 74-year-old patient from SGH Ward 58. Suspected Sars deaths also to be cremated within 24 hours. Three more hospitals restrict visitors to one per patient. All departing air passengers to be screened.

24 Death 22: Woman, 62, wife of Sars patient infected at SGH radiology. Parliament sits; combat-team ministers speak via videolink. Penalties stiffened: Jail, tagging for quarantine breakers. Two HDB blocks set aside for emergencies. By June, all homes to get thermometers.

25 House passes tough new laws. BBC calls Singapore's measures the world's toughest. PM hosts media lunch to show life must go on. SM Lee reveals brush with Sars: Mrs Lee quarantined after going to SGH.

26 Deaths 23, 24: Female health attendant, 54, from SGH urology centre; retiree Ramanathan Kandiah, 63, an SGH patient. 63 Health ministers from Asean, China, Japan, South Korea meet; propose strict screening at checkpoints, stopping 'sick' from travelling.

27 Total of 2,876 linked to Pasir Panjang market under home quarantine.

28 Death 25: 77-year-old husband of woman who died on April 24. WHO declares Vietnam Sars-free.

29 Asean leaders meet in Thailand.

30 Death 26: Filipino male nurse Jonnel Fabuyon Poorá, 25, who worked at The Orange Valley Nursing Home. All homes to get

MAY 1 DPM Lee Hsien Loong dispels rumours: Not true that some races are more likely to get sick than others. TTSH is safe.

2 Death 27: Male patient, 62, from SGH outbreak. Chua Hock Seng, 50, is arrested for breaking his quarantine order twice.

3 No hospital infections in 15 days. Sars combat team ministers drink Sars at their first briefing.

4 Pasir Panjang Wholesale Centre reopens at midnight. But only to trade buyers and with temperature checks.

5 Death 28: Tay Guan Choon, 21, son of a Pasir Panjang vegetable wholesaler who died earlier. PM Goh goes to Washington to sign free trade pact with the US.

6 Death 29: Mr Chia Sok Son, 72. Three weeks after death of his wife, Madam Lim Guat Lan. Step Out Singapore drive launched to get people out again, while Singapore's OK campaign targets public toilets for cleaning.

7 US lifts travel warning to Singapore. Random temperature checks to be done on cars at land checkpoints.

9 Chua Hock Seng jailed for six months for breaking quarantine twice.

10 Health officials to check that GP and polyclinic clinics have proper safeguards.

11 Death 30: TTSH nurse Hamidah Ismail, 44, in intensive care since March 17. She is the fifth health-care worker to die.

12 Pasir Ris holiday chalets for civil servants, Aloha Resorts, to be set aside for quarantine use, for $25 a day. Cabbies get their own thermometers.

13 Possible new outbreak at Institute of Mental Health (IMH): 6 nurses, 24 patients from two wards come down with fever and 1,600 staff go into self-quarantine. School principals to check students' passports to make sure they don't lie about travelling.

14 SIA cuts more flights: 358 weekly flights now suspended.

15 Early test results from IMH group points to flu, not Sars.

16 PM says 99 per cent sure IMH group has flu.

17 100 per cent sure IMH group has the flu, so it looks like Singapore is set to be removed from WHO Sars list.

18 A new probable Sars case turns up: Lee Chong Kiat, 39, a quantity surveyor. Total probable cases: 206, with 28 deaths. DPM Tony Tan calls Sars outbreak Singapore's Sept 11.

19 Foreign arrivals up for the first time since outbreak began. Six acts pull out of Arts Festival. WHO says it's safe to fly: Only 16 people have become infected inflight.

20 17 hauled to court and fined $300 each for spitting. Australia clears travel to Singapore.

21 Death 31: Mrs Bindi Rao, 28, infected at NUH A&E in early April. National Wages Council recommends pay cuts for Sars-hit industries, except public health-care workers. Sars Channel goes on air.

