

CHAPTER 3

# Staying Ahead Of The Curve

Evaluating a febrile cancer patient is bread and butter for an Infectious Diseases (ID) physician, but when I started typing, I froze. I had interviewed and examined him mechanically, but as I entertained the diagnostic possibilities, I started trembling. A few days earlier, we had just confirmed Singapore's first case of infection with the virus from Wuhan. Unsurprisingly, it was a tourist from the city. The patient I had just seen had certainly not travelled, but what if he had, just before his admission, hosted friends or relatives from China? What if he had a family member who worked in the travel industry? I had to ask him more questions.

But he was breathless and coughing. Was this the Wuhan pneumonia? I looked at the cancer patients in the room and all my hairs stood on end. I saw visions of SGH being castigated in the media for spreading the infection to a roomful of cancer patients.

After collecting myself, I made my clinical recommendations on the computer and headed to the next patient on my list. I told myself that none of us in SGH had done wrong – the patient<sup>1</sup> did not fulfil the Ministry of Health's (MOH) criteria for a suspect case. Although we had not broken any rules, my mind was racing with all the what ifs. This time, I told myself, SGH would not experience intra-ward transmission. All patients with symptoms that were even vaguely suggestive of this novel infection had to be segregated till proven otherwise.

Fortuitously, I bumped into Chian Min<sup>2</sup> and voiced my concerns. He understood immediately. We discussed various ways of minimising the risk of contagion. A ward for patients with respiratory complaints would be a perfect solution. By luck, I also met Ghee Chee<sup>3</sup>, and was also able to sell my ideas to him. If a ward could be found, he was happy to have his staff man the ward.

We called them Acute Respiratory Infection (ARI) wards. We made the rules as we went along. In that electrifying early period, every day, Ghee Chee and I met the consultants running the first three ARI wards and discussed all suspicious cases. We were determined not to miss any case of the novel coronavirus infection. We read the daily MOH press releases no matter what time they came out. We picked out the workplaces of the day's confirmed cases. These were relayed through text messages to the ARI staff. Every new cluster site mentioned was incorporated into the electronic medical record system so that frontline doctors would not miss these out in the contact history. The first consultants of the ARI wards – Leong Chai<sup>4</sup>, Melvin<sup>5</sup>, Jenny<sup>6</sup> and Yuyang<sup>7</sup> – were true heroes. They worked uncomplainingly in areas that did not have the usual safety nets of a purpose-built Isolation Ward (IW).

### **TAN BAN HOCK**

Senior Consultant,  
Department of Infectious Diseases

<sup>1</sup> This patient was eventually confirmed not to have COVID-19.

<sup>2</sup> Dr Loo Chian Min, Chairman, Division of Medicine and Senior Consultant, Department of Respiratory and Critical Care Medicine.

<sup>3</sup> Dr Phua Ghee Chee, Head and Senior Consultant, Department of Respiratory and Critical Care Medicine.

<sup>4</sup> Dr Leow Leong Chai, Senior Consultant, Department of Respiratory and Critical Care Medicine.

<sup>5</sup> Dr Melvin Tay, Senior Consultant, Department of Respiratory and Critical Care Medicine.

<sup>6</sup> Dr Jenny Hsieh, Associate Consultant, Department of Internal Medicine.

<sup>7</sup> Dr Tan Yuyang, Consultant, Department of Internal Medicine.

## SHADOW-BOXING AN UNKNOWN ENEMY

News of the horrifying extent of the outbreak from Wuhan filtered through to us from multiple sources, but what stuck in my mind were personal stories and terrible experiences from frontline workers in China describing the severity of the outbreak and the toll it had taken on them physically and mentally.

We read constantly to try and keep up with the barrage of news and literature updates as it was crucial for our job. We had to know where the latest hotspots were, what occupations were now more at risk, which nationalities were more likely to be affected, and update our daily history-taking template accordingly. We had to know what the latest research was showing. Was the virus airborne? How long did it survive on surfaces? Could we risk-stratify patients based on biomarkers? The daily sharing sessions led by senior ID physicians were instrumental in distilling and spreading information to our teams. We then modified our workflow accordingly. If it didn't work well, we tried something else. It was both refreshing and exhilarating at the same time.

