

“THERE ARE THREE THINGS WE BUILD BETWEEN OUTBREAKS TO ENSURE THAT WE CAN RESPOND EFFECTIVELY DURING AN OUTBREAK. **WE BUILD RELATIONSHIPS THROUGH A COLLECTIVE LEADERSHIP MODEL. WE BUILD COMMUNITIES OF PRACTICE** THAT ALLOW US TO LEARN AS WE DO, RATHER THAN AFTER. AND **WE ALSO STRESS RENEWAL** AND ENCOURAGE OUR STAFF TO REST SO THAT THEY CAN CONSTANTLY INNOVATE, IMPROVE, AND TRANSFORM THE WAY THEY DELIVER CARE.”

Professor Eugene Fidelis Soh Deputy Group CEO (Integrated Care), NHG & CEO, Tan Tock Seng Hospital & Central Health

TAN TOCK SENG HOSPITAL + NATIONAL CENTRE FOR INFECTIOUS DISEASES



TAN TOCK SENG HOSPITAL

As the dedicated 'SARS Hospital' and the original home of the Communicable Disease Centre (CDC), Tan Tock Seng Hospital (TTSH) was poised to take its place as a crucial vanguard in the battle against COVID-19. When COVID-19 reached Singapore's shores in January 2020, TTSH worked closely with the National Centre for Infectious Diseases (NCID), the Ministry of Health (MOH), community partners, and the public to manage the on-going pandemic by providing critical infrastructure, manpower, and patient care. TTSH's strong relationships with health and social partners, culture of continuous learning and innovation, as well as sustained emphasis on collective leadership, were instrumental in building a 'Community of Care' to help it stay resilient and on course in the battle against COVID-19.

TTSH SUPPORTS NCID IN COVID-19 RESPONSE

SETTING UP THE SCREENING CENTRE

The NCID Screening Centre was set up within 24 hours on 29 January 2020 supported by manpower from TTSH. Nearly 400 nurses, Allied Health Professionals (AHPs) and operations personnel across TTSH were trained and deployed to the NCID Screening Centre at the height of the pandemic. The TTSH Emergency Department (ED) was in charge of running the operation. From a small-scale response equipped to test about 100 patients a day, it scaled up to handle hundreds during the surge in COVID-19 cases in March 2020. Amid the uncertainty and fast-evolving protocols, nursing and medical leads were quick to set up tentages in less than five days to manage the high daily patient-load – a testament to the team's cohesive preparedness.

In addition to supporting the running of the NCID Screening Centre, TTSH's Department of Laboratory Medicine together with the Medical Laboratory Technology Service, Department of Diagnostic Radiology and the Radiography Service, ramped up support round-the-clock to ensure rapid turnaround of COVID-19 testing.



"TTSH's response to the pandemic is built on three key fundamentals – relationships, learning, and renewal. What really holds our plans together are the relationships we build between outbreaks, and the Collective Leadership we foster at every level of the organisation. When it comes to learning, we build Communities of Practice that allow us to implement better strategies in our outbreak response – they enable us to learn 'as we do' and not 'after we do'. Last but not least is our emphasis on renewal – the ability to allow our staff to innovate, improve, and transform the way we deliver care."

Professor Eugene Fidelis Soh Deputy Group CEO (Integrated Care), NHG & CEO, Tan Tock Seng Hospital & Central Health



PROVIDING NURSING SUPPORT

In March 2020, when the COVID-19 situation in Singapore escalated, TTSH Nursing proved instrumental in the scale-up of beds for COVID-19 patients at NCID. The team coordinated the effort with various departments across the hospital, and also ensured medication, linen, and food and beverage (F&B) supplies were adequate for incoming patients. In addition, over 500 nurses were deployed to NCID.

The Nursing Education team also provided support behind the scenes. It was responsible for putting together training/educational materials for various needs, including refreshers for NCID nurses on outbreak protocols, training for general ward nurses, and swab testing and PPE training for community partners. The team ensured that the training kept up with changes to workflows, in line with evolving clinical processes and policies.

"It is intuitive for doctors and nurses to urgently attend to patients whose conditions are rapidly deteriorating, but it is essential that they are properly equipped first. For every staff that is down, we lose the opportunity to take care of other patients."

Dr Hoi Shu Yin Chief Nurse, Tan Tock Seng Hospital



TTSH Nurse Educators providing training on PPE.

Below: The conversion of wards at TTSH Main Building to support COVID-19 care; Supporting NCID in scaling up bed capacity.



“I volunteered as a healthcare assistant at the Woodlands Lodge Dormitory because I wanted to do my part for the community. I treasure the camaraderie formed with my co-workers during that time, and felt a sense of fulfilment when the migrant workers recovered from the virus.”

Atiq Syazwani Binte Roslan
Senior Physiotherapist, Tan Tock Seng Hospital



AHP-LED EXERCISES TO BOOST MORALE

A TTSH physiotherapist deployed to the NCID Screening Centre took the initiative to lead simple stretching sessions to lift the morale of migrant workers waiting for admission after COVID-19 screening. This spurred the AHP team to create a wellness and empowerment programme for recovering COVID-19 migrant worker patients.

