



COLLECTIVE LEADERSHIP
EMERGING STRONGER, TOGETHER






"I commend and thank every member of the NHG Family for your commitment and sacrifice in the fight to contain the COVID-19 pandemic. We should stand ready and take on any unforeseen developments of the virus, especially when Singapore lifts more restrictions and opens up progressively."

Mr Tan Tee How
CHAIRMAN, NHG



COLLECTIVE LEADERSHIP

EMERGING STRONGER, TOGETHER



Adding years of healthy life



"The COVID-19 pandemic has tested healthcare systems, nations, and our resilience. We witnessed acts of great courage, strength, and solidarity from those on the frontlines, as well as from others rallying behind the scenes."

Professor Philip Choo
GROUP CEO, NHG



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WE ARE NHG

The National Healthcare Group (NHG) is a leader in public healthcare in Singapore, recognised at home and abroad for the quality of its medical expertise and facilities. Care is provided through an integrated network of six primary care polyclinics, acute care and tertiary hospitals, national specialty centres, and business divisions. Together, they bring a rich legacy of medical expertise to our philosophy of integrated patient-centred care.

NHG's vision is "Adding Years of Healthy Life". This vision goes beyond merely healing the sick to the more difficult and infinitely more rewarding task of preventing illness and preserving health and quality of life. With some 20,000 staff, NHG aims to provide care that is patient-centric, accessible, seamless, comprehensive, appropriate, and cost-effective.

As the Regional Health System (RHS) for Central Singapore, it is vital for NHG to partner and collaborate with stakeholders, community advisors, and social care agencies. Together with our patients, their families, and caregivers, we aim to deliver integrated healthcare services and programmes that help in *Adding Years of Healthy Life* to all concerned.

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OUR VISION

ADDING YEARS OF HEALTHY LIFE

OUR CORE VALUES

PEOPLE-CENTREDNESS

We value diversity, respect each other and encourage joy in work.

INTEGRITY

We commit ourselves to the highest standards of ethical conduct.

COMPASSION

We care with love, humility, and empathy.

STEWARDSHIP

We are responsible for the care of our people, patients, and population.



Adding years of healthy life



ABOUT THE COVER

The cover depicts how the NHG Family, together with partners and the community, stepped up and displayed Collective Leadership to contribute to Singapore's battle against the COVID-19 pandemic.

EDITORS

Wong Fong Tze, Lydia Soh

CONTRIBUTORS

Jason Chiew, Benetta Lim, Danielle Goh, Ong Chong Pheng, Khairunnisa Binte Abdul Halek, Chong Xing Yuan, Fazilah Latif, Christina Low, Shyamala Naguleswaran, Ng Si Jia, Jacinta Ong, Michelle Jessica Pereira, Kevin Seak, Eugene Seng, Sabrina Sit, Charlene Tan, Teo Shu Phay, Lynnette Wang, Hannah Wong, Kirstie Wong, Jacqueline Woo

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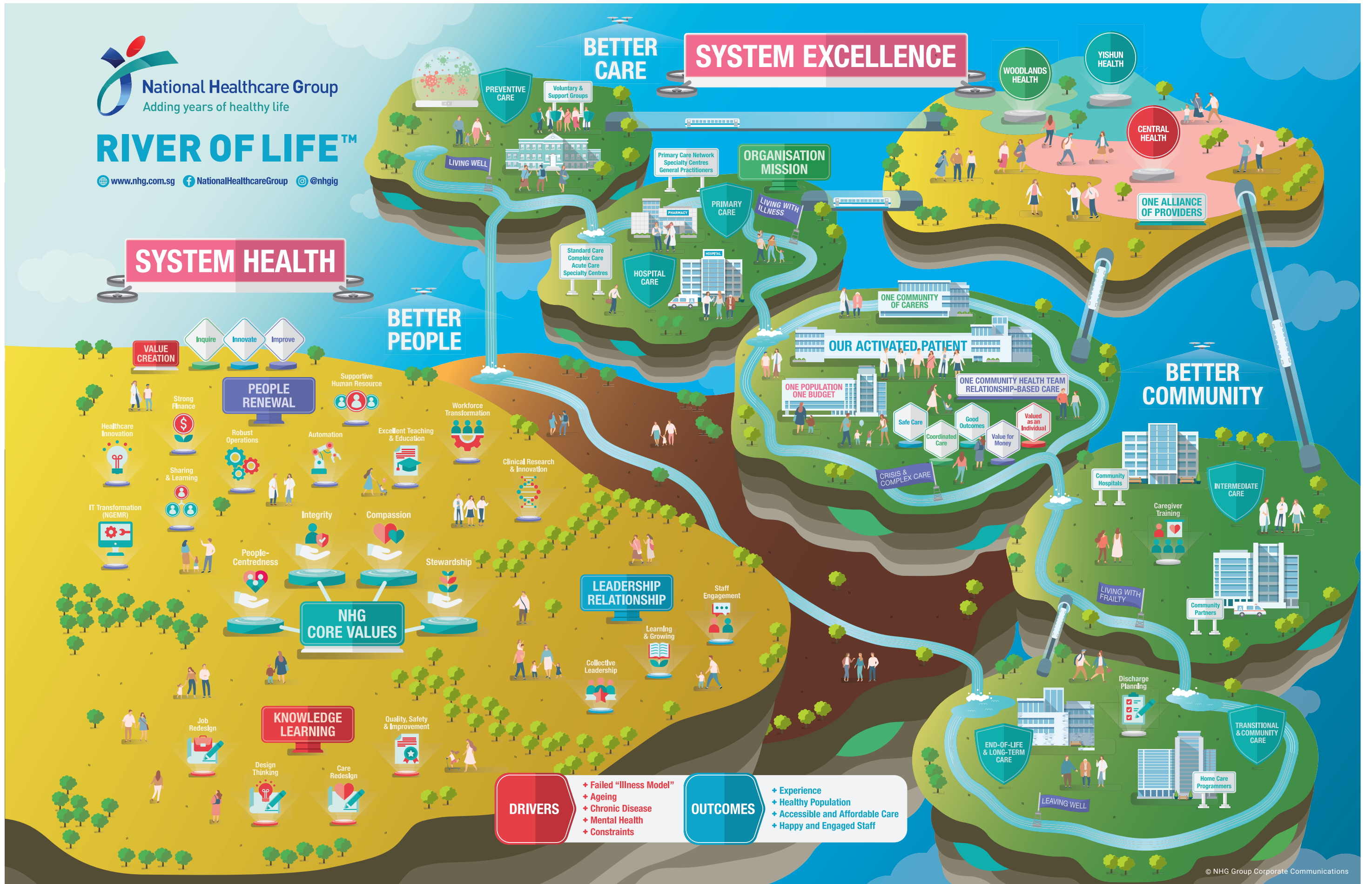
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SYSTEM HEALTH

VALUE CREATION
Inquire Innovate Improve

PEOPLE RENEWAL

NHG CORE VALUES

KNOWLEDGE LEARNING

BETTER CARE

SYSTEM EXCELLENCE

ORGANISATION MISSION

BETTER PEOPLE

LEADERSHIP RELATIONSHIP

DRIVERS

- + Failed "Illness Model"
- + Ageing
- + Chronic Disease
- + Mental Health
- + Constraints

OUTCOMES

- + Experience
- + Healthy Population
- + Accessible and Affordable Care
- + Happy and Engaged Staff

BETTER COMMUNITY

OUR ACTIVATED PATIENT

TRANSITIONAL & COMMUNITY CARE

Home Care Programmers

CHAIRMAN'S MESSAGE

IT HAS BEEN SOME TWO YEARS SINCE COVID-19 REACHED SINGAPORE'S SHORES – AND WE HAVE COME A LONG WAY, AS A HEALTHCARE CLUSTER AND AS A NATION,

since those harrowing early days of trying to stay a step ahead of a then-unknown virus. Today, the picture looks very different. Singapore is one of the most vaccinated countries in the world, with eight in 10 residents fully inoculated with two doses of the COVID-19 vaccine. The number of severely ill cases remains stable despite the rise in total cases – a commendable feat in the face of an unyielding and evolving virus. In light of these new realities, the country has shifted from its “Zero Cases Approach” to one of living with the virus by becoming “COVID Resilient” – and the NHG Family has played a contributory role in getting Singapore to this stage in the management of this century’s most devastating health crisis.

The National Centre for Infectious Diseases (NCID) and Tan Tock Seng Hospital (TTSH) remain at the vanguard of understanding SARS-CoV-2 and the clinical management of critical COVID-19 cases in Singapore. Multiple wards at Khoo Teck Puat Hospital (KTPH) and Yishun Community Hospital (YCH) were converted into COVID-19-related and operationally ready Intensive Care Unit (ICU) wards to handle surging caseloads. Woodlands Health (WH) and the National Healthcare Group Polyclinics (NHGP) were at the forefront of the fight to manage the



outbreak among migrant workers. The Institute of Mental Health (IMH) and the National Skin Centre (NSC) deployed staff to support the management of the pandemic, including in the dormitories, Swab Isolation Facilities (SIFs), and the Community Care Facilities (CCFs), in addition to providing mental health and skin care as national specialty centres. I commend and thank every member of the NHG Family for your commitment and sacrifice in the fight to contain the pandemic. We should stand ready and take on any unforeseen developments of the virus, especially when Singapore lifts more restrictions and opens up progressively.



FORGING AHEAD IN POPULATION HEALTH

Although much of the focus in FY2020 was on containing COVID-19, it was not at the expense of NHG’s mission to foster better management of population health; our mandate to transform care for over 2.2 million residents in the Central Region remains our priority. COVID-19 has only strengthened our commitment to creating *coordinated* and *integrated* health services by collaborating with the community to serve the population holistically. Towards this end, we have restructured the NHG organisation to support the next phase of our population health journey.

Our Group Accountable Care Division is responsible for the population health outcomes, while keeping healthcare sustainable. In support of this, it will

work to align the various payers and providers by creating strong partnerships focused on shared value, and develop the strategy to roll out capitation funding and the NHG Health Plan for the enrolled population. Our Group Integrated Care Division, led by the acute hospitals, is responsible for activating patients for self-management and for providing integrated care and services through a network of providers targeted at the distinct needs of their local populations. It will drive this mission by supporting integrated care planning and programmes, and by collaborating closely with both health and social care providers, and with the patients and residents.

NHG will focus on five key areas to propel our care transformation journey: Partnership, Care, Finance, Workforce Transformation, and Digital Transformation. Digital innovation will be integral to advancing our population health efforts. It helped sustain productivity and operational readiness during the unprecedented disruptions caused by the COVID-19 pandemic and played a crucial role in our effective management of the crisis. Furthermore, the last year saw an exponential acceleration in the creation and adoption of digital solutions. We will capitalise on this trend to continue the enhancement of our care.

NHG’s population health approach aims at addressing several challenges facing the public healthcare system in Singapore. An ageing population, with a concomitant rise in frailty and chronic illnesses, makes an institution-centric, fragmented, treatment-focused model of care unsustainable in the long run. We can future-proof our healthcare system by *aggregating* the different players, within NHG as well as in the community, *aligning* them around creating shared value for patients and residents, and *anchoring* them to forge a common focus on the population health aims – better health outcomes, better individual care experience, and lower cost per capita – undergirded by strategic partnerships and satisfied staff.



SAFEGUARDING THE NATION'S MENTAL WELL-BEING

The COVID-19 pandemic has impacted every aspect of life – including the mental well-being of our population. According to preliminary findings from a study by IMH, about 13 per cent of over 1,000 participants, who were polled between May 2020 and June 2021, reported symptoms of anxiety and depression during the pandemic. This study is supplemented by real world data from IMH that showed a 50 per cent rise in the number of calls made to its Mental Health Helpline in 2020, as compared to 2019.

To manage the psycho-social effects of the pandemic, an inter-agency taskforce, the *COVID-19 Mental Wellness Taskforce (CoMWT)*, was set up in October 2020, with NHG’s Deputy Group CEO (Strategy & Transformation), and CEO, KTPH & Yishun Health, Professor Chua Hong Choon as the chairman. The Taskforce made three recommendations that will be progressively implemented by the Ministry of Health (MOH) – developing a national mental health and well-being strategy to align and guide the work of various agencies in the area; creating a national mental health resources online portal to increase access to useful and accurate information; and establishing a national mental health competency training framework to align and standardise training curricula on mental health in the community. IMH will lead multiple agencies in the development of this framework, which will include a national curriculum for the management of mental health issues among frontline workers,



and more training among General Practitioners (GPs) to handle mental health issues.

In addition to these policy-level efforts, IMH has played a significant part on the ground in safeguarding Singapore residents’ mental well-being during this crisis. In April 2020, the *National CARE Hotline* was launched to offer psychological first aid to people who felt stressed and anxious about the COVID-19 pandemic. Associate Professor Lee Cheng, Clinical Director, Population Health, IMH, and Associate Professor Clare Yeo, Senior Principal Clinical Psychologist, IMH, were activated as Chief, CARE, and MOH Head, CARE, respectively. 105 staff volunteers took on eight-hour shifts as Duty Care Officers. The hotline managed some 30,000 calls five months after it was introduced. In June 2020, IMH was part of a multidisciplinary team, which included clinicians, social and data scientists from the MOH Office for Healthcare Transformation (MOHT), the Ministry of Social and Family Development (MSF), and the National Council of Social Service (NCSS), that launched *mindline.sg*. This online tool facilitated the health and emotional wellness of Singaporeans by providing users convenient access to a wide range of help and support resources. A key feature of *mindline.sg* is a clinically-validated self-assessment tool designed by IMH, which matches local help resources to users’ needs.