Whatever concerns or fears that I had at the beginning were put to rest once the actual work started on the ARI wards. I knew that I had a good team of junior staff. The young doctors worked extremely hard to cope with the high daily numbers of admissions and discharges that came through the ARI wards. They looked out for each other all the time, from making sure that everyone's Personal Protective Equipment (PPE) was put on properly to checking that swabs were taken in a safe and timely manner to meet the tight timelines. This was crucial for ensuring that beds were freed up for the new admissions<sup>8</sup>. The juniors covered each other constantly, for meals, breaks and calls. We joked to keep our spirits buoyant and to distract from what was happening to frontline healthcare workers in Wuhan. The enthusiasm, commitment and competence that they demonstrated, in responding to this unknown and potentially deadly situation, really impressed me and made me feel silly for having had doubts and fears.

**There was not a single murmur of complaint or unhappiness from the young doctors. In fact, it was the opposite; they were even fighting to volunteer when the need arose.**

Leow Leong Chai, Senior Consultant, Department of Respiratory and Critical Care Medicine

<sup>8</sup> Patients were discharged from the ARI wards only after they had tested negative for the virus at least twice. Reports indicated that people presenting very early in the illness might not yield positive swab results, so the swabs had to be done on different days, and the interval between swabs varied depending on the clinical presentation.

## Creating new workflows

There was no blueprint or standard operating procedure for the ARI wards, so the teams had to fly the plane while building it. The purpose and objectives were clear – to look for and limit possible spread of infection. Each zone was manned by a dedicated team, 24/7, that would not work elsewhere.

But there were problems aplenty. When the ARI teams requested sub-speciality consults, some specialists required the patients to be tested negative for the virus two times over before reviewing them. Others insisted on the patients being cleared and transferred to a “safe” ward before evaluation. When procedures needed to be done in another part of the hospital, transporting the patient under full infection control precautions was an exercise in patience and endurance because of the need for strict attention to detail. Thankfully, the hospital Command Centre was unwavering in its support. ID physicians Limin Wijaya<sup>9</sup> and Chua Ying Ying<sup>10</sup> were indefatigable – negotiating patiently with multiple departments to develop protocols to smoothen the workflow.



ID physicians Chua Ying Ying (left) and Limin Wijaya in deep thought during a quiet moment as they worked tirelessly to integrate processes across the hospital.

<sup>9</sup> Dr Limin Wijaya, Senior Consultant, Department of Infectious Diseases.

<sup>10</sup> Dr Chua Ying Ying, Senior Consultant, Department of Infectious Diseases.

### THE PURPOSE OF THE ARI WARDS

All official definitions, from MOH, the World Health Organisation (WHO) and the US Centres for Disease Control and Prevention (CDC), for a suspect case of the novel infection combined symptoms with epidemiologic exposures. Thus a person with cough was a suspect only if he or she had been in contact with a known case of the novel coronavirus infection, or had travelled to an area experiencing community transmission of the infection.

The ARI ward, on the other hand, was meant for persons who had suggestive respiratory symptoms but no known epidemiologic exposure, or whose exposures were considered remote. Such persons could only be infected if they had been exposed to asymptomatic intermediaries, and then only if asymptotically infected persons were capable of transmitting the virus. This would soon become fact, but in late January 2020, it was based only on a statement from a spokesman for the Chinese government, as reported by China Central Television and the local media on 26 January 2020.

The ARI wards formed an isolation zone for people who fell through the cracks of the official definitions of a suspect, as illustrated by the patient described below. In this case, the patient herself had not visited the church, and her sister was not yet proven to have the infection.