22 Deaths 32 and 33: Male patients from SGH, 64 and 78, at TTSH since April. US expert says Sars could flare up again in winter.

23 HK researchers finger civet cat – part of the mongoose family and not a cat – as source of Sars. AVA confirms it is culling stray cats, but says it is for Singapore's OK campaign.

24 WHO invites Singapore to become member of global response team, to manage outbreaks.

25 Sars combat chief Khaw Boon Wan says to expect small increase in medical fees from greater infection control costs. Pasir Panjang market starts allowing casual buyers again.

26 New fever cut-off for schools set at 37.5 deg C after some parents complained their children had unusually high temperatures and were being sent home unnecessarily.

28 Courage Fund looks set to have $25 million after Government top-up; no further donations needed.

29 China to lift travel ban to Singapore, Malaysia and Thailand.

30 WHO takes Singapore off Sars list a day early.

31 Hospitals' no-visitor rule to be relaxed to one visitor per patient. There are five Sars patients still in hospital wards, and four in intensive care.

JULY 13: Last patient leaves TTSH Sars ward JULY 16: Health Ministry says Sars is eradicated, hospital restrictions to be eased

Writing the rules

SGH set up the Disease Outbreak Taskforce (DOTF) in the wake of SARS. Its main role was to develop policy and procedure for outbreaks. Every member of the taskforce had to come up with a step-by-step account of how his or her unit would respond to different scenarios. Clinic and ward supervisors had to list the steps they would take if they encountered a patient who fulfilled the definition of a "case" or a "suspect" of a novel infection. The details extended well beyond caring for the patient. How would the patient be transported to the Isolation Ward (IW)? What Personal Protective Equipment (PPE) would the porter wear? What equipment was needed to transport a patient's specimen? How would senior management be updated of such an event? How would this be communicated to the staff and the public? These plans were made, reviewed and updated every three years.

Coordinating all these processes was the Preparedness and Response Department (PRD), set up in 2006 to take over a role that was previously rotated among staff in the Operations Division.

Birth of an Infectious Diseases department

In 2003, there were only two specialist physicians and four advanced trainees in Infectious Diseases (ID), operating under the Department of Internal Medicine. In the aftermath of the SARS outbreak, several members of senior management favoured a full-fledged, independent ID department. At the very least, it would signal the hospital's awareness of outbreaks and the role ID doctors could play in one. In 2008, after a long process of approvals, a Department of Infectious Diseases (DID)

was formally constituted. The corps of ID physicians had grown by then, with workload as the main justification. In 2020, former Chief Executive Officer (CEO) Ang Chong Lye[1] remarked that SGH had managed to build a "formidable ID team" over the years.

Although clinical volume was the raison d'etre of the pioneering ID physicians, epidemic preparedness was always cited as one of the priorities. This was clear in a Medical Board paper proposing a stand-alone DID. "As a hospital that considers itself one of the leading regional centres, we should be prepared to receive a patient who arrives, ill, from an area with an outbreak of a highly communicable disease. Preparedness is a practical consideration as Singapore is an air and sea hub."

It was recognised that senior ID physicians would play a pivotal role in preventing a repeat of the SARS crisis and they were inducted into the DOTF. There was also strong awareness of the importance of a good Infection Control team. The PRD, which acted as secretariat to DOTF, worked closely with the Head of DID to iron out details as plans were submitted by the different departments, to ensure that proposed policies consistently upheld the most important principles from an ID viewpoint.

SARS IN SGH

The SARS outbreak in Singapore lasted from February to May 2003. 238 people were infected, 33 of whom died. Many of those infected were healthcare workers and their family members. In April 2003, SGH lost surgeon Alexandre Chao and health attendant Kiew Miyaw Tan. SGH had to close two wards and transfer 71 patients to Tan Tock Seng Hospital (TTSH). The Urology Centre and sections of the Radiology Department were also forced to close temporarily.