The pandemic brought mental health issues to the foreground of the collective conscience. Looking ahead, IMH, as the only tertiary psychiatric hospital in Singapore, will play a key role in turning this crisis into an opportunity to push mental wellness and psychological resilience as a priority for both providers and the population through public education, prevention, and infrastructure development.



Above: NHG staff at a migrant worker dormitory in 2020.

Above right: NHG Senior Management walking the ground at a migrant worker dormitory in 2020.

CHAIRMAN'S MESSAGE

PURSuing HOLISTIC CARE IN THE COMMUNITY

Primary care is the heart of our nation's health and serves as the frontline of healthcare. For many of our residents, it is the first point of contact with the healthcare system. To ensure healthcare remains robust and sustainable in the long run, we have to effectively manage chronic diseases, detect and intervene early to prevent severe illness and hospitalisation, and seek to achieve holistic health for our population. This is attained through developing a sustained relationship with our patients, championing coordinated, shared care – where possible – with our partners such as GPs, and moving upstream to advocate active lifestyles and health ownership among families and with the community.

In NHG's Central Zone and Yishun Zone, TTSH and KTPH respectively, have deployed health coaches to run community wellness programmes which help residents manage their chronic conditions better through targeted interventions. To nurture a pipeline of professionals with appropriate coaching skills, NHGP and the Singapore University of Social Sciences (SUSS) signed a Master Collaboration Agreement in January 2021 to equip undergraduates in health and wellness coaching, a first between a primary care organisation and an academic institution in



Singapore. Students will be trained on health and behavioural modification strategies. They will also learn to engage patients, including those with low health literacy, on health and wellness goals.

We have also made inroads into bridging acute and primary care across the cluster. To tackle the increasing burden of diabetes, the **Diabetic Foot in Primary and Tertiary (DEFINITE) Care** project was launched in June 2020. The DEFINITE Care team comprises collaborators across our Institutions. The project aims to integrate and coordinate multidisciplinary care across primary and tertiary sectors for patients with diabetic foot ulcers (DFU) to prevent DFU-related amputations, and help lower the economic and disease burden of DFU. It will eventually harmonise DFU-related services across all NHG polyclinics, TTSH, KTPH, and WH. Preliminary six-month data showed that nearly 2,000 patients with DFU have benefitted from the joined-up care.

ACHIEVING EXCELLENCE AMID A PANDEMIC

Amid such challenging times, I would like to acknowledge the many accomplishments of the NHG Family in the past year. Over 139 Senior Management and Staff from across NHG and our Institutions were honoured at the National Day Awards 2021, in recognition of their service to Singapore. My heartfelt congratulations to them for exemplifying the spirit of public service integral to our work at NHG.

In July 2021, two nurses from NHGP and TTSH were bestowed the President's Award for Nurses 2021, the nation's highest accolade in the nursing profession. Ms Lim Voon Hooi, Chief Nurse, NHGP, and Mr Christopher Soh, Assistant Director of Nursing, TTSH, were among seven

nurses presented with the award by President Halimah Yacob in a virtual ceremony. Ms Lim and Mr Soh made critical contributions toward NHG's collective COVID-19 response. Ms Lim was instrumental in the setting up of medical posts at the migrant worker dormitories. She not only managed the nursing support team, but also undertook the responsibility of designing clinical processes and planning logistics deployment. Mr Soh has built his career over 20 years in the TTSH Emergency Department, and led staff to implement workflows to ensure the smooth operation of the NCID Screening Centre during the height of the COVID-19 pandemic. Ms Lim and Mr Soh epitomise the *Collective Leadership* NHG inspires and aspires to be.

In September 2020, NCID and the Ng Teng Fong Centre for Healthcare Innovation (CHI) received international acclaim at the European Healthcare



NHG's award-winning publications on health.



Design (EHD) Awards 2020 and the Design & Health International Academy Awards, for their innovative healthcare design which enabled the effective delivery of complex services during the COVID-19 crisis. Both buildings received the Healthcare Design Award, Design for Adaptation and Transformation, and the International Health Project – High Commendation Award. In addition, NCID's Executive Director, Professor Leo Yee Sin, was lauded by *The Lancet* and *BBC (100 Women list)* for her steadfast leadership during the COVID-19 pandemic.

NHG and our Institutions also clinched seven awards across multiple categories at the APEX 2021, an annual US-based competition which recognises excellence in publishing. This year, APEX 2021 received some 1,200 entries from professional communicators worldwide. We thank the NHG team and applaud your efforts to cascade population health messages across Singapore, and globally.

ADVANCING INTO A NEW ERA

As we stand on the cusp of a new phase in our care transformation journey, I would like to express my gratitude to those who have contributed immensely to how far we have come. We thank Mr Gabriel Lim, who stepped down from the NHG Board in October 2021, for his commitment and contributions during his tenure. In April 2021, Professor James Best, NHG Board Member and Dean of the Lee Kong Chian School of Medicine (LKC Medicine), retired after seven years of guiding the medical school, and stepped down from the NHG Board. Prof Best steered the growth of education and research at LKC Medicine, and was bestowed the Imperial College Medal in recognition of his exceptional leadership. We thank Prof Best for his dedication and wish him the best in his future endeavours.

Professor Joseph Sung succeeds Prof Best as the new Dean of LKC Medicine. I welcome Prof Sung, as well as Mr Augustin Lee, Chief Executive Officer of the CPF Board, and Mr Patrick Tay, Assistant Secretary-General of NTUC, to the NHG Board. We look forward to working with all our NHG Board Directors as we forge ahead into this new era of change and transformation.

On behalf of the NHG Family, I would also like to extend my deepest appreciation to my predecessor, Madam Kay Kuok, for helming the NHG Board for the past 12 years. During her tenure, Mdm Kuok played an integral role in NHG's care transformation journey towards population health through its *River of Life* framework. She oversaw NHG's efforts in strengthening its primary care and mental health infrastructure and capabilities, including the initiation of the National Mental Health Blueprint in 2006. Under her stewardship, NHG implemented numerous successful care innovations, including the development of three Family Medicine Clinics, NHGP's patient empanelment and the "teamlet" care model, telehealth initiatives for chronic disease management, as well as mental health programmes in the community.

Mdm Kuok also oversaw the expansion of our institutions, including KTPH and YCH following the amalgamation of the former Alexandra Health System with NHG, as well as new developments such as HealthCity Novena, NCID, CHI, WH, and the new NSC Campus. All these milestones have strengthened NHG's foundation, and we thank Mdm Kuok with much gratitude for her invaluable contributions and impactful leadership.

NHG turned 21 this year. To commemorate this "coming of age", we launched the NHG21 Logo, designed by Group Corporate Communications, a homage to the enduring spirit of service alive in the people of NHG that will push us to ever greater heights in our relentless pursuit of better health outcomes for our patients and the population. As the nation opens up and rallies to become "COVID Resilient", it is the dawn of a new era – not just for NHG but for public healthcare as a whole, and indeed for Singapore. I would like to thank every one of you for going above and beyond in the nation-wide efforts to keep Singapore safe. As we embark on the next phase of our journey, let us uphold the NHG values of *People-Centredness, Integrity, Compassion, and Stewardship* to deliver our vision of "Adding Years of Healthy Life" for our fellow Singaporeans.



GROUP CEO'S MESSAGE

THE COVID-19 PANDEMIC IS FAR FROM OVER BUT SINGAPORE IS LESS IN THE GRIPS OF IT, WITH MORE PEOPLE VACCINATED AND BECOMING ACCUSTOMED TO THE DISEASE.

Even amid a highly contagious Delta variant of the coronavirus and the sudden surge of community cases, the nation is better placed, having fought the pandemic relentlessly for nearly two years. On-going defences include ready access to vaccines, calibrated lockdowns, emergency public health and hygiene protocols, safe management measures, and repeated calls for social responsibility. These have kept COVID-19 in Singapore contained. Despite these moves, COVID-19 will be with us for the foreseeable future as an endemic disease.



Left: Prime Minister Lee Hsien Loong at Ang Mo Kio Polyclinic as Singapore started the roll-out of COVID-19 vaccination for seniors in January 2021.
Below: (From left) A/Prof Thomas Lew, Group Chief Data & Strategy Officer, NHG, Prof Philip Choo, Group CEO, NHG, and Asst Prof Eric Wong, Group Chief Clinical Informatics Officer, NHG, after receiving their first dose of the COVID-19 vaccine.



MOUNTING VACCINATION EFFORTS AND THE NEW NORMAL

In an endemic COVID-19 world, the mass vaccination of our population is key to curbing transmission to induce herd immunity, and, NHG with our Institutions are at the forefront to support our nation.

As part of the National Vaccination Programme, National Healthcare Group Polyclinics (NHGP) began administering vaccinations for the public at its Ang Mo Kio Polyclinic in January 2021, starting with seniors aged 70 and above, and by February, the Programme was expanded to its remaining five polyclinics. As of 31 March 2021, NHGP had administered 56,000 doses of COVID-19 vaccinations to members of the public and staff.

As the epicentre of the national COVID-19 response, Tan Tock Seng Hospital (TTSH) and the National Centre for Infectious Diseases (NCID) continue to provide care for the majority of critical patients. Woodlands Health (WH), Yishun Health (YH), National Skin Centre (NSC), Institute of Mental Health (IMH), NHG Pharmacy (NHGPh), NHG Diagnostics (NHGD), and NHG HQ have tirelessly worked as one team to build up COVID-19 resilience in the community.

With Singapore's adoption of a vaccination-differentiated approach to COVID-19, our Institutions have also adjusted their healthcare and safe management protocols for visitors and patients. Plans have been

rolled out to support the *Vaccinate or Regular Test (VoRT)* regime which was implemented from 1 October 2021. Under this regime, unvaccinated individuals from several settings including healthcare must be tested twice a week using *Antigen Rapid Tests (ART)* to enable early detection of possible infections to keep the community safe.

The pandemic has accelerated the adoption of technologies to bring care to patients in the new normal. Telehealth is increasingly used in clinical consultations. Community Health Teams from Central Health and Yishun Health use it to screen



and determine if additional home visits are necessary for vulnerable and at-risk patients. The TTSH Home Ventilation and Respiratory Support Service leverages on teleconsultations to assess the need and frequency for visiting home-based patients on ventilators.

At IMH and NSC, clinicians and nurses provide tele-psychiatry and tele-nursing services, respectively to residents of nursing homes. Patients consult TTSH pharmacists on certain high-risk medication remotely from home. NHGP monitors patients with chronic diseases, including hypertension, through the use of tele-sensors for vital signs, paired with video and telephone clinical reviews. These telemedicine services are complemented by home delivery for medication, and community-based blood tests and laboratories.

COVID-19 has indeed disrupted the way we live and work. Our staff have adapted to new digital learning platforms and tools to attend meetings, e-learning classes, conferences, and webinars during *Work From Home (WFH)*. Even as our workplace practices continue to evolve, NHG is committed to empowering our staff and creating a sustainable, high-performing and collaborative environment for them to carry out their duties, no matter where they might be. Change has brought uncertainty and anxiety. To engage staff and boost employee resilience, and promote Joy in Work, the NHG Staff Well-Being Committee (NHG-SWC) introduced a Co-Funding Scheme for Staff Mental Well-Being. New workplace health initiatives such as NHG's *Zest For Life* continue to be rolled out to improve employees' physical, emotional, and psychosocial well-being.

I am proud of how the NHG Family has adapted to the evolving COVID-19 situation, and embraced collective leadership to steer our people well.



Above: Woodlands Health worked with NTUC Health and Resorts World Sentosa to set up the first Community Treatment Facility at the NTUC Health nursing home (Tampines) in September 2021.

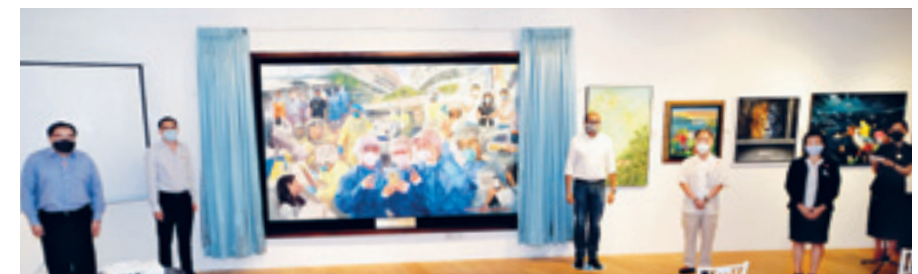
BREAKING THE CHAIN OF TRANSMISSION

The COVID-19 cluster which emerged in TTSH in April 2021 was a solemn reminder of the need to stay vigilant. It also demonstrated great teamwork, strong leadership, and staff dedication. The hospital, supported by the Ministry of Health (MOH) and NCID, was quick to Contain, Control, and Cast a wide net to ring-fence the coronavirus transmission and secure the safety and well-being of patients and staff. Although the outbreak affected the operations of other public healthcare institutions (PHIs) including those from NHG, they readily stepped up to help manage the spill over of patient workloads diverted from TTSH. Staff across NHG even came together to show support in an uplifting video – *NHG Voices to Support TTSH: Count on Me* – produced by Group Corporate Communications. I would like to commend our TTSH colleagues for their professionalism, and quick and decisive response, as well as our Institutions who stood in solidarity with TTSH.