ID physician Tan Ban Hock recollected. “One Sunday morning, a few days after we had opened the ARI wards, Leong Chai brought up a patient for discussion. She had prolonged symptoms of a respiratory tract infection as well as lymphopenia<sup>11</sup> on the blood counts. He dropped the bombshell in his next sentence – the patient’s sister frequented the church at the centre of Singapore’s then-largest cluster and had been admitted to Tan Tock Seng Hospital a day or two before. The patient was moved promptly to an IW and her roommate was not allowed out of that room till multiple tests adequately excluded the infection in both of them. Once again, we had to develop the rules according to the circumstances. But soon, a true positive was found in the ward. They were uncommon, but every case reminded us that there was no room for complacency.”

---

<sup>11</sup> A deficiency of lymphocytes, a type of white blood cell. Lymphopenia was recognised as a feature of the novel infection very early on. Lymphopenia is not unique to COVID-19, but in the correct setting, it is a clue to the diagnosis.

## Staying true to the purpose

As worries about unwittingly missing a case grew, more and more patients were admitted to ARI wards and the number of wards had to be expanded. In each ARI ward, the number of beds per cubicle was reduced and this impacted hospital bed capacity. Designating a new ward as an ARI ward meant complex logistics and administrative challenges. The ARI proponents received untiring support from a steadfast team of administrators – the unseen and unheard – who oiled a growing machine that had sprung from the scars of SGH’s painful experience with SARS. This backroom team became the Division of Medicine’s Preparedness and Response capability – Ratna binte Abdul Rahman<sup>12</sup>, Grace Kwek<sup>13</sup>, Ang Yilin<sup>14</sup>, Ho Wanqi<sup>15</sup> and Tan Shuxian<sup>16</sup>.

Sometimes, an ARI ward opened the next day or on a Friday evening. There would be a mad scramble to change the roster of the Division of Medicine. Luckily, every time we called a Head of Department, he or she would agree. We had to know which doctor had failed mask-fitting – they could not be assigned to the IW or ARI wards. Because things happened very fast, all of us were checking our phones all the time, day and night, even on weekends. Many people may not think much of medical administrators, but after COVID-19, even our family members realised that medical administrators mattered too.

Ang Yilin, Senior Executive, Division of Medicine

<sup>12</sup> Ratna binte Abdul Rahman, Senior Manager, Division of Medicine.

<sup>13</sup> Grace Kwek, Senior Executive, Division of Medicine.

<sup>14</sup> Ang Yi Lin, Senior Executive, Division of Medicine.

<sup>15</sup> Ho Wan Qi, Healthcare Management Executive.

<sup>16</sup> Tan Shu Xian, Senior Executive, Division of Medicine.

### IMPACT OF THE ARI WARDS

From 5 February to 18 March 2020, 446 patients fulfilled MOH's criteria for a suspect case and were admitted to our IW – 15 of these tested positive for the novel virus. During the same period, 1,178 patients were admitted to ARI wards – five were tested positive. Although the yield appeared low, SGH stalwarts (SARS veterans in particular) recognised the positive impact of the ARI wards. We had prevented five clusters from forming in Singapore.

What could have been worse was that those clusters could have formed within SGH wards, spreading infection to staff and to vulnerable patients. The repercussions on staff morale and hospital reputation were unthinkable. The destination, though clearly not final, was (in the words of an old song) nevertheless worth the while.

These data from the statistical analyses performed by the ARI pioneers were published in an academic journal<sup>17</sup>.

## You can't do without nurses

As always, nurses were indispensable. Nurse Nanthakumahrie d/o Gunasegaran<sup>18</sup> was tasked to convert and man ward 65B as an ARI ward. She recalled the early problems. "It was a real challenge to work with different nurses, all coming from different wards, with vastly different experiences in infectious disease management. The spectrum ranged from novice nurses who had worked for less than a year, to those from the neonatal units and operating theatres, who had not worked in an acute adult ward for years. Not having healthcare assistants added to the challenge. Everyone rolled up our sleeves and learnt from each other."

---

<sup>17</sup> Wee LE et al. Respiratory surveillance wards as a strategy to reduce nosocomial transmission of COVID-19 through early detection: the experience of a tertiary-care hospital in Singapore. *Infect Control Hosp Epidemiol* 2020;41:820.