[1] Dr Ang Chong Lye, an ophthalmologist and a SARS veteran, was CEO of SGH from 2008 – 2017. During his tenure, the number of ID consultants in SGH grew steadily.

Making space for an Isolation Ward

After the debacle of SARS, the cry for an IW in SGH rang loud and clear. Early in the SARS outbreak, it was decreed that six-bedded cubicles would only house one patient, for lack of dedicated isolation facilities. Industrial fans were placed at the windows to act as exhaust fans, creating makeshift negative pressure rooms. This arrangement quickly led to a bed shortage, and the multi-bedded rooms were then hurriedly retrofitted with temporary walls to turn the six-bedded cubicles into four compartments, each meant for one patient. These rushed arrangements were costly, yet fell short of infection control requirements.

The question that remained was where to site the IW. Physician Ng Keng Yeen[2] suggested using Block 6 level 8 and this idea was floated to senior management. This location then accommodated a staff canteen, a board room, a library and a medical students' lounge. While management bought into the idea, it took a lot of political will to see it through. Resistance came from all quarters, especially staff who valued their private space.

Lack of isolation facilities meant that SARS patients/suspects were cared for in general wards, with just one patient in a cubicle meant for six.

[2] Dr Ng Keng Yeen, Senior Consultant, Department of Gastroenterology and Hepatology.

Medical staff preparing to intubate a suspected COVID-19 patient in an isolation room in the IW.

The next problem was funding. Without any push from the ID team, hospital administration, led by then Deputy CEO Karen Koh[3], looked out for funds and seized on a national call for strategic projects. The young ID team responded swiftly when asked to provide clinical input for the project, and funding was secured.

Although everyone had good ideas, no one in SGH had experience building a state-of-the-art IW. Ng Han Seong[4], Chairman of Medical Board (CMB) at that time, felt that it was best to learn from hospitals abroad. He brought a small team on a study trip to Ditan Hospital in Beijing and the Princess Margaret Hospital in Hong Kong. Ditan was Beijing's response to SARS and Princess Margaret Hospital had just built a new isolation wing. Like us in Singapore, the Chinese and Hong Kong authorities had been badly hit by SARS. This prompted them to put money and resources into preparing for the next epidemic. These study visits provided the team with many useful insights.

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[3] Karen Koh, Deputy CEO of SGH, 2003 – 2008.

[4] Prof Ng Han Seong, Emeritus Consultant, Department of Gastroenterology and Hepatology, was Chairman of Medical Board from 2006 to 2012.

The lessons of SARS informed many aspects of the design of the IW. In its current form, the ward has an Intensive Care Unit (ICU) that, in peacetime, mostly functions as a high-dependency area. No longer would the need for close clinical monitoring be an excuse for not isolating a patient. Patients with chickenpox or tuberculosis, infections transmissible by the airborne route, occasionally become very sick, requiring intensive care. By having an ICU located within the IW, such patients are able to receive appropriate high-level care without posing an infection risk to others. In addition to the dedicated ICU, every bed in the IW can double up as an ICU bed. This ability to ramp up capacity was built in because of the concern that a massive outbreak with a highly virulent virus would lead to a surge in the demand for ICU beds.

LEVELS OF INTENSIVE CARE

SGH, with its seven blocks, was built in the 1970s. It has multiple ICUs, but not all ICU beds are in single rooms. The concept of an area for "intermediate care" or "high-dependency care" evolved over the years, and multi-bedded pods were renovated to function in this manner, allowing for increasingly sophisticated care stratification. Each of these beds, for example, has the capability for continuous ECG monitoring. While these facilities were developed with clinical needs in mind, infection control had not been prioritised in the design.

After SARS, everyone instinctively understood that an isolation area would require ICU beds, with each bed in a single room. It was also clear that appropriate air engineering was essential, so that staff could work safely. While isolation ICUs enjoyed widespread buy-in, the need for an "isolation intermediate care area" was not similarly appreciated initially. Catering for such zones was in itself another struggle requiring intense negotiations for the necessary resources.