PARTNERING THE COMMUNITY IN THE BATTLE AGAINST COVID-19

COLLABORATING WITH COMMUNITY PARTNERS

TTSH, as the Integrated Care Organisation (ICO) in the Central Zone, collaborated with a network of partners, including Ren Ci Community Hospital (RCCH), Ang Mo Kio-Thye Hua Kwan Hospital (AMK-THK), and the Community Care Facility@EXPO, to provide care during the pandemic. TTSH’s Medical Social Workers (MSWs) and Nursing team worked together to identify cases suitable for transfer to AMK-THK and RCCH, ensuring integrated care for patients.



CONTACT TRACING

TTSH’s Department of Clinical Epidemiology and NCID’s National Public Health and Epidemiology Unit supported contact tracing which involved surveillance of suspect COVID-19 patients seen in TTSH’s ED, performing activity mapping, and identifying close contacts of confirmed cases to be followed up by MOH for quarantine. The team also performed fever and health surveillance on more than 10,000 staff at TTSH.

PROVIDING COVID-19 TESTING TO THE COMMUNITY

The TTSH Laboratory supported COVID-19 testing with rapid turnaround times — swabbing results were available within six to eight hours, and chest X-rays within the hour. Its efforts was crucial in providing timely care for confirmed cases.

The Department of Diagnostic Radiology saw an average of 1,400 patients per day for X-rays, ultrasound scans, CT scans, MRI, and other diagnostic services. Imaging results were ready within the hour to ensure timely care for patients. To handle the large volume of testing required, staff from other departments were cross-trained to conduct the COVID-19 PCR test.

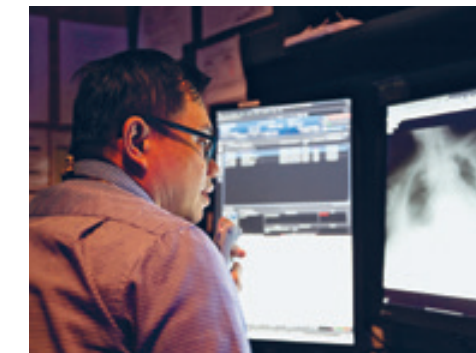
TTSH also set up Community Swab Teams (CSTs) to support nursing homes and home care providers with COVID-19 testing. Community care providers were trained to perform swab tests. The CSTs also worked closely with partners, MOH, and the Agency for Integrated Care (AIC), to ensure nursing homes implemented safety measures and strategies to manage potential COVID-19 clusters.

INNOVATING AND THINKING OUT-OF-THE-BOX IN A PANDEMIC

C3 SMART HOSPITAL SYSTEM

The TTSH Operations Command Centre (OCC), which features the C3 (Command, Control, and Communications) Smart Hospital System, went fully operational in December 2019. Through the analysis of data from Real-Time Location System sensors and CCTV video footage, and use of artificial intelligence (AI) to predict bottlenecks, C3 provided better visibility of the outbreak response and coordination across TTSH-NCID. This included adjusting manpower distribution, ensuring critical supplies such as PPE and COVID-19 medication, optimising COVID-19 patients’ admission and discharge, and monitoring the volume and waiting times of laboratory and radiology tests at the Screening Centre. This allowed the hospital to ensure facilities were not overcrowded and safety management measures were adhered to, while maintaining support for staff in the frontlines.

The C3 Smart Hospital System is part of nation-wide efforts to leverage technology and automate hospitals to improve patient care.



“Future-proofing and strengthening the resilience of healthcare infrastructure is key. We need to develop modularity and scalability, and ensure reliability, efficiency, and effectiveness over aesthetics.”

Er. Goh Mia Siang Director, Facilities Development and Management, Tan Tock Seng Hospital



TAN TOCK SENG HOSPITAL

AI SYSTEM RADIOLOGIC

TTSH and Agency for Science, Technology and Research (A*STAR) collaborated to develop an AI-powered diagnostic tool, *RadiLogic* that allowed rapid identification of abnormal chest X-ray findings in individuals being tested for COVID-19. *RadiLogic* uses machine learning technology to prioritise and classify images of normal and abnormal chest X-rays, specifically, those that show signs of lung infection (pneumonia) in a patient. Pneumonia is one of the admission criteria for suspect COVID-19 patients. More severe findings on chest X-rays correlated with increased need for supplemental oxygen therapy and mechanical ventilation in the ICU. Previously, radiologists had to read each radiograph in sequence in order of their occurrence. *RadiLogic*, on the other hand, analyses each X-ray within three seconds and flags abnormal X-rays with an accuracy rate of 96 per cent within a minute. Radiologists were able to automatically prioritise and detect an abnormal chest X-ray, particularly during the surge in COVID-19 cases in April 2020, thus allowing them to report such cases more quickly. Earlier detection allowed for greater diagnostic confidence and prompt interventions for COVID-19 patients.