<sup>18</sup> Nanthakumahrie d/o Gunasegaran, Nurse Clinician, Nursing Research.

The overwhelming majority of patients admitted to ARI wards were not anticipated to have the novel infection. Therefore, multi-bedded cubicles continued to be used, though with fewer beds in each cubicle to increase the distance between the patients and to minimise the number of people exposed, should a patient turn positive. When the diagnosis of infection was confirmed in such a multi-bedded cubicle, any patient who shared the cubicle was designated a Person Under Quarantine (PUQ). PUQs had to be carefully managed. If they still required inpatient care, they had to be transferred to a single room, preferably in an IW. If they were fit for discharge, they had to be quarantined according to national guidelines. The discharge process had to be carefully coordinated, and SGH soon had a small platoon dedicated to the tedious liaison with various external parties to ensure that discharged PUQs got to their place of quarantine safely without potentially infecting anyone else.



Staff in ARI wards delivering care were mindful of the risks of COVID-19.





Converting a ward to an ARI ward was always a hectic affair. To make Ward 76 an ARI ward, nurse leaders such as Deputy Director Nursing Ang Shin Yuh (left) turned up to help move patients to newly commissioned wards in the nearby Outram Community Hospital.

Nurse Kan Sook Han<sup>19</sup> was assigned to be the nursing manager of ARI ward 67. “We had to create an entirely new procedure for patients discharged to designated community care facilities. The scale of collaboration and coordination was enormous. This involved a multi-disciplinary team – the coordinator who liaised with MOH, doctors, nurses, security officers and medical social workers. Without the dedication of every single person, there would have been a great mess and every day would have been a mad scramble.”

Despite the careful planning, hiccups were inevitable. One patient, a PUQ, required home quarantine by national guidelines. He was in his mid-seventies, lived alone and could not cook. Officials from the various ministries had anticipated such a situation and the ward team was informed that a scheme for meal delivery could be activated. Still, the septuagenarian found himself without meals on his first day at home. Nurse Hartini binte Osman<sup>20</sup>, who was in charge of the ward to which he had been admitted, took it upon herself to rush over to his house with some dinner.

<sup>19</sup> Kan Sook Han, Nurse Clinician, Ward 45 (Respiratory Medicine).

<sup>20</sup> Hartini binte Osman, Senior Nurse Manager, Ward 73 (Internal Medicine).

## Identifying the enemy

The SGH Molecular Pathology Laboratory (MPL) was set up in July 2006. The initial vision was to consolidate molecular testing within the Pathology division. After SARS in 2003 and H1N1 in 2009, the MPL made preparations for the next pandemic. It was almost an obsession for the two molecular virologists, Chan Kian Sing<sup>21</sup> and Lynette Oon<sup>22</sup>, who always factored pandemic considerations into all their decision-making. In 2019, when the national stockpiles for laboratory reagents were dismantled, SGH maintained its own inventory. They had also put in place a streamlined respiratory swab processing protocol, and had purchased an automated liquid handler. These proactive steps to enhance the laboratory's capability would prove prescient.

The SGH Molecular Pathology Laboratory (MPL) was critical to Singapore's response to COVID-19. They got out a new polymerase chain reaction (PCR)<sup>23</sup> test very quickly; they anticipated shortages in reagents and consumables and stockpiled in advance. They were among the first in the world to notice subtleties and idiosyncrasies of COVID-19 testing, and their expertise likely underpinned some of the frontline actions that led to SGH detecting cases that did not fit the existing MOH case definition at that time.

Koh Tse Hsien, Head and Senior Consultant, Department of Microbiology

---

<sup>21</sup> Dr Chan Kian Sing, Senior Consultant, Department of Molecular Pathology.

<sup>22</sup> Dr Lynette Oon, Head and Senior Consultant, Department of Molecular Pathology.

<sup>23</sup> PCR tests detect the genetic material (nucleic acid) of micro-organisms and are generally considered the best test for picking up small quantities of micro-organisms.