Nurturing a team

Building a cohesive team of IW nurses was a slow process. Nurses had to be trained in the principles of infection control, and cross-trained to manage both surgical and medical patients. It was recognised that a few senior nurses needed training in the running of such a ward. Phuah Gaik Kheng[5] became the first nurse who was not previously working in Infection Prevention (IP) to receive funding to train abroad. It was remarkable as she took up the challenge at the age of 54! She became the first Senior Nurse Manager (SNM) of the IW. Suriana binte Sanwasi[6] was next. Although Suriana was no longer in charge of the IW in 2020, management tapped on her to guide other nurses who had to convert their wards into isolation facilities as cases surged.

Initially, few nurses wanted to work in the IW and morale was low. To make matters worse, there was a need for nurses with a range of sub-speciality skillsets because patients requiring isolation could originate from any speciality department. The Nursing Division supported the endeavour by sending nurses into the ward, but it took leadership and tremendous effort to turn the motley crew into a good team. To build camaraderie, the fledgling DID scraped from its meagre departmental funds to support annual Christmas and Chinese New Year celebrations at the ward. ID physicians would turn up at such functions to share light-hearted moments with the nurses.

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[5] Phuah Gaik Kheng joined SGH in 1983 and worked in the ICU before the isolation ward. After retiring as a nurse in 2019, she continued in SGH as a Senior Patient Experience Manager.

[6] Suriana binte Sanwasi, Senior Nurse Manager, Ward 58.

Never let a crisis go to waste

In 2015, SGH was once again shaken by a virus. A cluster of acute Hepatitis C infections in the renal transplant ward announced the arrival of another outbreak. When the hospital reported the outbreak to the Ministry of Health (MOH), and then went public, it found itself swirling in negative publicity. MOH convened a Committee of Inquiry to investigate the root causes and SGH's leaders stood once again in the firing line as they faced the press. Although the Committee was unable to pinpoint the exact cause of the outbreak, several lapses in infection prevention were identified.

HEPATITIS C OUTBREAK

The Hepatitis C outbreak in 2015 affected 25 patients in the renal wards and was linked to eight deaths. Twenty of the patients were kidney transplant recipients.

Although the Hepatitis C outbreak largely affected only one department, it led to an extensive internal review of all practices related to IP and Patient Safety. Infection Prevention Nurse (IPN) Molly How[7] felt that hospital management was sincere in wanting to elevate infection prevention practices. "Measures such as single-use vials and needleless connectors that we had long fought for became a reality. The needleless connector proposal had been rejected because of its cost. This time, CMB Fong Kok Yong[8] and CEO Ang Chong Lye supported the interventions. They said that preventing a needle-stick injury would reduce a ton of mental anguish for the person involved. Our salute to them."

[7] Molly How, Senior Nurse Clinician (Specialty Care), Infection Prevention and Epidemiology.
[8] Dr Fong Kok Yong, Chairman of Medical Board, 2012 – 2019.

> The culture is now very different. Staff feel more encouraged to speak up. The number of emails and calls that I receive from staff has increased tremendously after the Hepatitis C incident. The crisis has taught me the importance of being open – open to admitting mistakes and open to learning from mistakes.
>
> Lee Lai Chee, Assistant Director Nursing (Speciality Care), Infection Prevention and Epidemiology

Daily grind, tall order

When Molly joined the then Infection Control team in 2000, there were six other nurses led by microbiologist Ling Moi Lin[9], who served as the hospital's Infection Control Officer on a part-time basis. Molly remembered that SARS was a taxing time. "There were so few of us, but so many things to do. We had to do mask-fitting, infection control training and answer all the queries coming in. We had to visit the wards often to check that infection control practices were in place. Luckily, Nursing pumped in manpower for the audits."