THANKING OUR FRONTLINERS

To commemorate the first year of the COVID-19 response, TTSH and NCID held a *Stronger Together, Better Together* – Staff Appreciation event in January 2021. It saw the unveiling and dedication of five unique wire sculptures by artist Victor Tan to TTSH and NCID. This work depicts the Coming Together of the mind, body, and heart of all healthcare workers and the community to fight COVID-19 with valour and resilience.

In March 2021, NHG and the Singapore Art Society (SAS) co-organised the *Heroes Of Our Time* art exhibition as a tribute to COVID-19 frontliners. Held at the sponsored venue ION Art Gallery, the exhibition featured more than 200 artworks by children, migrant workers, and professional artists, capturing their individual experiences and perspectives of the pandemic. The central artwork, titled *Heroes of Our Time*, has images of Singapore's battle against COVID-19. It was created by 18 artists from SAS, and presented to NCID in recognition of NHG's and its significant contributions towards our pandemic response.



Above: NHG and the Singapore Art Society (SAS) co-organised the *Heroes Of Our Time* art exhibition as a tribute to COVID-19 frontliners.

WHAT'S NEXT IN OUR CARE TRANSFORMATION JOURNEY

Developing A New Model Of Care

2021 marked the 21st anniversary of NHG. The Health Ministry announced the appointment of Mr Tan Tee How as the new Chairman of NHG. Mr Tan, who succeeded Madam Kay Kuok in April, brings extensive expertise in leading public entities to NHG. In the coming years, he will further advance our population health efforts through actualising the *River of Life* (ROL) framework of care, and enhancing the shared value between payers and providers through tighter collaboration and better integration of care. This will help maximise health for patients, taking into account distinct demographics and health status over their lifespan and healthcare costs. To accomplish this, NHG has aligned its population health efforts and clinical care delivery into the Accountable Care Organisation (ACO) and Integrated Care Organisations (ICO) – ACO-ICO model.



NHG has also gained more ground with children and youth through our Living Well@School initiative, with the Ministry of Education (MOE) and schools as partners to coach and empower students and their parents, and teachers, to lead healthy lifestyles. We are co-developing curriculum and activities that emphasise behavioural-based nutrition and a “growth mindset” for Primary Schools and MOE Kindergartens. In addition, a three-year pilot to train about 1,000 teachers from more than 300 schools to be health coaches will be launched in seven Primary Schools in 2021. Beyond schools, NHG is partnering SportSG and ActiveSG to develop community initiatives that advocate and enhance health and physical activity across different platforms.

A key driver of population health in NHG is Primary Care, with almost 80 per cent of the 2.2 million residents in the Central region accessing its services. As General Practitioners (GPs) remain the first point of care for some 60 per cent of our residents, NHG and Institutions collaborate closely with GPs and care providers in different zones to right-site patients. In September 2020, Woodlands Health (WH) launched its GPFIRST Programme in the North to encourage residents to first seek care for non-emergency conditions from their family doctor. To-date, WH in partnership with Yishun Health has engaged 139 GPs in Woodlands, Sembawang, and Yishun, and recruited 81 for the programme as of June 2021. Between September 2020 and February 2021, some 1,205 GPFIRST referrals were made



Expanding Care In The Community

Although COVID-19 occupied much of our time and resources in 2020 and 2021, our vision of *Adding Years Of Healthy Life* for Singaporeans remains unchanged. Since 2017, NHG has moved upstream to drive health ownership, modify lifestyle habits, prevent disease, or slow down the progression of chronic illnesses. We have made wellness education and activities within easier reach of the community and encouraged more individuals to make informed choices and take charge of their health.

to the Urgent Care Centre@Admiralty (UCC@Admiralty) and the KTPH A&E department. The UCC has seen close to 4,000 patients as of April 2021.

Nestled in the Central Zone, the Ang Mo Kio Specialist Centre (AMKSC), set up by TTSH in close collaboration with Primary Care and community partners, opened in December 2019. AMKSC provides holistic specialist care that includes:

- An eye clinic that accepts referrals from GPs for patients with stable chronic eye conditions;
- Additional diagnostic hearing tests for residents who have abnormal hearing results, following basic functional screening;
- Integrated musculoskeletal services, where patients from polyclinics or GPs are triaged to consult occupational therapists/physiotherapists for timely treatment before their Specialist Outpatient Clinic (SOC) appointments;
- Trans-disciplinary care, where clinical diabetes educators, as well as GPs, collaborate to support patients with Diabetes Mellitus (DM); and
- Co-located integrated health and social care services.

Strengthening Mental Health

The COVID-19 pandemic has accelerated the need for mental health with more people reporting symptoms of anxiety and depression.

Under the leadership of its new CEO, Associate Professor Daniel Fung since February 2021, IMH will support individuals across all dimensions of mental health by focusing on three strategic goals: recovery, hope, and independence for patients; wellness, resilience, and happiness for the people of Singapore; and meaningful, rewarding, and joyful work for staff and partners. These goals will be carried out through more person-centred programmes that holistically assess needs of patients, with shared decision-making and greater ownership with the patients, caregivers, and partners in the development of care plans and supporting initiatives.



Above: A/Prof Yong Keng Kwang, Group Chief Nurse, NHG, (second from right) and nursing staff from Woodlands Health.

Establishing Group Nursing

Maintaining a robust nursing workforce is essential to meeting the needs of diverse patients and advancing population health. I am excited that we have established the NHG Group Nursing (GN) Department in October 2020. Led by Group Chief Nurse, Associate Professor Yong Keng Kwang, GN, serves as the administrative arm of the NHG Nursing Council, NHG Nursing Strategic Map, and NHG Community Nursing. In the coming years, it will help elevate the nursing profession by facilitating best practices and attaining excellence in patient care across NHG.

NHG Community Nursing, a key pillar of our population health strategy, has made good progress in recent years. Clinical workflows to guide the delivery of care to patients with chronic conditions such as dementia and diabetes, and their caregivers in the community have been developed. They enable individuals-at-risk timely access to health services and interventions, an important goal for preventive health. As at December 2020, our Community Nursing teams have served more than 15,000 clients in Central Zone, and some 13,000 clients collectively in Yishun Zone and Woodlands Zone.

ADVANCING DIGITAL TRANSFORMATION

As part of our digital transformation journey, we have set our sights on developing our people as thought leaders in digital health, and to raise mobility-enabled productivity by implementing sustainable and connected capabilities, and building digital portals, relationship management systems, and analytics platforms.

We have data scientists to analyse trends across the population spectrum – *Living Well, Living with Illness, Crisis and Complex Care, Living with Frailty, and Leaving Well* – to capture and provide evidence-based information for clinical strategies and programmes to strengthen health and avert medical complications. NHG is also building common data definitions, and a population health and risk registry for the future, to enable the use of analytics capabilities across these ROL five segments of care. Enabled by technology, we firmly believe we can enhance patient self-efficacy and empowerment.

We achieved a milestone with the successful “GO-LIVE” of the Next-Generation Electronic Medical Records (NGEMR) at NHGP’s Geylang Polyclinic on 27 February 2021. NGEMR was implemented in the remaining five polyclinics. As more NHG Institutions adopt NGEMR, this IT platform will provide more integrated, timely aggregated patient data for patient care.

Redesigning Education

While the COVID-19 pandemic has disrupted the training and education of medical students, residents, and healthcare professionals, it presented opportunities for growth in the way we teach and learn, digitally. New tech tools for learning were rolled out and will remain mainstream.

CELEBRATING NHG21

To mark NHG’s 21st anniversary, Group Corporate Communications designed the NHG21 Logo, which pays homage to the bright, enduring spirit of service displayed by the NHG Family. The slogan – *Blazing Beyond Boundaries with Better People and Better Care* – heralds the next phase in NHG’s care transformation journey. The logo and slogan are a rallying call to apply our core values – People-Centredness, Integrity, Compassion, and Stewardship (PICS) – in the pursuit of NHG’s vision of *Adding Years of Healthy Life*.

Reflecting on how far NHG has come, I would like to express my deep gratitude to our former Chairman, Madam Kay Kuok, for her wisdom and great leadership in charting the course of NHG for more than a decade. Under her chairmanship, NHG achieved several milestones of care delivery – from championing disease management programmes, to laying the groundwork for population health management, laying the foundation of the National Mental Health Blueprint, and encouraging an on-going culture of continuous improvement in collaborative and team-based care in our ROL framework.

Let us continue to remain focused, vigilant, and adaptable as one NHG Family, and stay grounded in our core values to serve our nation.



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Our great appreciation to former NHG Chairman Madam Kay Kuok for her exemplary 12-year tenure and former NHG Board Members Mr Gabriel Lim for completing his tenure as of 1 October 2021, and Professor James Best for completing his tenure as of 31 March 2021.

“BEING ASSOCIATED WITH NHG SINCE ITS BEGINNINGS 21 YEARS AGO, I AM PARTICULARLY PROUD OF OUR PEOPLE AND STRONGLY BELIEVE THAT **BETTER PEOPLE LEAD TO BETTER CARE.** AS HEALTHCARE NEEDS BECOME MORE COMPLEX, WE REMAIN COMMITTED TO LOOKING AFTER THE WELL-BEING AND GROWTH OF OUR EMPLOYEES.

LET US ALL REMAIN FOCUSED ON THE MEANING OF OUR WORK, TO KNOW THAT WHAT WE DO HAVE REAL IMPACT ON NHG’S COLLECTIVE EFFORTS TO SERVE. IT IS MY SINCERE WISH THAT WE STAY GROUNDED ON OUR CORE VALUES OF *PEOPLE-CENTREDNESS, INTEGRITY, COMPASSION, AND STEWARDSHIP (PICS)* TO MAKE NHG A GREAT PLACE OF WORK AND TO SERVE OUR NATION WELL.”

Mr Tan Tee How Chairman, NHG

SENIOR MANAGEMENT



Prof Philip Choo
GROUP CHIEF EXECUTIVE OFFICER
National Healthcare Group



Dr Jason Cheah
DEPUTY GROUP CHIEF EXECUTIVE OFFICER (ACCOUNTABLE CARE)
National Healthcare Group
CHIEF EXECUTIVE OFFICER
Woodlands Health



Prof Eugene Fidelis Soh
DEPUTY GROUP CHIEF EXECUTIVE OFFICER (INTEGRATED CARE)
National Healthcare Group
CHIEF EXECUTIVE OFFICER
Tan Tock Seng Hospital & Central Health



Prof Chua Hong Choon
DEPUTY GROUP CHIEF EXECUTIVE OFFICER (STRATEGY & TRANSFORMATION)
National Healthcare Group
CHIEF EXECUTIVE OFFICER
Khoo Teck Puat Hospital & Yishun Health



Prof Benjamin Seet
DEPUTY GROUP CHIEF EXECUTIVE OFFICER (EDUCATION & RESEARCH)
National Healthcare Group
ASSISTANT CHIEF EXECUTIVE OFFICER (CORPORATE SERVICES)
Tan Tock Seng Hospital & Central Health



Prof Lim Tock Han
GROUP CMB (CHAIRMAN MEDICAL BOARD)
National Healthcare Group



A/Prof Daniel Fung
CHIEF EXECUTIVE OFFICER
Institute of Mental Health



A/Prof Chong Phui-Nah
CHIEF EXECUTIVE OFFICER
National Healthcare Group
Polyclinics & Primary Care



Prof Tan Suat Hoon
DIRECTOR
National Skin Centre



A/Prof Chin Jing Jih
CHAIRMAN MEDICAL BOARD
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CHAIRMAN MEDICAL BOARD
Khoo Teck Puat Hospital & Yishun Health



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GROUP CHIEF CORPORATE COMMUNICATIONS OFFICER
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A/Prof Tai Hwee Yee
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National Healthcare Group



A/Prof Thomas Lew
GROUP CHIEF DATA & STRATEGY OFFICER
National Healthcare Group



Prof Leo Yee Sin
EXECUTIVE DIRECTOR
National Centre For Infectious Diseases



A/Prof Michelle Jong
GROUP CHIEF EDUCATION OFFICER
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GROUP CHIEF NURSE
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Mr Huan Boon Kean
GROUP CHIEF INFORMATION OFFICER
National Healthcare Group



Mr Lim Thow Chang
GROUP CHIEF INFORMATION SECURITY OFFICER
National Healthcare Group



Mr Darion Chong
GROUP CHIEF CORPORATE DEVELOPMENT OFFICER & GROUP CHIEF DATA PROTECTION OFFICER
National Healthcare Group



Dr Jamie Mervyn Lim
CHIEF OPERATING OFFICER
Tan Tock Seng Hospital & Central Health



Ms Yen Tan
CHIEF OPERATING OFFICER
Khoo Teck Puat Hospital & Yishun Health



Dr Wong Kirk Chuan
CHIEF OPERATING OFFICER
Woodlands Health



Dr Mok Ying Jang
CHIEF OPERATING OFFICER
National Healthcare Group
Polyclinics



Mr Lim Hock Leng
CHIEF OPERATING OFFICER
Institute of Mental Health



Dr Heng Bee Hoon
SENIOR DIRECTOR, HEALTH SERVICES & OUTCOMES RESEARCH (HSOR)
National Healthcare Group



Dr Elaine Tan
CHIEF, INTEGRATED CARE (CLINICAL)
National Healthcare Group



Dr Karen Ng
CHIEF, CLINICAL SERVICES
National Healthcare Group
Polyclinics



Ms Chan Soo Chung
EXECUTIVE DIRECTOR
National Healthcare Group
Pharmacy



Ms Lim Soh Har
EXECUTIVE DIRECTOR
National Healthcare Group
Diagnostics

Our appreciation to former Deputy Group CEO (Population Health) Professor Pang Weng Sun for completing his tenure as of 31 March 2021.