On 30 December 2019, Lynette noticed a post on four cases of pneumonia of unknown cause on ProMED, a publicly available surveillance system that reports infectious diseases outbreaks around the world. A few days later, on 2 January 2020, MOH sent out a circular laying down the criteria for a suspect case of the novel infection and instructed that samples from such patients be sent to the National Public Health Laboratory (NPHL). On 8 January 2020, Chinese scientists reported finding from the affected patients a novel coronavirus, which was neither SARS-CoV nor MERS-CoV. At this point, the MPL knew that it was a matter of time before the the virus found its way to Singapore and decided to develop a test for it.

The complete genome of the novel coronavirus was made publicly available on 11 January 2020. By 13 January 2020, real-time PCR protocols were published on the WHO website. Cases were reported from Thailand and Japan on 15 January 2020 – the urgency of developing a diagnostic test was growing. MPL ordered primers and probes on 17 January 2020 and Lynette harried the vendors daily to expedite delivery.

The plan was to first use ribonucleic acid (RNA) extracts of SARS-CoV, which MPL had archived from the old days, as positive controls for the PCR. The team of scientists and technologists, notably Lim Kun Lee<sup>24</sup>, Kenneth Chan<sup>25</sup>, Yau Ee Xuan<sup>26</sup> and Bryan Tan<sup>27</sup>, worked tirelessly to modify and validate the PCR assay so that it was fit for clinical use. On 23 January 2020, the PCR assay for the novel coronavirus was ready for clinical use, making MPL the first service laboratory in Singapore to offer this test.

---

<sup>24</sup> Dr Lim Kun Lee, Principal Medical Laboratory Scientist, Department of Molecular Pathology.

<sup>25</sup> Kenneth Chan, Medical Laboratory Scientist, Department of Molecular Pathology.

<sup>26</sup> Yau Ee Xuan, Medical Laboratory Scientist, Department of Molecular Pathology.

<sup>27</sup> Bryan Tan, Medical Laboratory Technologist, Department of Molecular Pathology.

The new test proved itself the very day it was first used – by detecting Singapore’s first case. The result came out at 2:30pm, and the NPHL confirmed the accuracy of the result by 6:00pm, with the news released by MOH to Singapore the same evening.

A senior ID physician shared his pride in the MPL. “One day, as I discussed the results of various viral PCRs while rounding on transplant patients, the medical officer asked me how I had managed patients in the primitive 1990s when all these tests were not available. We have indeed come a long way. I can look at international colleagues in the eye, because we in SGH have personal experience with the CMV, EBV and BKV PCRs<sup>28</sup>, and many more. We are familiar with their utility and limitations.”

**If we are a first-class hospital,  
it is because we have a first-class  
Molecular Lab and forward-looking  
molecular virologists.**

Tan Ban Hock, Senior Consultant, Department of  
Infectious Diseases

---

<sup>28</sup>Cytomegalovirus, Epstein-Barr Virus and BKV, which is a virus from the polyomavirus family.

## RACE TO DEVELOP A PCR TEST

**30 December 2019**

ProMED post on four cases of pneumonia of unknown cause in Wuhan noticed by SGH molecular virologist.

**2 January 2020**

MOH sent circular laying down criteria for a suspect case of the novel infection and instructed that samples from such patients be sent to the National Public Health Laboratory (NPHL).

**20 January 2020**

MPL modified and validated the PCR assay to be fit for clinical use.

**17 January 2020**

SGH MPL ordered primers and probes. For positive controls, MPL planned to use RNA extracts of SARS-CoV from their archives.

**23 January 2020**

The PCR assay for the novel coronavirus was ready for clinical use.

**2:30pm**

In its maiden run, the new test detected Singapore's first case of COVID-19, a patient from China admitted to SGH the day before.

**8 January 2020**

Chinese scientists reported finding a novel coronavirus from the affected patients.

**11 January 2020**

The complete genome of the novel coronavirus was made publicly available by Chinese scientists. It had about 80% genetic similarity with SARS-CoV which caused the SARS outbreak.

**15 January 2020**

Cases were reported in Thailand and Japan. The urgency of developing a diagnostic test was growing.