[9] Dr Ling Moi Lin, Director, Infection Prevention and Epidemiology, SGH. She was appointed to the same role for the SingHealth cluster during COVID-19.

Building an IP team took many years. There was a relentless increase in the types of multi-drug resistant organisms worldwide, and many were detected in Singapore's hospitals soon after, and sometimes before, they were characterised. Hospital leadership followed these trends with as they were updated on the rise of superbugs within SGH.

Moi Lin and her IPNs formed a team of dedicated professionals who devoted themselves to the many difficult tasks associated with infection prevention — running hand hygiene campaigns, performing audits, instituting policies, measuring infection rates. A physician commented in late 2020, "The battle against the superbugs was hard to win, but the efforts of the infection prevention team paid off during the pandemic. As far as I know, no staff passed COVID-19 to a patient and no staff caught COVID-19 from a patient."

Ling Moi Lin at the Command Centre. She heads the Infection Prevention and Epidemiology teams at SGH and SingHealth.

Fever screening area in a carpark

For pandemic preparedness, MOH required each hospital to have a fever screening area (FSA)[10] that was sited away from the Emergency Department (ED). This would be used during outbreaks to decongest the casualty department. SGH welcomed the idea. The fever zone in the ED was small. When a new multi-storey carpark was being built on the SGH campus in 2013, PRD and a team that included ID physicians and IPNs hit on the idea of siting the FSA there.

Then Chief Operating Officer (COO) Loh Yong Ho[11] was supportive. Placing tents during an emergency in an open-air carpark was not tenable because proper facilities would take too long to set up. The option of converting space used for patient services, when needed, was considered potentially disruptive. Driven by a sense of purpose and urgency, SGH used its own funds to retrofit the carpark for FSA purposes.

Over the course of six months, SGH added

- a staircase for staff in the middle of the carpark to allow separation from incoming patients;
- a lead-lined room for an X-ray facility;
- staff toilets and shower facilities;
- store rooms on every level where recycled furniture could be stored for FSA use; and
- walls and shutters so that office spaces could be quickly set up with the necessary air conditioning ducting in place.

[10] For more details about the FSA, see Chapter 4.
[11] Loh Yong Ho, Chief Operating Officer, 2010 – 2018.

Having a lead-lined room at the multi-storey carpark enabled SGH to quickly move in X-ray equipment to set up the Fever Screening Area there in February 2020.

When it was ready in early 2015, PRD organised four drills that same year to test the facility and its own workflow. A second cycle of exercises was held in 2019. To prepare staff for the drills, PRD put together briefing materials about the workings of the FSA and uploaded them on the intranet. With each rehearsal, these documents were amended to incorporate lessons learnt. The briefing materials came in handy during the COVID-19 outbreak when training was needed for staff deployed from various areas of the hospital to the FSA.

Jorin Ng[12], who joined PRD in 2010, had cut her teeth planning the hospital response to business continuity and mass casualty incidents. While working with many departments to put the plans together, she could visualise the scenarios such as a fire in the ward and understood the required changes to work processes. But planning for disease outbreaks proved very different.

[12] Jorin Ng, Senior Manager, Preparedness & Response, Crisis Planning & Operations Department.

"It is difficult to know what is going on because we can't see the virus and sometimes we don't understand how it behaves. COVID-19 has really been an eye-opener for me. When the call came to activate our FSA, I had mixed feelings. On one hand, we had always hoped our plans would never be put to use. Yet I couldn't help feeling grateful that all the effort had not been in vain. I was excited at this true test of all our plans, but also relieved that we had done the preparations."

Imaging safely

While it was natural for ID physicians and IW nurses to take upon themselves the task of preparing for a future pandemic, the enthusiasm with which the Department of Diagnostic Radiology (DDR) embraced epidemic preparedness needed explanation. Unsurprisingly, their fervour had its roots in SARS[13]. Radiologists Chan Lai Peng[14] and Tan Bien Soo[15] knew that "cross transmission had occurred in the bowels" of their department – a painful but defining event.