THE CHI LIVING LAB (CHILL) DEVELOPS FACE SHIELDS

Goggles and face shields are important components of the PPE for frontline staff who provide care to patients. A team from CHILL, in consultation with Dr Shawn Vasoo, Clinical Director, NCID, designed and produced two face shield prototypes that emphasised safety and comfort for the users. The CHILL design team used maker tools and 3D printing to fashion the face shield components and assemble the pieces.

Funded by the Ng Teng Fong Healthcare Innovation Programme, 7,500 pieces of the Disposable Face Shield prototype and 100 pieces of the Spectacle Face Shield prototype with 15,000 disposable shields were deployed for internal use and trial testing at select areas. In June 2020, Siemens and its partners came on board to help optimise the 3D printed face shields with enhanced durability and strength.

PIONEERING TREATMENT OF ARTERIAL BLOOD CLOTS IN COVID-19 PATIENTS

In May 2020, a young migrant worker with COVID-19 developed an unusual blood clot in his thoracoabdominal aorta. To treat this, and avoid open chest surgery, a team of TTSH doctors performed a minimally invasive procedure and inserted a stent into the aorta to trap the blood clots against the wall of the blood vessel. They then removed the blood clots from the patient's leg to restore its blood flow. The medical team later published a paper in the *British Journal of Surgery*, the first publication in Asia involving the treatment of arterial blood clots in COVID-19 patients.



“In any outbreak, we should always expect the unexpected. The learning curve has been steep, the pressure intense, and it has been an emotional roller-coaster. But I’m grateful that my team has emerged stronger and more resilient together.”

Ms Joycelyn Sin Manager, Hospitality & Environmental Services, Tan Tock Seng Hospital

CARING FOR THE CARERS

PSYCHOLOGICAL TOOLKIT FOR FRONTLINE WORKERS

A psychological preparedness toolkit was put together to help staff deployed to the frontlines and their supervisors manage anxiety. It provided realistic depictions of frontline work, which would be unfamiliar to healthcare professionals from different care settings and experience.

This toolkit covered a range of topics, including tips when wearing PPE, and management of stress.



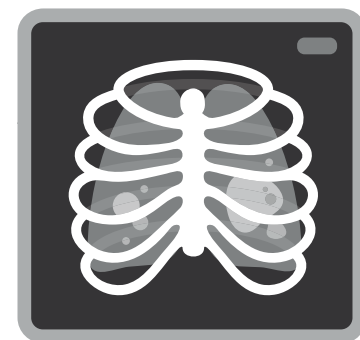
SPREAD A SMILE CAMPAIGN

The *Spread A Smile* campaign was launched in February 2020 to uplift staff at TTSH and NCID. Themed “Be that smile behind the mask”, it encouraged staff to go the extra mile to engage and be thoughtful towards each other.



“Regardless of our roles, we are working with each other, for each other, and looking out for one another. We know, we cannot win this war on COVID-19 alone.”

Dr Jamie Mervyn Lim COO, Tan Tock Seng Hospital & Central Health



TTSH DEVELOPS FORTITUDE KIT TO DIAGNOSE COVID-19

TTSH worked with scientists from the A*STAR Experimental Drug Development Centre and Bioinformatics Institute to develop a diagnostic test kit for COVID-19. It comprised a pre-packed mix of reagents to test patient samples, which was later fed into a machine to analyse the results. The procedure saved time by making the screening procedure easier to administer, and allowed more laboratories in Singapore, including those with less experience working with reagents used to test for the virus, to conduct such tests well without compromising the accuracy of the results.

TTSH LEVERAGES ‘ULEAP’ TO TRAIN STAFF DURING THE PANDEMIC

TTSH’s microlearning platform, *Uleap*, launched in September 2019, provided bite-size training modules to staff that can be completed on-the-go. It was used during the COVID-19 crisis in the following ways:

- A series of six COVID-19 related modules was published between February and March 2020 to train staff on guidelines and procedures in a timely manner.
- The Welfare Officer Programme, comprising five modules, was made available to guide welfare officers in managing challenging situations and providing emotional support to colleagues in need.
- There were videos to train staff on the proper use of PPE.





#HEALTHCAREHEROES

Each TTSH staff received a #HealthcareHeroes badge in recognition of his/her exceptional efforts in the fight against COVID-19. With the support of the Ministry of Culture, Community & Youth (MCCY), People's Association (PA), and partners such as the Singapore Medical Association (SMA) and DBS Bank, the #HealthcareHeroes movement extended beyond the hospital into the community in support of all healthcare workers across different institutions.



Above: TTSH 'Kampung Mart' was stocked with items ranging from daily essentials to sweet treats donated by members of the public and various organisations.

Above right: Staff receiving bouquets of flowers from members of the public in appreciation of the work of frontliners at TTSH.

“Valentine’s Day had a whole new meaning in 2020. We received flowers from the public and I saw joy and tears in the eyes of our staff – the unspoken gratitude behind their masks. Indeed, it was the best Valentine’s Day ever.”

Ms Lek Jie Ying Assistant Manager, HR Wellness, Tan Tock Seng Hospital