**13 January 2020**

Real-time PCR protocols were published on the WHO website.

**6:00pm**

The NPHL confirmed the result of the SGH test, and MOH released the news to Singapore the same evening.

## SECURING RESOURCES

With our new test, SingHealth<sup>29</sup> was able to keep ahead of the outbreak by detecting the virus in patients who did not meet the official case definition for a suspect case. On 4 February 2020, the first local cases (without travel history) were diagnosed in SGH. This development may have led to changes in the national criteria for calling a patient a suspect case.

After the diagnoses of the first few novel coronavirus patients in Singapore, our senior team met on 28 January 2020. We were then receiving about 40 samples a day from SGH and other SingHealth hospitals. With Europe and USA following quickly behind Asia in the growing outbreak, there was a narrow two- to three-week window to secure sufficient supplies of reagents and consumables before supply chain disruptions came into play. Our most important reagent was the RNA<sup>30</sup> extraction reagent produced in France. SGH had a small stockpile of this reagent which would have lasted a few months if the testing workload remained below 50 samples a day. However, the anticipated demand to support broader screening was estimated at 300 samples a day.

Manpower was another consideration. More staff were required to run these additional tests on top of routine clinical tests. Operating hours had to be extended. Extra medical technologists had to be found and trained at short notice. We reached out to the other laboratories in the Pathology division for reinforcements. Through the support of Division Chairman Tan Puay Hoon<sup>31</sup>, a reserve force appeared. This comprised volunteers from the laboratories of Diagnostic Bacteriology, Virology, Cytology, Immunology and Serology, Cytogenetics and Translational Pathology. Later in the outbreak, the Division of Research also provided researchers to assist with the PCR tests.

### LYNETTE OON

Head and Senior Consultant,  
Department of Molecular Pathology

<sup>29</sup> SGH is part of the SingHealth cluster, which comprises four hospitals, five specialty centres, community hospitals and a chain of polyclinics.

<sup>30</sup> Ribonucleic acid is the genetic material of the coronavirus. Purity and amount of the RNA extracted affect the performance of the downstream PCR tests.

<sup>31</sup> Dr Tan Puay Hoon, Chairman, Division of Pathology.

More space, preferably on another floor, was needed to implement the split team system so that a second team could continue doing the testing if the first team was stricken by the virus and had to be quarantined. A Virology laboratory was eventually repurposed to run PCR tests.

In early March 2020, MOH mandated further increases in national laboratory testing capacity and asked SGH to double its capacity to 600 samples per day. To manage the increase in specimens, SGH placed an order for three automated nucleic acid extractors but Germany then banned exports of all their extractors and restricted the use of the critical RNA extraction reagent to only Europe.

Kian Sing expressed his worries. “We realised there wasn’t any stockpile of the reagent. They were running so low that it was scary how many days of stock were left – nine days. There was now no point getting the new extractors.”



Shamala d/o Letchmanan, Senior Medical Laboratory Scientist, working in the MPL.



Lynette made frantic phone calls to other vendors. Only one vendor had the equipment in Singapore, but it was their demonstration unit. This was the instrument running the first FDA<sup>32</sup> approved SARS-CoV-2 PCR test in the market. It was almost fully automated, capable of a throughput of over 1,000 tests per day. The company was also willing to commit to providing the necessary reagents. There was a catch though – the equipment could not fit into the laboratory because of its size. Measuring 3 metres by 1.3 metres and weighing nearly 1,700 kg, it was a behemoth by laboratory standards. With a growing global waiting list for this instrument, the SGH team had to act fast to find a solution and secure this precious capability. Thankfully, the Immunology Laboratory provided their Immunofluorescence room to house the equipment.

Within three months of the outbreak,  
we were processing up to five times  
more samples. Work was pouring in  
like torrential rain!

T Shalini, Medical Laboratory Technologist, Molecular Laboratory



Bryan Tan, Medical Laboratory Technologist, was among the team who worked tirelessly to develop the diagnostic test for the novel virus for clinical use in January 2020.