“MANY PEOPLE ASK ME, ‘DID YOU EXPECT EVERYONE TO DO THEIR JOB?’ MY ANSWER IS, ‘YES’. **WHEN WE ARE GIVEN A MISSION AT NHG, EVERYONE STEPS UP.** THIS CRISIS HAS SHOWN THAT WE HAVE A VERY GOOD TEAM ON THE GROUND – GOOD LEADERSHIP AT EVERY LEVEL. I AM VERY THANKFUL FOR THAT.”

Professor Philip Choo Group CEO, NHG

NATIONAL HEALTHCARE GROUP HQ



POPULATION HEALTH

NHG is committed to fostering and improving the overall health outcomes of over two million residents in Central Singapore. At the height of the COVID-19 pandemic, NHG leveraged on technology and used innovative approaches to ensure residents received integrated care.

TRANSFORMING DIABETES CARE

PUTTING A 'DEFINITE' FOOT FORWARD

In June 2020, the **Diabetic Foot in Primary and Tertiary (DEFINITE)** Care programme was launched with funding from the Population Health Grant. DEFINITE Care is a first-of-its-kind programme that aims to coordinate multidisciplinary care across Primary and Tertiary clinical settings for patients with diabetic foot ulcers (DFU) to prevent diabetes-related lower limb amputations. This in turn lowers the disease burden of DFU within NHG and Singapore. Services for patients with DFU are integrated across National Healthcare Group Polyclinics (NHGP), Tan Tock Seng Hospital (TTSH), Khoo Teck Puat Hospital (KTPH) and the upcoming Woodlands Health (WH).
The DEFINITE Care team engaged more than 60 healthcare professionals from NHG Institutions to form a multidisciplinary DFU care team (comprising Vascular Surgery, Endocrinology, Orthopaedics Surgery, Primary Care, Podiatry, and Nursing). Under the programme, a new role, Diabetic Foot Coordinator (DFC), will ensure care integration, improved monitoring and patient adherence, and improved patient outcomes across primary and tertiary care. A DEFINITE Registry was established, in collaboration with NHG's Health Services & Outcomes Research (HSOR) Department, which analysed the cost-effectiveness, cost-utility, and long-term sustainability of the programme. This would help facilitate the scale and spread of the model beyond NHG to other clusters. The DEFINITE Care programme partnered the Lee Kong Chian School of Medicine (LKCMedicine), Skin Research Institute of Singapore (SRIS), Agency for Science, Technology and Research (A*STAR), and industry collaborators to study the efficacy of a patient-centric wound care app. This enabled the tracking and monitoring of wounds, and early detection of deterioration by leveraging Artificial Intelligence (AI) and deep learning via wound image analysis, in order to prevent diabetes-related amputations.
Preliminary data showed more than 2,800 patients benefitting from the programme to-date. Minor and major amputation rates have dropped, and diabetes and hyperlipidaemia control among DEFINITE patients has improved.

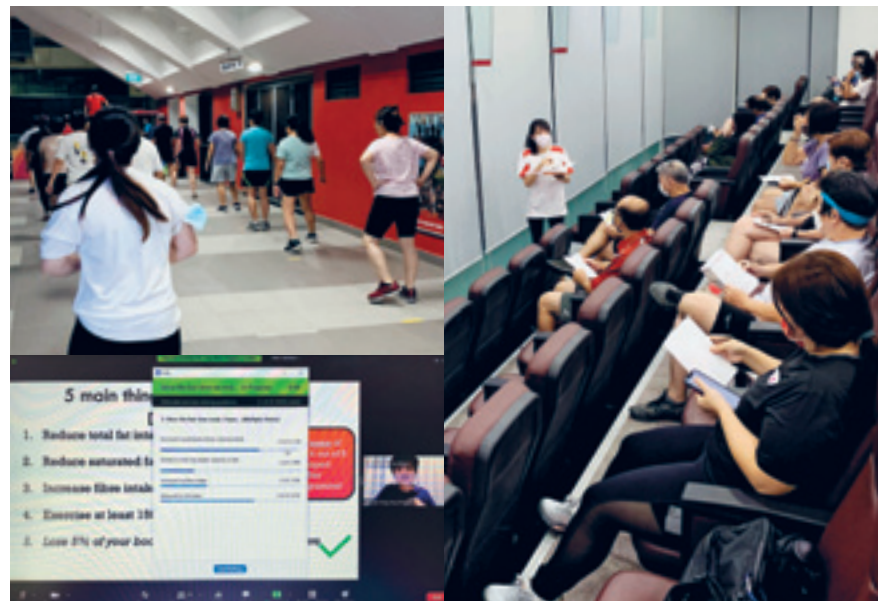


Top: A multidisciplinary team from KTPH, including vascular surgeons and podiatrists, help evaluate and care for patients with diabetic foot ulcers.

Above: A podiatrist from NHGP educating a patient with diabetes on foot health.

WAR ON DIABETES COMMUNITY INTERVENTION PROGRAMME

Since the COVID-19 pandemic, the War on Diabetes (WOD) Community Intervention Programmes (CIP) team has re-organised its programmes and adopted digital tools to pivot to online learning. This included adjusting the structure, timing, duration, and content of the programmes, to heighten engagement and ensure desired outcomes.
WOD CIPs are now conducted onsite and online.



A COMMUNITY APPROACH TO MANAGING POPULATION HEALTH

CONTINUING CARE WITH TELEHEALTH SERVICES

Yishun Health's Population Health and Community Transformation (PHCT) team continued to help residents manage their chronic conditions by increasing the number of Community Nurse Post (CNP) sessions, leveraging technology, and conducting teleconsultations. The service catered to two groups of resident patients: seniors with stable long-term conditions, and seniors with more complex issues who required closer medical supervision. The PHCT team also piloted a Telehealth Kit for residents who did not have digital devices. The kit consists of a tablet and health monitoring devices, such as automated blood pressure monitors, thermometers, and weighing scales. This allowed residents to consult nurses on their conditions remotely.
Between April and September 2020, PHCT reached out to 1,330 residents.



FOSTERING SOCIAL CONNECTEDNESS

Yishun Health collaborates with the health and social service sector to address critical health determinants so that targeted efforts are made to sustain capacity and cost, and facilitate community re-integration. Its Regional Teams, consisting of community nurses, regional connectors, Allied Health Professionals, administrators, and local community partners, engage residents where they live, work, and play. These Regional Teams build connections with residents, facilitate sustainable community-driven programmes, and activate and empower residents to take ownership of their health and well-being. The Regional Teams also identify potential areas of health inequity using population and health utilisation data.



Seniors monitor their chronic conditions and participate in activities at the Wellness Kampung.

Building a Culture of Self-help and Mutual Care

A culture of self-help and mutual care, where residents actively participate in community activities, elicits a sense of belonging, develops social connectedness, and invokes pride and ownership. Such a community grows in resilience and is equipped to respond to crisis effectively.

CARING FOR PATIENTS AT HOME

To continue caring for patients transiting from hospital to home and relieve the surging demand for hospital beds, the Yishun Health Ageing-In-Place Community Care Team (AIP-CCT) ramped up its capacity to care for more patients with medical needs at home. The AIP-CCT redesigned its service to include intensive and continuing home rehabilitation for Hip Fracture, Orthopaedic, Neurology, and General Medicine patients. From April to September 2020, there was a 21 per cent increase in patient enrolment, as well as a 30 per cent increase in home visits made by the team as compared to FY2019.

SUPPORTING THE ELDERLY AND VULNERABLE

In April 2020, the Yishun Health PHCT team partnered GeriCare and various departments to manage COVID-19 cases among the frail and vulnerable in nursing and welfare homes. The team trained staff in swabbing, outbreak management, and infection control, and helped these homes implement safety measures against COVID-19 transmission. At the height of the pandemic, about 1,400 swab tests were conducted on residents and staff of these homes.



POPULATION HEALTH



BUILDING PARTNERSHIPS

WH has been serving and engaging residents in Northern Singapore since 2016. During the Circuit Breaker in 2020, WH collaborated with community partners to stay connected with patients and monitor their health.

Partners included the Ministry of Social and Family Development (MSF), SATA CommHealth, the Asian Women's Welfare Association (AWWA), Muis, MENDAKI, MESRA (M3), Masjid Yusof Ishak, and schools such as Christ Church Secondary School, Riverside Secondary School, as well as Republic Polytechnic and Nanyang Polytechnic.

Through these collaborations, WH reached out to more than 500 residents and 2,000 students virtually and through house visits in 2020. Residents who needed support were referred for follow-up at Community Nurse Posts (CNPs). SATA CommHealth's Doctors-On-Wheels sessions were introduced to make primary care easily accessible to the neighbourhoods.

The WH team doing house visits and conducting health and wellness talks via Zoom.



MINI MEDICAL SCHOOL WEBINAR

Yishun Health's long-running Mini Medical School (MMS) reached one of its largest audiences to-date via its first online forum. Some 341 "students" signed up for the *Covid-19, 20-21...* webinars held in December 2020, which covered risk factors in COVID-19 transmission, public health measures to curtail its spread in Singapore, the psychological resilience of community, as well as community preparedness in growing safer together. The event featured speakers from the National Centre for Infectious Diseases (NCID) and the National University of Singapore (NUS) Saw Swee Hock School of Public Health.



PROVIDING BETTER ACCESS TO CARE

ANG MO KIO SPECIALIST CENTRE

Nestled in Central Zone, the Ang Mo Kio Specialist Centre (AMKSC), set up by TTSH in close collaboration with primary care and community partners, opened in December 2019. AMKSC provides holistic specialist care that includes:

- An eye clinic that accepts referrals from GPs for patients with stable chronic eye conditions.
- Additional diagnostic hearing tests for residents who have abnormal hearing results, following basic functional screening.
- Integrated musculoskeletal services where patients from polyclinics or GPs are triaged to consult occupational therapists/physiotherapists for timely treatment before their Specialist Outpatient Clinic (SOC) appointment.
- Trans-disciplinary care where clinical diabetes educators, as well as GPs, collaborate to support patients with Diabetes Mellitus (DM).
- Co-located integrated health and social care services.

AUGMENTING CARE AND EMPOWERING RESIDENTS

WH introduced several initiatives to augment care in the community and empower residents to take charge of their own health.

- The Urgent Care Centre (UCC) at Kampung Admiralty (UCC@Admiralty) is equipped to handle urgent and acute conditions, reducing the need for residents to visit the hospital emergency department. It has seen more than 4,000 patients between September 2020 and April 2021.
- In September 2020, WH launched its GPFIRST Programme in the North to encourage residents to first seek care for non-emergency conditions from their family doctor. To-date, WH in partnership with Yishun Health has engaged 139 GPs in Woodlands, Sembawang, and Yishun, and recruited 81 for the programme as of June 2021. Between September 2020 and February 2021, 1,205 GPFIRST referrals were made to the UCC@Admiralty and KTPH's A&E.
- In FY2020, WH Community Nurses provided care to more than 240 unique residents at the eight CNPs. Five CNPs have started to offer teleconsultation.



POPULATION HEALTH

ADVOCATING MENTAL WELLNESS

EQUIPPING COMMUNITY PARTNERS

The **Assessment Shared Care Team** (ASCAT) is an adult community psychiatric programme which manages patients in the community with mild to moderate mental health conditions. The Institute of Mental Health (IMH) ASCAT team, comprising doctors, nurses, Medical Social Workers (MSWs), and case managers, trains and supports polyclinic doctors through co-consultations.

In FY2020, ASCAT hosted one training workshop and numerous case discussions with community partners. 88 per cent of the community partners reported they achieved an 80 per cent improvement in their understanding on mental health. 100 per cent of clients who were enrolled in the ASCAT programme reported an increase in their quality of life as compared with 63 per cent of clients in FY2019.

SUPPORTING SENIORS WITH MENTAL HEALTH ISSUES

In FY2020, the Aged Psychiatry Community Assessment and Treatment Service (APCATS) – a community-oriented psycho-geriatric outreach service that promotes ageing-in-place for seniors with mental health issues – conducted 75 first visits and 881 repeat visits to seniors who faced challenges accessing mental health services. This helped reduce caregiver burden and prevented unnecessary admissions, especially during the COVID-19 pandemic.

The team implemented virtual consultations with patients at home or in nursing homes. In addition, community partners were equipped with knowledge and skills in depression and dementia care.