Staff attending to a suspect COVID-19 patient undergoing a CT scan.

[13] Health attendant Kiew Miyaw Tan had caught SARS while attending to a patient in DDR. She was one of two SGH staff who passed away during the SARS outbreak.
[14] Dr Chan Lai Peng, Head and Senior Consultant, Department of Diagnostic Radiology.
[15] Dr Tan Bien Soo, Senior Consultant, Department of Vascular and Interventional Radiology.

After SARS, there was a need to change both process and infrastructure to face the next outbreak squarely. Inpatient and outpatient imaging facilities were segregated. Negatively-pressured rooms for general radiography, ultrasound, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) were installed. When the Division of Radiological Sciences was constituted, with Bien Soo as Chairman, a thorough review of practices was carried out with a focus on infection prevention. An internal task force was set up in 2018, in collaboration with colleagues from ID and Infection Prevention and Epidemiology (IPE). Through audits, the task force helped identify several areas of improvement in infection prevention, which radiology staff worked hard to implement. When the pandemic struck, the team was glad that they had taken the lessons gleaned from SARS seriously.

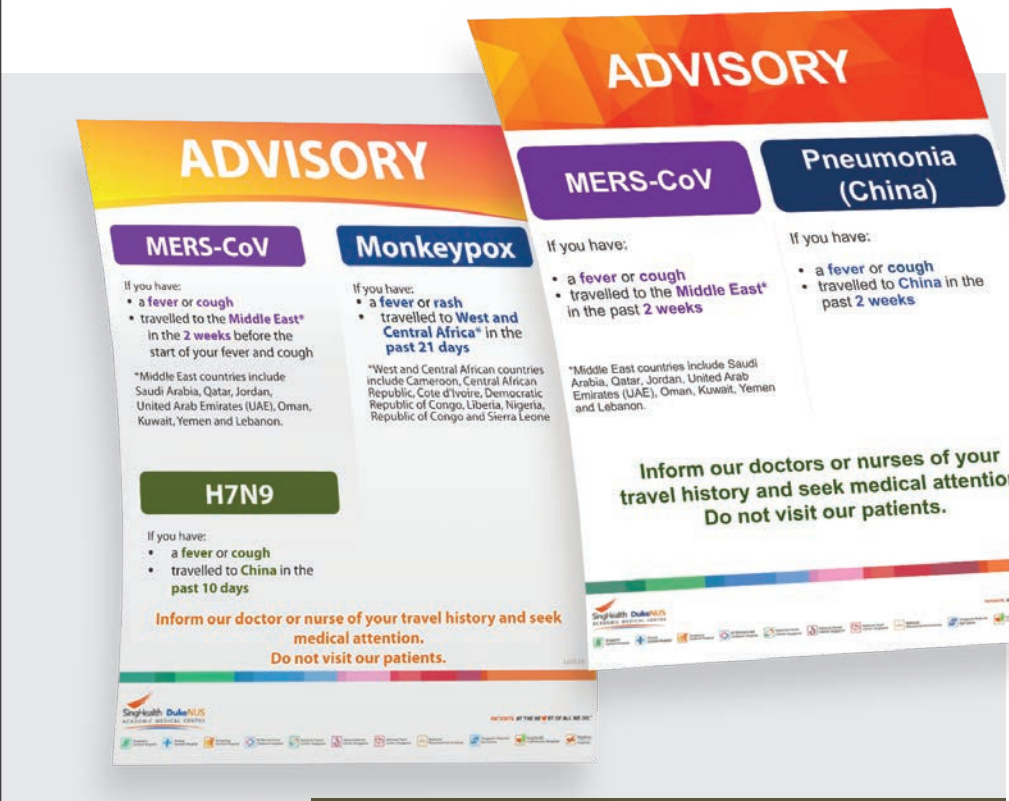
Rehearsing to avoid regret

The Middle East Respiratory Syndrome (MERS) coronavirus was first identified in 2012 in a patient in Saudi Arabia. It rapidly demonstrated human-to-human spread and outbreaks in healthcare institutions were soon reported across the Middle East. The news of this novel coronavirus with a propensity for intra-hospital spread sparked alarm in SGH. There was grave concern that a case might slip into our wards.