<sup>32</sup>Food and Drug Administration of the USA, responsible for ensuring the safety and efficacy of drugs and medical devices.

The vendor started installing the instrument on 30 March 2020. With outbreaks in the dormitories escalating, validation of the test and training of staff proceeded at breakneck speed. Validation of the test was completed on 10 April, just as the avalanche of samples from the dormitories started. Over the next four months, the laboratory tested up to 1,100 samples a day from dormitories, community care facilities, polyclinics as well as SGH itself. The IT infrastructure was initially unavailable for the dormitory swab operations and hundreds of samples a day came in with handwritten patient details. Lynette was appreciative of the combined team effort. “The rest of the Pathology Division stepped in again – we soon had a platoon of clerical volunteers from our Client and Specimen Management colleagues and Division of Pathology administrative staff. This problem was finally fixed when informatics experts Goh Min Liong<sup>33</sup>, Pamela Tan<sup>34</sup>, and medical administrator Seah Waih Khuen<sup>35</sup> from Pathology came together to provide an automated end-to-end IT solution that enabled external patient details to be incorporated into our systems.”

### **Round-the-clock testing**

As the work piled up, and specimens kept coming in, the MPL ran tests continuously, day and night, for months on end. Help came from the Bacteriology Laboratory to run the overnight tests. Medical Laboratory Scientist Eileen Goh<sup>36</sup> appreciated that everyone chipped in during tough times. “We used to work a five-day week, taking turns on Saturdays when the lab opened for half a day. That changed in February 2020 when the lab started operating every day. All of us worked six days a week, taking turns on Sundays and public holidays. Some shifts focused solely on COVID-19, while other staff split their time between the COVID-19 virus and other viruses. Our entire Division of Pathology came together to help the nation in our COVID-19 battle.”

---

<sup>33</sup>Dr Goh Min Liong, Group Chief Medical Informatics Officer, SingHealth.

<sup>34</sup>Pamela Tan, Assistant Director, IT.

<sup>35</sup>Seah Waih Khuen, Senior Manager, Division of Pathology.

<sup>36</sup>Eileen Goh, Medical Laboratory Scientist, Molecular Laboratory.

## ERRING ON THE SIDE OF CAUTION

I was a third-year medical student when my seniors fought against SARS. I remember being wide-eyed as they recounted stories that reflected courage, selflessness and sacrifice. I was determined to emulate them.

As the world plummeted precipitously into uncertain times, I found myself exactly where my seniors stood – as one of the pioneer batch of consultants assigned to the ARI wards in February 2020. I went on to volunteer for a second month because I really enjoyed the camaraderie and wanted to ensure that the work processes were refined as much as possible before I handed over.

When I started in ward 75, I drafted an informal guideline for our team of Respiratory doctors on how to conduct ward rounds in a pandemic. I had been keenly following the Chinese medical literature, and what I read made me doubt the prevailing understanding of the virus' route of transmission, that is, via droplet only. A staff nurse shared with me anecdotes from her ex-colleagues in China – stories that spoke of an unusually contagious virus. I insisted that my team be more cautious. I shared our concerns with Sister Chiew<sup>37</sup>, the ward manager. She listened without prejudice and raised them to the hospital Command Centre promptly. Within days, the minimum PPE was escalated from surgical mask (with gown and gloves) to N95 masks.

Not long after that, the ward picked up the first COVID-19 patient within an ARI ward in SGH. The patient had slipped through screening as she had chosen to hide some critical information, but possibly because of all the precautions we took, none of us in the ward caught the infection from her.

### MELVIN TAY

Senior Consultant,  
Department of Respiratory and Critical Medicine

*Melvin diagnosed the first positive case in an ARI ward. He subsequently developed fever, but thankfully tested negative for COVID-19.*

---

<sup>37</sup> Chiew Siew Fong, Senior Nurse Manager, Ward 75 (Orthopaedics). She found herself running a medical ward when her ward was converted into an ARI ward.



Staff in the Acute Respiratory  
Infection wards delivered care  
mindful of the risks of COVID-19.