HELPING PATIENTS TO REINTEGRATE INTO THE COMMUNITY

In 2015, IMH collaborated with the Agency for Integrated Care (AIC) and started the *Aftercare Programme* for one pilot site and one community partner to provide intensive case management and care planning for cases in the community with complex needs. In tandem with close monitoring, patients adhered more to treatment and sustained good mental health. As a result, readmission rates and emergency room visits declined. IMH also worked with community partners to ensure patients stayed on track to recovery.

As of March 2021, IMH collaborated with five community partners and enrolled 1,842 patients in the programme, as compared to 1,540 patients in FY2019.

RAISING AWARENESS OF CHRONIC ILLNESSES

In December 2020, NHGP partnered TCS to organise a session on diabetes management. Titled *Better Sleep for Better Diabetes Management*, it provided insights into the inter-relationship between stress, sleep, and diabetes, and tips on sleep hygiene.

To commemorate World Obesity Day 2021, NHGP collaborated with KTPH and TTSH to host a webinar, *Health 4 Life*. The webinar shared the weight management programmes provided by NHGP, such as *Lighter Life* and *FitterLife*, and the role of nutrition and sustainable eating habits in maintaining a healthy weight.



COLORECTAL CANCER AWARENESS MONTH 2021

In March 2021, in conjunction with *Colorectal Cancer Awareness Month*, NHGP held a webinar, supported by the Singapore Cancer Society (SCS), on how to lower one's risk for the condition by adopting healthy lifestyle habits and going for regular screening. The session discussed the symptoms and risk factors for colorectal cancer, and shared the importance of diet and exercise in helping reduce the risk.

Below: Speakers sharing tips on managing mental health during the *Manage Your Mind & Fight the Fear* virtual talk.

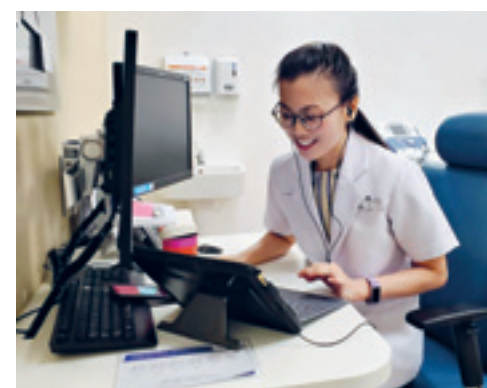


PROMOTING HEALTH EDUCATION FOR THE POPULATION

To encourage people to embrace healthier lifestyles, National Healthcare Group Polyclinics (NHGP) continued to organise several virtual events to engage and educate patients and the population.

FRAILTY MANAGEMENT WEBINAR

In September 2020, NHGP held its first live webinar, titled *Living Well in Your Golden Years*, sharing tips on improving nutrition and recommended appropriate physical activities to help seniors keep frailty at bay.



INTEGRATING MENTAL HEALTH INTO PRIMARY CARE

On World Mental Health Day in October 2020, NHGP partnered the Women's Executive Committee of Nee Soon East Community Club and the People's Association (PA) Women's Integration Network (WIN) Council to conduct a talk, *Manage Your Mind & Fight the Fear*. It discussed management of individual mental health and anxiety.

NHGP also worked with TOUCH Community Services (TCS) between October and December 2020 to organise a series of talks, *The 2 Challenges in Senior Years – Dementia and Depression*. Conducted in English, Mandarin, and Malay, the session covered how to enhance quality of life and age healthily in the community in spite of these two conditions.

BOOSTING ACCESS TO DIAGNOSTIC SERVICES

IMPROVING AWARENESS ON MAMMOGRAM SCREENING

In November 2020, National Healthcare Group Diagnostics (NHGD) created a "three-bead keychain" as a visual tool to educate and promote the importance of early detection of breast cancer through mammogram screening. NHGD also implemented a new self-service appointment system that improved community access to mammograms. The new E-bookings increased by 70 per cent within the first month of the launch.



BONE MINERAL DENSITY SCREENING IN THE COMMUNITY

NHGD collaborated with the People's Association (PA) and SportSG to provide Bone Mineral Density (BMD) services in the community. Residents of Yishun, Woodlands, and Geylang could go for scans on-board NHGD's Mobile BMD conveniently located at Nee Soon East Community Club (CC), Fuchun CC, and Geylang East Swimming Complex. The BMD scan aids in the early detection, diagnosis, and treatment of osteoporosis and risk of bone fracture.



GUARD AGAINST THE 3 SILENT KILLERS HOW LHS CAN DAMAGE YOUR HEALTH.



+ DYSLIPIDAEMIA
An abnormal amount of lipids (fats) in the blood. The most common type is hyperlipidaemia - a condition where there is an elevated level of triglycerides, consisting of low-density lipoprotein (LDL, the 'bad' cholesterol) and high-density lipoprotein (HDL, the 'good' cholesterol).

+ HYPERTENSION
When your blood pressure reading shows 130/90 mmHg or higher. A 2017 Guidelines published by the American College of Cardiology and the American Heart Association, classify readings above 140/90 mmHg as Stage 2 hypertension.

+ SMOKING
It is not good for you, even casually. A 2018 study in the British Medical Journal (BMJ) found that people who smoke one cigarette a day carry a greater risk of developing coronary heart disease and stroke than expected.

Why are LHS called SILENT KILLERS?

LHS are considered chronic diseases that collectively increase the risk of **stroke, heart disease, diabetes, and kidney disease**. If not managed well, LHS can result in long-term disability and even death. These diseases do not present any visible signs or symptoms even when they are quite severe, and hence are called 'silent killers'. For example, causes of most cases of 'sudden' heart attacks are usually linked to LHS and in truth, do not actually come suddenly. They can be traced back to long-term struggle with dyslipidaemia, Hypertension and/or Smoking (LHS).

Uncontrolled LHS can lead to major health damages.

- **Coronary Artery Disease (CAD)**
Major blood vessels to the heart become damaged or diseased. If severe, this condition can cause a heart attack.
- **Heart failure**
The heart becomes weakened after long periods of pumping harder against a high-pressure system in the blood vessels.
- **Stroke**
It is caused by the narrowing of blood vessels to the brain. The most common type, ischaemic stroke, occurs when a blood clot blocks the flow of blood and oxygen to brain cells. In other cases, a weakened blood vessel may burst and bleed into the brain causing a haemorrhagic stroke.
- **Peripheral artery disease**
The narrowing of blood vessels decreases the oxygen supply to tissue in the arms and legs, potentially leading to skin ulcers, infections, poor wound healing, or the need to have a leg or foot amputated.
- **Kidney failure**
Caused by damage to tiny blood vessels within the kidney filtration system.



Prevent LHS from creeping into your life

KNOW YOUR READINGS

When you undergo a lipid panel, which is a set of tests that checks the amount of lipids in your blood, you will receive four measurements, including your total cholesterol level. That in itself is less important than the other three readings, which show you the breakdown of the levels of good and bad lipids. Below are the optimal lipid levels recommended by the Health Promotion Board (HPB) for the general population:

- **TOTAL CHOLESTEROL**
less than 200 mg/dL or 5.2 mmol/L
- **LDL CHOLESTEROL**
less than 130 mg/dL or 3.3 mmol/L
- **HDL CHOLESTEROL**
more than 40 mg/dL or 1.0 mmol/L
- **TRIGLYCERIDES**
less than 2.3 mmol/L



ADOPT A HEALTHY LIFESTYLE

➤ Eat a healthy diet that meets your nutritional needs.

- Include a variety of fruits and vegetables that make up the colours of the rainbow. They are high in potassium, magnesium, and fibre, all of which can help lower blood pressure.



➤ Limit salt intake

- The recommended daily salt intake is 2,000 mg (1 teaspoon).

➤ Moderate alcohol consumption

- Apart from raising blood pressure, the calories in alcohol can lead to weight gain - a known risk factor for high blood pressure.
- Limit intake to no more than two standard drinks a day for men, and no more than one standard drink a day for women.
- A standard drink translates to 330 ml of beer, 100 ml of wine or 30 ml of hard liquor.

➤ Incorporate a regular routine for physical activities that you enjoy

- Just 30 minutes of moderate exercise five to seven days a week can help to lower your blood pressure.
- Exercises include, a brisk walk, a swim, or even some very diligent mopping.
- By maintaining a body mass index (BMI) of 23 kg/m² or lower, you can lower your risk of high blood pressure significantly.



➤ Quit smoking

- Nicotine raises your heart rate and blood pressure. If you don't smoke, don't take it up. If you are a smoker, here is another reason to quit. See below on 'Tips to Stop Smoking'.

KNOW YOUR RISK LEVEL THROUGH REGULAR HEALTH SCREENING

- Your family physician can advise you on proper management and/or treatment, as hypertension and hyperlipidaemia can be effectively managed with medication, as well as adopting a healthy lifestyle.

| KNOW YOUR READINGS: | SYSTOLIC TOP NUMBER | mmHg | DIASTOLIC BOTTOM NUMBER |
|-----------------------------|---------------------|--|-------------------------|
| Normal | BELOW 120 | AND | BELOW 80 |
| Elevated | 120-129 | AND | BELOW 80 |
| High blood pressure STAGE 1 | 130-139 | OR | 80-89 |
| High blood pressure STAGE 2 | 140 OR HIGHER | OR | 90 OR HIGHER |
| Hypertensive crisis | ABOVE 180 | AND/OR CONSULT YOUR DOCTOR IMMEDIATELY | ABOVE 120 |

Produced by NHG Group Corporate Communications

REDUCE STRESS AND PREVENT BURNOUT



- Get enough sleep.
- Practise self-care - spend time on your hobbies and take time to rest.
- Find trusted friends, family, or colleagues and talk out your problems.
- Manage your time - set clear boundaries between work and personal time. For example, limit the hours of overtime and place restrictions on how often you check on your work email.
- Take heed of warning signs of burnout, and slow down.
- Take part in an employee assistance programme.

TIPS TO STOP SMOKING

➤ **DECIDE TO QUIT.** Choosing to quit is a good first step.

➤ **GET PROFESSIONAL HELP.** Speak to a pharmacist to get advice on your "quit smoking" journey.

➤ **TELL YOUR FRIENDS AND FAMILY.** Get the encouragement you need by sharing your decision to quit smoking with your loved ones.

➤ **BE REALISTIC.** Quitting smoking is a process, and it will take time. Be open to various smoking cessation methods that can help curb withdrawal symptoms.

➤ **KNOW WHY YOU NEED TO STOP.** Write down your reasons for quitting, such as the arrival of a baby or for your family's health. This can sustain your motivation during tough times.



DIGITAL TRANSFORMATION

NHG has a strong tradition in educating future generations of healthcare providers. Beyond enhancing data literacy in our highly motivated digital-native workforce, we have set our sights further to develop them into thought leaders in digital health, mobility-enabled productivity, and self-learning. Patient-care efficacy and empowerment are championed through relationships enabled by technology. We seek to curate and implement sustainable and connected capabilities, build digital portals, relationship management systems, and analytics platforms, to *Add Years of Healthy Life* to our population.

“Our NHG workforce will be trained to adopt new technologies, and be conscientious stewards of data; yet be imbued with the core fundamentals of the healthcare profession – ethos, empathy, and critical thinking. It is our people, and not machines, that determine the success of relationships afforded by science and circumstances.”

Associate Professor Thomas Lew
Group Chief Data & Strategy Officer, NHG

AI AND ANALYTICS IN NHG

Machine-learning applications in healthcare have tremendous potential that cuts across clinical decision-making capabilities, logistics, and even mundane repetitive operational tasks to improve productivity. We support our clinicians and operational leaders by creating robust test-bed environments, analytic bench tools, and trusted algorithms that are eventually built into our healthcare systems.

NHG’s innovators are currently involved in a wide variety of machine-learning tools and AI-related research and operations. These include algorithms to improve accuracies of X-ray diagnoses, microscopic blood-tests screening, ophthalmology screening, and falls prevention. Algorithms are also used to drive predictive modelling for patient flow management in our facilities.

NHG has established good decision-making tools in its hospitals and clinics to enhance high acuity-based care and precision in clinical decision-support, e.g., antibiotics prescriptions and monitored alerts for at-risk patients. To improve well-being and deliver appropriate care, we use our analytical capabilities to facilitate the safe transfer of patients from hospitals to step-down facilities, and identify patients suitable for community-based interventions. Our data scientists analyse trends across the population spectrum we serve, from the well to the frail, to provide evidence-based information for clinical strategies and programmes to strengthen health and avert medical complications.



ADVOCATING TELEHEALTH

Telehealth can effectively replace physical visits and promote a trust-based, long-term relationship with patients that appropriately addresses their needs. Synchronous or asynchronous modalities of clinical communications can enhance wellness, continual assessment, and influence treatment recovery such as rehabilitation. The end-to-end delivery of complementary services such as medication delivery, community-based investigations, and timely analysis of patient data must be equally well-coordinated, to enhance telehealth experiences.

At NHG, we use all modalities of telehealth tools. Institute of Mental Health (IMH) clinicians provide tele-psychiatry services to patients in nursing homes. At Tan Tock Seng Hospital (TTSH), in addition to telemedicine, clinical pharmacists conduct teleconsultations on certain high-risk medications with patients. National Healthcare Group Polyclinics (NHGP) monitors patients with chronic diseases with tele-sensors for vital signs (e.g., blood pressure monitoring), together with video and telephone reviews. These services are supported by home delivery of medication, and community-based blood tests and laboratories.