One critical decision made by the DOTF was that anyone who had been to the Middle East recently and who had respiratory symptoms had to be admitted to the IW first and tested for MERS. The technical wizards in the Molecular Laboratory quickly developed a PCR[16] test for MERS. As air traffic was high between the Middle East and Singapore, this single decision enabled many of DOTF's plans to be tested regularly. Junior doctors became adept at taking throat swabs. Nurses and porters also became familiar with the process of handling the swabs for safe transport to the laboratory. These processes were easily replicated when H7N9 influenza and Ebola became outbreaks of concern.

The principle, instinctively understood, was that a potential case had to be identified at the very door of SGH and not after they got into the system. Hence it was decided that everyone coming to the clinics or to the wards had to complete a declaration form prepared by PRD. Visitors and patients had to declare if they had symptoms such as fever, cough or breathlessness. They also had to declare if they had been in the Middle East in the preceding two weeks. To ensure that visitors, patients, and accompanying persons had adequate warning that such screening would take place, posters were placed at strategic locations.

[16] Polymerase chain reaction (PCR) tests detect genetic material. These tests are able to detect minute quantities of genetic material. The interpretation of PCR test results requires expertise and experience.



These posters at the entrances of SGH were constantly updated to reflect the infectious diseases in circulation. From left – May 2019 and January 2020.

These posters became a familiar sight at the hospital's entrances. They served as constant reminders to the staff of the danger of emerging infections, since every entry point had to develop protocols to deal with people who answered "Yes" to any of the questions on the declaration form. The ED had no problems with these, as they had been operating a fever zone for years. DDR also eased the needed processes comfortably into their workflow. However, the outpatient clinics had to develop new routines. Clinic managers pooled resources to keep one consultation room empty every day, so that any patient identified as being at risk could be ushered into it without delay, to be attended to under isolation conditions. This also meant that every clinic maintained a small supply of PPE.

In April 2013, news of human cases of H7N9 influenza emerged from China. The posters were rapidly updated. This ensured that persons who had been to either the Middle East or to eastern China were kept apart from the rest of the public from the moment they entered SGH. With the West African Ebola crisis of 2015, the travel questionnaire was amended yet again. With each outbreak of concern, the Communications and PRD teams, which produced the posters and screening forms, needed less guidance from the ID physicians. Once the email exchanges began among members of the DOTF, they needed no reminders to ensure that the posters and questionnaires reflected the latest concerns.

Drills are for real

The seriousness with which a few SARS-scarred ID physicians took their epidemic preparedness work did not always go down well with the rest of the staff. One junior ID physician felt that outbreak preparedness and drills seemed "over the top, encroaching on the doctors' and nurses' burgeoning schedule".

In 2014, when the Ebola virus outbreak in West Africa occurred, despite the low number of African patients here, drills started. The ID team, the IW nurses and the ICU team all had to undergo training on donning and doffing of PPE under the watchful eyes of the IPNs. The transfer of suspected cases from the ED to the IW was also rehearsed.

PUT TO THE TEST

In October 2014, an African businessman arrived in SGH with fever, nausea and vomiting. Because he was from Kenya (not Guinea, Liberia or Sierra Leone, which were the epicentres of the Ebola outbreak), he did not fulfil MOH's definition of a suspect case. However, he had recently visited Ghana in West Africa. It was a "grey case", a forerunner of many of our COVID-19 suspects today. It was a tough call to activate the Ebola drill, but on hindsight, I am glad that our leaders did. This involved more than just recalling one ID specialist back to hospital at night. Our department's roster had to be reshuffled in the middle of the night as I would not be allowed to work outside the small Ebola zone of the IW.