During the COVID-19 pandemic, telehealth consultations were used by Community Health Teams from Central Health and Yishun Health to screen and determine whether additional home visits were needed for vulnerable and at-risk patients. Special clinical teams, such as the TTSH Home Ventilation and Respiratory Support Service used teleconsultations to ascertain the frequency and need for visits to patients on home ventilators.

We are establishing an architecture for data generated by residents and our population, across multiple sensing systems. With consent from NHG providers, this repository will allow patients to have insights into their customised care plans via our digital applications.

“As more NHG Institutions come onboard the NGEMR, the consolidated IT foundation will allow us leverage to provide more integrated care, optimised with aggregated patient data, and help the population take ownership of their own health and future healthcare needs. This is the patient-centred care of the future.”

Assistant Professor Eric Wong Group Chief Clinical Informatics Officer, NHG

USING DATA AND CLOUD TO ENHANCE INTEGRATED CARE

NHG is sharing data nationally to determine the appropriate load-leveiling of services and resources to provide timely access to treatment, including demands from pre-hospital emergency services. Further connectivity of Command, Control, and Communications (C3) systems between our Institutions enable closer operational integration. For population health, we are building a common data definition, and a population health and risk registry for the future, to enable the full use of analytics capabilities across the population segments we serve. In this regard, our integration and partnership with caregivers, and community health and social services providers, is critical, as holistic information, with the consent of our partners and residents, will in turn help them to remain healthy.

In 2020, NHG Institutions augmented patient flow and service-demand management systems to meet huge surges. Stratification of patients’ clinical data enabled safe right-siting of institution-based care of COVID-19 patients at the various acute and step-down facilities. Chronic disease patients who could not visit our Institutions during the Circuit Breaker were cared for remotely, well-supported by community-based services.

Left: The connectivity of Command, Control, and Communications (C3) systems between our institutions enable closer operational integration.



NGEMR “GO-LIVE” IN NHG

In 2021, NHG achieved a key milestone in its care transformation journey when the Next-Generation Electronic Medical Record (NGEMR) successfully went “live” at the National Healthcare Group Polyclinics (NHGP). NHGP piloted NGEMR at Geylang Polyclinic on 27 February, and at the rest of its polyclinics on 3 May.

NGEMR is a joint project between NHG, the Ministry of Health (MOH), Integrated Health Information System (IHIS), Epic, and National University Health System (NUHS). Pushing the boundaries of clinical care with the use of big data, analytics, and healthcare prediction models, NGEMR is a state-of-the-art IT enabler that is pivotal in driving NHG’s *River of Life* population health strategy. It integrates the numerous existing systems and functionalities into a single platform, facilitating information-sharing across NHG Institutions and our partners.

Through system harmonisation, NGEMR enhances the coordination of care plans, boosts efficiency of services, and amplifies data management for research and education. Patients can access tools and services such as educational materials and self-management of medical appointments. Ultimately, NGEMR aims to improve patient/population health outcomes by revolutionising delivery of care and advocating ownership of well-being, even as it supports the growing demand for healthcare services in Singapore.

GROUP RESEARCH

Research is an integral part of NHG's *River of Life* strategy as there is a strong push to translate R&D to better patient outcomes, better healthcare, and a healthier population.

As such, NHG Group Research works towards three global outcomes:

- i) To raise research intensity
- ii) To build international peaks of excellence
- iii) To provide real-world evidence to transform population health.



Prof Benjamin Seet, Deputy Group CEO (Education & Research), on the ground with staff at a migrant worker dormitory.

NHG PACT PROGRAMME

The Partnerships for Capability Transformation (PACT Programme) is a pioneering collaboration between NHG and Enterprise Singapore's (ESG) Clinician-driven Innovation (CDI) initiative. Under PACT, NHG's Centre for Medical Technologies and Innovations (CMTi) catalyses partnerships between clinicians and Singapore MedTech companies to co-develop and commercialise innovative healthcare products and solutions that are clinically impactful, and which address global health needs. The first of its kind in public healthcare, the success of the PACT programme in NHG has helped proliferate the adoption of the programme in SingHealth and NUHS.

SUPPORTING THE COVID-19 BATTLE

Together with the Infectious Disease Research Training Office at National Centre for Infectious Diseases (NCID), NHG Group Research helped coordinate multi-agency R&D efforts in the fight against COVID-19. Some of the initiatives included:

- Coordination of COVID-19 R&D efforts across Singapore to better characterise and understand the pathogen and local outbreak.
- Clinical evaluation and participation in multi-centre trials of novel and repurposed therapeutic agents against COVID-19.
- Technical evaluation, selection, and procurement of vaccine candidates for the national vaccination programme.
- Development of network analysis of COVID-19 outbreaks in migrant worker dormitories.
- Survey of perceptions towards COVID-19 vaccines in healthcare workers, as well as support public communication efforts to drive vaccine uptake by the Singapore population.
- Expedition of approval for surge in Domain Specific Review Board (DSRB) applications for COVID-19 related studies, with more than 460 submissions approved within a mean record time of 21 days and eight days for new and amended proposals, respectively.
- As part of the Joint Task Force set up by Ministry of Manpower (MOM) and Ministry of Health (MOH), NHG Group Research officers were deployed to coordinate medical support for 14 migrant worker dormitories in the north of Singapore.

"We have to collaborate with the right partners, be it other healthcare institutions, academia, or industry, to achieve our goals and deliver quality care to our patients and population."

Professor Benjamin Seet Deputy Group CEO (Education & Research), NHG, & Assistant CEO (Corporate Services), Tan Tock Seng Hospital & Central Health

RESEARCH TALENT DEVELOPMENT

The NHG-Lee Kong Chian School of Medicine (LKCmedicine) clinician-scientist development programmes were extended to nurses, pharmacists, and allied health professionals from July 2020. These healthcare professionals made up about 45 per cent of successful awardees of the Clinician-Scientist Preparatory Programme (CSPP). Dr Ng Tat Ming, a Principal Pharmacist (Clinical) at Tan Tock Seng Hospital (TTSH), was awarded the Clinician-Scientist Career Scheme, which would provide him with post-doctoral funding support to prepare him to compete for national grants and awards.

FIRST BIODESIGN FELLOW IN NHG

Dr Chen Kok Pun, Associate Consultant Gastroenterologist, TTSH, returned to NHG in March 2021 after completing a six-month training with the Singapore Biodesign Innovation Fellowship Programme, which focused on the biodesign process of healthtech innovation. He worked with multidisciplinary teams, comprising engineers, healthcare professionals, and business/industry professionals. Together, they learnt to implement a rigorous and methodical framework to develop innovative solutions to meet real-world problems, and the know-how to commercialise products successfully.



NOTABLE STAFF ACHIEVEMENTS

- **National Clinician Scientist Awards 2020**
Associate Professor Rupesh Agrawal, TTSH, and Dr Yew Yik Weng, National Skin Centre, received the Clinician Scientist Award and the Transition Award, respectively, given out by the National Medical Research Council (NMRC).
- **National Outstanding Clinician Scientist Resident Award 2020**
Dr Xu Chuanhui (left), clinician-scientist resident from NHG, was bestowed the National Outstanding Clinician Scientist Resident Award 2020 by the NMRC. This annual award honours and recognises Residents who excelled in clinical training and have made significant research contributions with actual or potential clinical translational applications to improve clinical care. Dr Xu is currently enrolled in the NHG Rheumatology Residency Programme and is the first resident in NHG to receive the award.

THE NEXT STEP IN BIOMEDICAL RESEARCH

The National Precision Medicine (NPM) strategy was launched in 2017 as a 10-year plan to enhance and accelerate Singapore's biomedical research, health outcomes, and economic growth. To achieve this, Precision Health Research, Singapore (PRECISE), was set up as the central entity to drive NPM. In NPM Phase II, which started in April 2021, PRECISE collaborates with research and clinical partners from the Singapore ecosystem, including NHG and LKCmedicine, to study the genetic makeup of 100,000 healthy Singaporeans and up to 50,000 people with specific diseases. The genetic data will be integrated with detailed lifestyle, environmental, and clinical data to yield rich insights into factors that contribute to Asian diseases and conditions. PRECISE is supported by the National Research Foundation Singapore and the National Medical Research Council.



Dr Chen Kok Pun, Associate Consultant Gastroenterologist, TTSH, completed a six-month training with the Singapore Biodesign Innovation Fellowship Programme.



ASSOCIATE PROFESSOR STEVEN THNG
CHIEF DERMATOLOGIST // SKIN RESEARCH INSTITUTE OF SINGAPORE // DIRECTOR // TRANSLATIONAL RESEARCH OFFICE // NHG // ASSOCIATE PROFESSOR // LEE KONG CHIAN SCHOOL OF MEDICINE

PROFESSOR BENJAMIN SEET
DEPUTY GROUP CEO (EDUCATION & RESEARCH) // NHG // ASSISTANT CEO (CORPORATE SERVICES) // TAN TOCK SENG HOSPITAL & CENTRAL HEALTH // PROFESSOR // LEE KONG CHIAN SCHOOL OF MEDICINE

ASSOCIATE PROFESSOR TAN CHER HENG
DEPUTY CLINICAL DIRECTOR // CENTRE FOR HEALTHCARE INNOVATION // TAN TOCK SENG HOSPITAL // COMMITTEE MEMBER // CENTRE FOR MEDICAL TECHNOLOGIES AND INNOVATIONS // NHG // ASSISTANT DEAN (CLINICAL RESEARCH) // LEE KONG CHIAN SCHOOL OF MEDICINE

IF THE COVID-19 PANDEMIC HAS TAUGHT US ANYTHING, IT IS THE IMPORTANCE OF COLLABORATION.

Transcending traditional sector boundaries and international borders, many of the solutions and interventions to complex issues caused by the global crisis were developed through cross-discipline and cross-industry approaches. Singapore, too, has benefitted from such strategic partnerships.

At the IT Leader Awards 2021 – the country’s longest-running local tech awards, organised by the Singapore Computer Society, held in March – Tan Tock Seng Hospital (TTSH) was a co-winner (Infrastructure) with the

Agency for Science, Technology and Research (A*STAR) for their joint development of RadiLogic, an artificial intelligence (AI)-powered tool that can rapidly detect COVID-19 pneumonia (lung infection) on chest X-rays. The innovation was driven by both organisations’ common goal to fight the disease more effectively and provide timely, appropriate care to infected patients.

Indeed, strategic and timely collaborations are key to delivering quality care and improving the health of our population. NHG is working in synchronicity with its partners to achieve its vision of “Adding years of healthy life” to the people of Singapore.

WORKING IN CONCERT

Our research works towards three global health outcomes, says Professor Benjamin Seet, Deputy Group Chief Executive Officer (Education & Research), NHG. The first is to raise research intensity, largely by orchestrating research activities across NHG institutions “so that the collective effort comes across as a symphony, rather than as a compilation of soloists”, as Prof Seet puts it.

Second, NHG seeks to build international peaks of excellence in areas where it has clinical strengths, such as infectious diseases, dermatology, and mental health, which centres on research at

the National Centre for Infectious Diseases (NCID), National Skin Centre (NSC), and the Institute of Mental Health (IMH), respectively.

Third, NHG’s research aims to provide real-world evidence to transform population health. “We don’t plan for research to end with only papers or patents. There has to be a strong push to translate research and development (R&D) to better patient outcomes, better healthcare, and a healthier population. R&D will be an integral part of NHG’s population health strategy and programmes,” Prof Seet advocates.

Collaboration is fundamental to achieving all three goals. In today’s world, it is not possible to do everything by ourselves, says Prof Seet, “Diverse resources are needed to turn the best research into new drugs, devices, or clinical protocols.”

“Research at the cluster level will take on major health challenges where there are unmet needs or big gaps in knowledge. This often remains underfunded because of the difficulty in stringing together a coherent programme,” he elaborates. Examples of healthcare areas that have significant gaps to fill include frailty and depression in the elderly, multi-morbidity and polypharmacy (or the use of multiple medications by an individual), and the primary prevention of chronic diseases.

The success of a collaboration largely hinges on having the right partner. In the area of research, NHG frequently works with the Lee Kong Chian School of Medicine (LKCmedicine) at Nanyang Technological University (NTU) and

BOOSTING BRAIN RESEARCH

In 2021, National University of Singapore’s (NUS) Yong Loo Lin School of Medicine became a partner of Brain Bank Singapore. A research repository for brain and spinal cord tissues from donors who have passed away, the joint partnership was set up in 2018 by NHG, LKCmedicine, and National Neuroscience Institute (NNI).



“We don’t plan for research to end with only papers or patents. There has to be a strong push to translate research and development to better patient outcomes, better healthcare, and a healthier population.”

Professor Benjamin Seet
Deputy Group CEO
(Education & Research), NHG

A*STAR. Earlier this year, NHG, LKCmedicine, and A*STAR signed a tripartite Memorandum of Understanding (MOU) to jointly establish a healthtech accelerator – Co11ab @ Mandalay – to facilitate the clinical adoption of new technologies that will create value for patients.

BUILDING BRIDGES FOR INNOVATION

Associate Professor Tan Cher Heng likens his job as a radiologist to being a detective, “Radiologists pick up clues from medical images and combine our understanding of anatomy, pathology, and physics to solve diagnostic puzzles that would be useful for helping clinicians better manage patients.” He adds that research and innovation are natural extensions of his passion for the science behind the subject. His spirit of curiosity and enterprise fits his three concurrent roles as Deputy Clinical Director of TTSH’s Centre for Healthcare Innovation (CHI), Committee Member of NHG’s Centre for Medical Technologies and Innovations (CMTi), and Assistant Dean (Clinical Research) of LKCmedicine. A/Prof Tan sees himself as a ‘human bridge’ connecting these institutions to collectively achieve desired health outcomes.

“I enjoy bringing like-minded clinicians and scientists together into a community where ideas are translated into projects so that technology can enable healthcare

transformation,” he explains. “Clinicians are best positioned to define and articulate the problem statement, while scientists and engineers are best suited to develop relevant solutions. Without a collaborative approach, the process will likely fail.”

Officially opened in 2019, CHI is a co-learning platform that drives thought leadership in healthcare innovation through technology and workforce transformation. Together with diverse partners, CHI co-creates healthcare innovations and seeks to redesign ways of working and learning.

WHAT CMTi HAS DONE

- Supported NHG clinicians in over **100 projects**
- Secured more than **\$28 million** in industry funding
- Filed over **87 patents**
- Created **20** commercialisable products



Fourier Intelligence's RehabHub™.

CMTi, which was set up in 2017 and is a close alliance of CHI, serves a complementary role of matching NHG clinicians with local and global technical experts from industry and academia, facilitated by Singapore government agencies, to co-develop innovative medtech solutions to address unmet healthcare needs.

CMTi provides administrative support to help turn prototypes into market-ready and commercially-viable products. "Even if the cross-disciplinary teams function well together, the lack of funding opportunities or of a business mindset may hinder them from taking their projects beyond the initial prototyping or proof-of-concept phase," says A/Prof Tan. "These challenges are addressed by our administration team, who advises our clinicians on appropriate partnerships and funding agencies, intellectual property protection, and business contract negotiations."

A/Prof Tan himself is part of the TTSH-A*STAR team behind the AI tool, RadiLogic. Their collaboration began when they participated in CMTi's Open Innovation Challenge, a platform to catalyse the co-development of novel healthtech products. "Since then, we have developed an AI model ready for licensing to a commercialisation partner," he discloses.

Two other notable collaborations facilitated by CMTi in the past year are with Trendlines Medical Singapore, a medtech incubator; and Fourier Intelligence, a Shanghai-based robotics company. In November 2020, NHG and Trendlines Medical renewed their existing MOU to continue co-developing innovative healthcare solutions. The partnership will leverage on NHG's clinical strengths as well as Trendlines Medical's market knowledge and technological expertise.

"As science and technology continue to deepen, the need for multi-faceted interdisciplinary collaborations will become greater.

This calls for an accelerated pace at which we develop solutions to ideas."

Associate Professor Tan Cher Heng
Deputy Clinical Director,
Centre for Healthcare Innovation,
Tan Tock Seng Hospital



➤ NEXT STOP: THE CLINIC

The close partnership between NHG and Trendlines Medical has led to the formation of nine new companies in just three years. Out of these, three are commencing clinical trials at NHG institutions, in the hope that these would solve some of today's most acute clinical challenges.



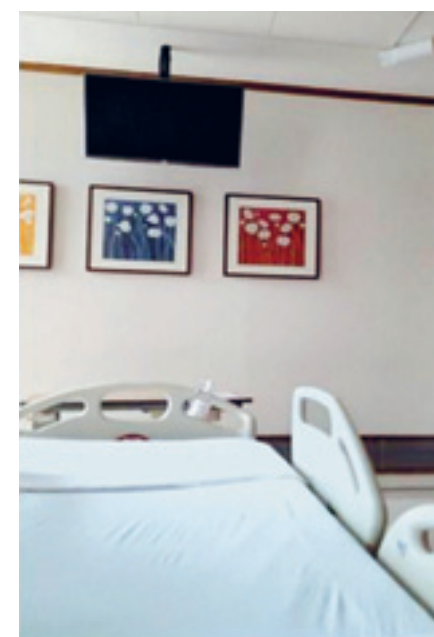
➤ **Medulla Pro** is developing an ultrasound-guided, real-time imaging system to increase the safety and accuracy of lumbar puncture (spinal tap) procedures. Clinicians from Khoo Teck Puat Hospital (KTPH) and TTSH are adapting the system for clinical use to better meet patient needs.

➤ **Szone** is developing an easy-to-use, accurate, real-time, and non-invasive hydration monitoring device, in collaboration with TTSH, to benefit patients with kidney failure or cardiovascular heart disease. The device will enable them to manage their daily fluid intake, and avoid complications from under- or over-hydration.

➤ **interVaal** is developing a uniquely-designed urinary catheter to reduce the risk of catheter-associated urinary tract infections, one of the most commonly reported hospital-acquired conditions. Clinical trials will be carried out at KTPH and Woodlands Health (WH).

In March, NHG and Fourier Intelligence signed an MOU to build on NHG's clinical strengths in rehabilitation medicine and the latter's RehabHub™ concept to co-develop cutting-edge rehabilitation technologies and robotics solutions. Such innovations will be designed to prevent falls and preserve mobility in frail older adults – an area of growing concern among ageing populations in Singapore, and globally.

Elsewhere, some medtech products backed by CMTi are already in the market. For example, TTSH nurses worked with local start-up CoNEX Healthcare to develop PreSAGE, a smart bed-exit prediction and falls prevention system currently deployed in TTSH's general wards for safer patient care. It alerts nurses whenever a patient tries to get out of bed, giving nurses more time to reach the bedside. There is also the attractive Suu Balm range of products, which provides rapid itch relief for atopic dermatitis (eczema) and other skin problems. Formulated by NSC and commercialised in collaboration with homegrown company Good Pharma Dermatology, the products are now available internationally.



PreSAGE, a bed-fall surveillance and prevention prediction system.

IN WITH SKIN

The success of Suu Balm points to dermatology, where NHG intends to build an international peak of excellence. A milestone was established in 2013 with the launch of the Skin Research Institute of Singapore (SRIS), a collaboration between A*STAR, NHG, and NTU that links scientists with clinicians and engineers to improve skin health and reduce the burden of skin diseases for Asian populations and globally.

"Gone are the days when one could just focus on an area of science, like skin biology, and be able to make a significant impact with that research. I am a strong believer that great outcomes will only come with the convergence of many disciplines in science," says Associate Professor Steven Thng, Chief Dermatologist of SRIS. "That is why SRIS brings skin biologists, biomedical engineers, clinicians, and digital scientists into each of our research programmes – to ensure that clinical problems are tackled holistically."

As one of SRIS' founding partners, NHG brings to the table its clinical expertise and large patient base. "We provide clinical insights, problems, and questions to help focus and direct the scientists' research. When a new technology or drug is developed, our patients are key for testing and validation," A/Prof Thng explains. He often represents SRIS whenever a commercial enterprise expresses interest in working with the Institute. He also runs all of SRIS' clinical trials at the P.H. Feng Research Centre, located at NCID.

Two areas of research hold great potential. One is clinical bedside, non-invasive imaging. While skin imaging tools can now diagnose skin cancer without the need for a biopsy, SRIS is working with A*STAR's Singapore Bioimaging Consortium (SBIC) to develop a machine capable

➤ UNITED AGAINST COVID-19

A BRIEF LOOK AT HOW EVERYONE IS COMING TOGETHER TO BEAT A GLOBAL PANDEMIC.

➤ BETWEEN LOCAL INSTITUTIONS

PLAYERS INVOLVED: A*STAR, TTSH, MiRXES (a biotech company)

WHAT THEY DID: Developed a diagnostic test kit, called the **Fortitude Kit**, to detect the SARS-CoV-2 virus (which causes COVID-19) quickly and accurately. A newer version is now able to differentiate between SARS-CoV-2 and the seasonal flu, which exhibit similar symptoms. More than five million kits have been sold locally and globally.

PLAYERS INVOLVED: Integrated Health Information Systems (IHIS), TTSH, ST Engineering

WHAT THEY DID: Launched the **Command, Control and Communications (C3)** system, believed to be the first smart hospital system in the world. C3 provides real-time analytics so that TTSH and NCID can optimise operations and resource flow in response to the pandemic.

➤ BETWEEN GOVERNMENT AND COMMUNITY

PLAYERS INVOLVED: Emerging Stronger Taskforce, industry, civil society

WHAT THEY DID: Formed **Alliances for Action (AfAs)**, a new model of private-public partnership to address pressing economic and social issues as Singapore enters the recovery phase. As of March 2021, there were 19 AfAs covering areas such as robotics, the built environment, digital literacy and access, and work-life harmony.

➤ BETWEEN COUNTRIES

PLAYERS INVOLVED: Gavi, the Vaccine Alliance; Coalition for Epidemic Preparedness Innovations (CEPI), World Health Organization (WHO)

WHAT THEY DID: Created the **COVID-19 Vaccine Global Access (COVAX)** platform. COVAX works with governments and manufacturers to ensure global equitable access to COVID-19 vaccines, especially for lower-income countries.

PLAYERS INVOLVED: Scientists all over the world

WHAT THEY DID: Uploaded SARS-CoV-2 genome sequences on the **Global Initiative on Sharing All Influenza Data (GISAID)** platform, which had more than 1.2 million submissions from 172 countries between January 2020 and April 2021. It has enabled the rapid development of diagnostic tests and vaccines, and the tracking of new variants.

of generating 3D images of tumours. This will allow surgeons to examine tumours virtually so that they can perform precise, personalised surgery. The second is atopic dermatitis, a common condition in Singapore. SRIS is involved in two new drug development projects with C&C Research Laboratories based in South Korea, as well as ASLAN Pharmaceuticals based in Singapore. A/Prof Thng is optimistic that both projects will result in novel therapeutics for atopic dermatitis, which for a long time received little innovation in treatment.

Better treatment options will go a long way towards improving the quality of life and self-esteem of people suffering from skin problems, in addition to saving them money they would otherwise spend (in vain) to manage their condition. However, benefits go further. “The new knowledge generated will be crucial in capturing value for the Singapore economy, in terms of attracting investment from MNCs and creating jobs,” says A/Prof Thng. He adds that a big reason Procter & Gamble



“While research is time-consuming, stressful, and frustrating at times, the joy of making a new discovery or innovation **that advances the care of patients – even by a little bit – more than compensates for the sacrifices we make.**”

Associate Professor Steven Thng
Chief Dermatologist, Skin Research Institute of Singapore

(P&G) has set up its regional lab in Singapore is because the company recognises the country’s ventures into skin research, results of which might influence P&G’s development of consumer care products such as soaps and facial cleansers.

NOT LOST IN TRANSLATION
A/Prof Thng also pulls double duty as the Director of NHG’s Translational Research Office (TRO). “TRO was established to chart the direction and strategy of NHG’s research activities and align them with our translational research foci, namely skin, infectious diseases, mental health, ageing, and population health,” he explains. “I work with the various translational research project leads to unlock internal funds to seed those initiatives, as well as obtain extramural grants such as from the National Medical Research Council (NMRC).”

TRO facilitated the establishment of the Wounds iCare Collaborative (WiCC) Research and Clinical Workgroup. It brings together representatives from various NHG institutions to consolidate efforts and resources in wound care management, and also serves

SRIS runs clinical research trials at the P.H. Feng Research Centre, located at NCID.



Photo: Skin Research Institute of Singapore (SRIS)

➔ **BESIDES SRIS, OTHER COLLABORATIONS FACILITATED BY TRO IN RECENT YEARS INCLUDE:**

- ➔ **Rehabilitation Research Institute of Singapore (RRIS), jointly established by NTU, A*STAR, and NHG**
- ➔ **Health for Life in Singapore (HELIOS) Study, a population cohort study led by LKCmedicine, in partnership with NHG and Imperial College London**
- ➔ **gAmes for heaLth InnoVations cEntre (ALIVE), launched by LKCmedicine and NHG**
- ➔ **Palliative Care Centre for Excellence in Research and Education (PaIC), set up by Dover Park Hospice, LKCmedicine, and NHG**
- ➔ **Brain Bank Singapore (BBS), initiated by LKCmedicine, the National Neuroscience Institute (NNI), and NHG**



as a coordinating platform for collaborations with academia and industry. “One important area to look at is Diabetic Foot Ulcers (DFUs), given the high prevalence of diabetes in our population. DFUs contribute to Singapore having one of the highest rates of lower-extremity amputation in the world,” says A/Prof Thng.

He adds, “Over the years, we have established many partnerships with the aim of translating research outcomes into evidence-based disease management, especially in areas with high disease burden in Singapore that collectively coincide with NHG’s and partners’ strengths.”

WHAT THE FUTURE HOLDS
Healthcare collaborations look set to gather pace. “As science and technology continue to deepen, the need for multi-faceted interdisciplinary collaborations will become greater. This calls for an accelerated pace at which we develop solutions to ideas,” says A/Prof Tan. Not even a pandemic can slow things down, he notes. “Technology provides opportunities for us to increase productivity and enhance care beyond the hospital and into the community through remote means and patient activation. Virtual cross-boundary discussions also allow us to engage global partners for research and innovation.”