When I arrived in the ward, the nurses were ready, and my head of department, Tan Thuan Tong[17], was already there. A final refresher of the protocols, and we were all set. The patient arrived soon after. He looked miserable with a vomit bag beside him. I thought, "Wow, this guy is alone in a foreign land, feeling miserable, and is now surrounded by healthcare workers, dressed like aliens in yellow gowns. And he's not even from one of the affected countries."

Planning of the consult was rehearsed mentally before entering the patient's room to minimise the steps needed to collect the necessary information. Within the constraints of space and the physical discomfort of the PPE, essential tests had to be performed, and this patient had to feel treated like a human being. What would routinely take 20 minutes now took more than an hour, and every step that I took was watched like a hawk by the IW nurses, who knew the drill by heart. iSTAT[18] was performed for basic biochemistry, and the results were transcribed on a piece of paper which would never leave the patient's room. I held it up against the window pane and there was a nurse on the other side copying the results. Additional blood specimens were collected, double bagged and wiped down. And the Ebola diagnostic test was stored in a container which I

[17] Dr Tan Thuan Tong, Head and Senior Consultant, Department of Infectious Diseases.
[18] The iSTAT machine is a portable device that can perform simple tests like blood counts and renal function.

thought appeared bomb proof and fit for the secret services of the world, ready to be delivered to the designated lab in the wee hours of the morning.

When the consultation was complete, we stepped out to the clean area for clinical documentation, administrative phone calls, and then we waited in our zone, demarcated from the rest of the ward. The other nurses made sure we were fed and brought us items we needed. We did not cross the line, and remained in our Ebola zone.

While waiting in the quiet, I reflected on the whole journey. During the encounter, I had caught a look of irritation in the patient's eyes. He had come to hospital to seek treatment, only to be shipped off to an isolation zone, have his personal belongings removed, and fussed over with an almost total loss of independence. Throughout that long night, we watched him through the glass double doors of his room. Fortunately, he remained stable and eventually tested negative for Ebola. He was diagnosed with malaria and made a full recovery.

This episode made me realise that the drill must happen over and over again to prepare our staff, test our processes and help us improve. But beyond getting the steps right to prevent harm to ourselves and the public health, it is about our duty to treat the patient as a person with dignity.

JASMINE CHUNG
Consultant,
Department of Infectious Diseases

IW nurse Ziyadah binte Zainuddin[19] commented that the Ebola drills were treated with great importance. "Anyone who missed a training session had to attend a make-up session and ICU nurses had to be similarly trained. Training was also held for all ID and ICU doctors. A handful of junior ID specialists had to demonstrate competency in blood taking and the use of the iSTAT machine."

Nurse Muhammad Syafiq bin Abdul Manaf[20] took on the role of Ebola champion. "The training was rigorous – donning and doffing of PPE, admitting suspected or confirmed Ebola cases from the ED, extracting a suspect case from other wards, assisting doctors in collecting blood specimens, managing waste and managing death. All aspects were covered."

> When COVID-19 started, I was deeply grateful for all the Ebola training we had in the ward.
>
> Teresa Cassandra Andrew, Nurse Clinician, Ward 58 (Infectious Diseases)

[19] Ziyadah binte Zainuddin, Senior Nurse Manager, Ward 68 (Isolation).
[20] Muhammad Syafiq bin Abdul Manaf, Nurse Clinician, Ward 68 (Isolation).

At the battle of SARS,
For each life lost
We mourned
But learned
through ATTRITION.
Analysed, dissected,
Remembered the LESSON.
Keep the faith alive
So we can fulfil
The mission of
our CALLING.

WOO KENG THYE
Emeritus Consultant,
Department of Renal Medicine

Prof Woo was Chairman, Division of Medicine, during the SARS outbreak.