One imagines that digital technologies will stretch the possibilities of what can be achieved in the future. For example, with the ability to analyse big datasets and machine learning, doctors can radically improve their understanding of health and diseases and make better treatment decisions with patients. “The way ahead is to stratify populations such that we can target early interventions in the groups which will benefit most, and where it makes economic sense at the systems level,” says Prof Seet.

For this to happen, close partnerships between scientists, clinicians, administrators, and patients – across primary, institutional, and community

care – are essential. “We need to develop a new level of partnership with patients. It is critical to elevate medical literacy in Singapore, and equip patients with the right knowledge and tools to better manage their medical conditions,” adds Prof Seet.

With the COVID-19 crisis still disrupting the global ecosystem, Prof Seet says collaborations now and into the future should be, “Targeted, Multiplier, Outcomes-driven.” Wise words indeed, as all sectors, including healthcare, will have to be dynamic and strategic to keep pace with the rapidly evolving changes in a post-COVID-19 endemic world.

➤ **THE CASE FOR CLINICIAN-SCIENTISTS**

To grow translational research activities, not only must NHG collaborate with multiple partners; it also needs clinician-scientists to helm such projects. Many clinicians may feel apprehensive about performing this dual role, due to the demanding training requirements and significant time commitment. But A/Prof Thng appeals to their altruistic nature. “Most of the time, medicine as it is practised today just alleviates symptoms, and is not curative. The only way to do better for our patients is through research,” he stresses. “While it is time-consuming, stressful, and frustrating at times, the joy of making a new discovery or innovation that advances the care of patients – even by a little bit – more than compensates for the sacrifices we make.”



GROUP EDUCATION

Education is the cornerstone of NHG's multi-faceted strategy to cultivate a sustainable healthcare system. Designed as a holistic enabler, it is committed to build a strong pipeline of resilient, future-ready and versatile workforce capable of operating cross-functionally in various care settings to serve our patients with quality care.



LEADERSHIP CHANGES AT LKCMEDICINE

On 1 April 2021, Professor Joseph Sung succeeded Professor James Best as the Dean of Lee Kong Chian School of Medicine (LKCMedicine). Renowned as a researcher in the field of gastroenterology and hepatology, Prof Sung had in 2003 led his medical team in Hong Kong in the fight against the Severe Acute Respiratory Syndrome (SARS). Prof Sung's extensive contributions and achievements place him well to provide counsel on NHG's education and research strategies, and to lead LKCMedicine to the next level of excellence.

"I am excited to work with our partner teaching hospitals, polyclinics, and national centres under NHG to develop translational research, and apply knowledge to clinical practice to make an impact on patients' outcomes. It would be good to have more platforms such as joint research and educational programmes, research seminars, and grand-rounds so that scientists are informed of patients' needs, and clinicians know more what technology and science can offer. It is only through the cross-fertilisation of ideas that we can build trust and partnerships to develop interdisciplinary research teams. We have the potential to change clinical practice and improve healthcare delivery."

Professor Joseph Sung Dean, Lee Kong Chian School of Medicine



LKCMEDICINE IS ONBOARD NATIONAL PRECISION MEDICINE RESEARCH

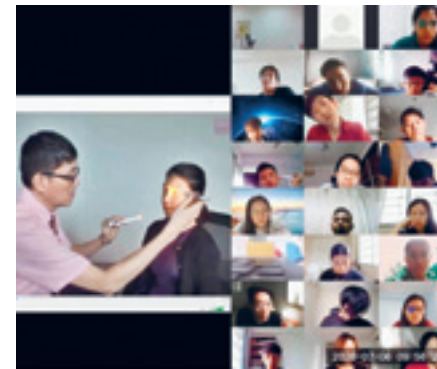
LKCMedicine collaborated with the Precision Health Research Singapore (PRECISE), as part of Singapore's National Precision Medicine (NPM) research initiative. During Phase II of the programme which started in April 2021, LKCMedicine was involved in analysing the genetics of 100,000 healthy Singaporeans, as well as 50,000 with specific diseases. The genetic data will be integrated with detailed lifestyle, environmental, and clinical data to yield rich insights into factors that contribute to Asian diseases and conditions. Professor John Chambers, Professor of Cardiovascular Epidemiology, Chief Scientific Officer of PRECISE, and one of the principal investigators supervising and coordinating the population cohort study highlighted its immense impact on the development of new approaches to treat certain diseases that are unique to Asia, as well as Singapore residents.

NHG RESIDENCY INITIATES CLINICAL LECTURES FOR LKCMEDICINE GRADUATING CLASS

NHG Residency conducted a series of clinical lectures for the graduating class of LKCMedicine, whose Student Assistantship Programme was shortened due to the pandemic. The lectures focused on the management of core acute medical problems to better prepare the students for clinical practice when they graduate in April 2020. The lectures were also extended to the Post-Graduate Year 1 doctors who were unable to have a full-scale orientation when they commenced their clinical training between February and March 2020.



Dr Vishal G Shelat (right), Programme Director, TTSH, conducting a virtual clinical lecture.



DISTANCE AUGMENTED REAL-TIME TRAINING (DART) FOR MEDICAL STUDENTS

The Distance Augmented Real-time Training (DART) programme was introduced during the Circuit Breaker to help medical students from NUS Yong Loo Lin School of Medicine and LKCMedicine continue with their clinic-based modules remotely, during their ophthalmology rotations. Developed by Associate Professor Yip Chee Chew, Education Director (Education Development Office), Yishun Health, DART used a combination of teaching methods, underpinned by learning theory, to help medical students practise basic eye examination skills.

The DART module comprised two parts: Self-Directed e-Learning and Face-to-Face teaching. The Self-Directed e-Learning sessions imparted knowledge through instructional videos and audio-guided mental rehearsals of the eye examination steps, and assessment of procedural knowledge. The second part required students to demonstrate the techniques on a 'standardised patient' such as a family member, during a face-to-face teaching session over Zoom. Timely corrective feedback was given by their peers and faculty to help improve students' performance.

MODIFIED PPP TO ILLUSTRATE PATIENT JOURNEY

Tan Tock Seng Hospital (TTSH) revamped its Professional Practice Placement (PPP) module for first-year students of the Singapore Institute of Technology (SIT) Diagnostic Radiography and Radiation Therapy Programme to provide a more comprehensive overview of the diversity, intricacies, and inner workings of the healthcare system from a patient's perspective. Launched in October 2020, the PPP module highlighted the role of radiographers in various clinical settings and was redesigned based on a patient's journey upon admission to the Emergency Department (ED). Students were presented with case studies, re-enactments, and real-life interviews with standardised patients. This helped them familiarise with the various stations in the ED, such as resuscitation bays, triage, nursing stations, and observation bays, as well as cultivate empathy for their patients.



Above: A radiographer at TTSH teaching an SIT student.



Above: SIT students in a classroom discussion.

ELEVATING CAPABILITIES TO BOOST PROFESSIONALISM

REDESIGNING TRAINING PROGRAMMES

The cessation of face-to-face training at the onset of the COVID-19 pandemic prompted NHG College to redesign 28 training and development programmes to go online. NHG College has adapted 70 per cent of its programmes to-date, and ensured that the learning needs of healthcare professionals, educators, and leaders were met in a safe manner, without compromising the quality of curriculum. As of FY2020, NHG College has organised 78 programme runs attended by 4,260 participants.



Below: Collective Leadership Conversations was one of the many training programmes that NHG College redesigned to go online during the pandemic.



GROUP EDUCATION

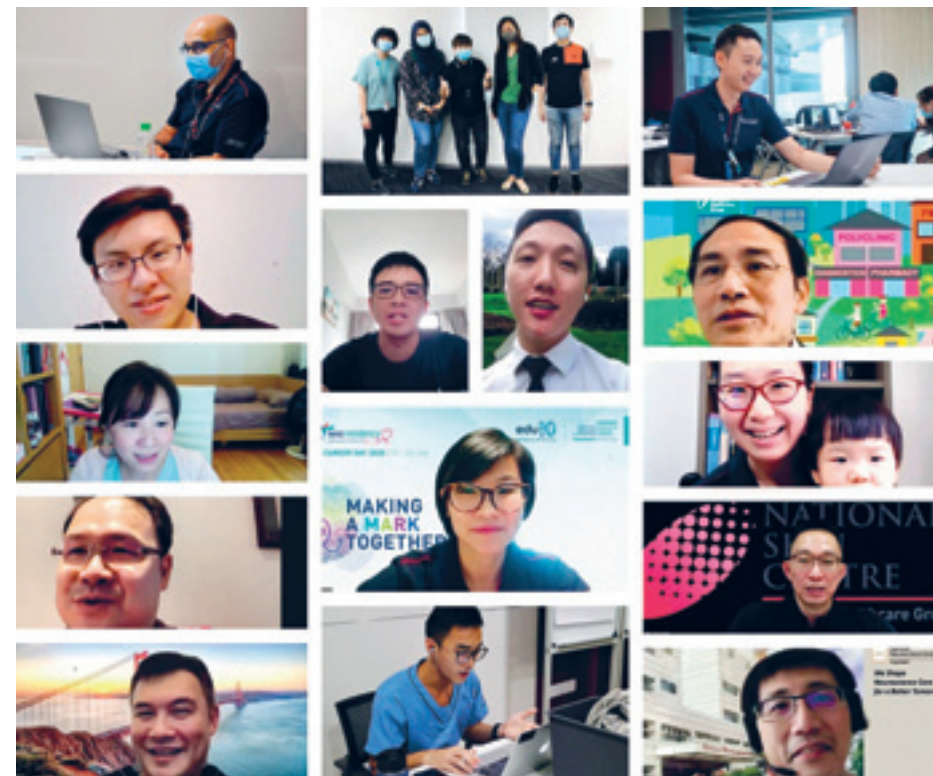
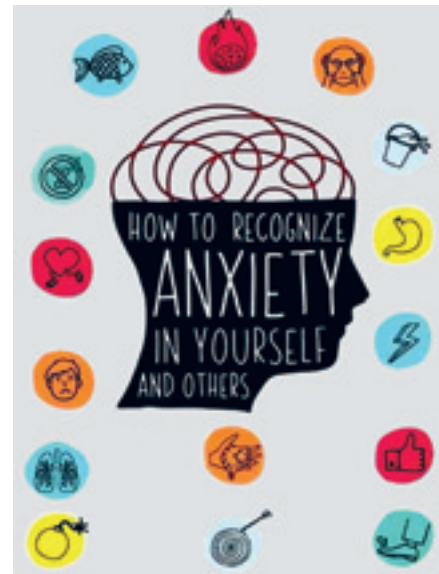
BOOSTING DIGITAL LITERACY AND ONLINE LEARNING

Recognising digital literacy was essential for designing and facilitating online learning, NHG College conducted eight 'Tech Tool Series' workshops that equipped 105 NHG educators and colleagues with the skills to strengthen digital literacy. Additionally, 'Tech Tool Series' guides and micro-learning courses were launched on NHG eLEARN in the first quarter of 2021 to encourage educators and staff to create engaging online learning materials.

NHG College also organised a series of Health Professions Education (HPE) webinars that showcased the use of technology to enhance learning and teaching. The webinars saw some 630 attendees across four sessions. Two e-learning modules, *Introduction to Online Teaching and Learning* and *Gamification in Healthcare*, were made available to NHG staff.

ENSURING WORKPLACE WELLNESS AND RESILIENCE

Burnout, fatigue, and trauma are some of the possible mental health conditions that healthcare workers may experience during the COVID-19 pandemic. To develop mental resilience, NHG College worked closely with core faculty teams from TTSH and the psychiatry department of Woodlands Health (WH) to develop the *Workplace Mental Health Workshops* to train staff to identify common mental health issues at the workplace, as well as administer mental health first aid. Two runs were conducted for 43 peer supporters and HR practitioners from NHG.



NHG RESIDENCY CAREER DAY 2020

NHG Residency held its first virtual Career Day in July 2020, which attracted more than 400 local and overseas Singaporean medical students and junior doctors. Some 800 residents, faculty members, and institution leaders across NHG showcased residency programmes and career opportunities, as well as hosted 'live' chat sessions with participants.



GATHERING ON-THE-GROUND KNOWLEDGE TO FIGHT COVID-19

STUDY ON PERCEPTION OF SINGAPORE'S HEALTHCARE WORKERS ON COVID-19 VACCINATION

In conjunction with Singapore's approval of the Pfizer-BioNTech's COVID-19 vaccine in December 2020, the HOMER (Health Outcomes and Medical Education Research) team worked closely with NHG Group Research and Group Corporate Communications to implement a study to examine vaccine hesitancy and vaccination concerns among healthcare workers.

An online questionnaire was disseminated to all NHG Staff, which focused on their willingness to receive COVID-19 vaccinations, perceptions on the risk of COVID-19 infections, awareness and concerns about COVID-19 vaccines, previous experience with vaccinations, and perceived professional and public health responsibilities. The subsequent roll-out of educational and publicity materials were based on the results of the study to address misinformation on and allay fears of COVID-19 vaccines. The findings were also used by the Temasek Foundation to develop public education materials on COVID-19 vaccination.

UNDERSTANDING COVID-19 TRANSMISSION IN THE MIGRANT WORKER COMMUNITY

HOMER led two studies that investigated the driving and mitigating factors that influenced the spread of COVID-19 within the migrant worker community. The studies also sought to better understand the health-seeking behaviours of migrant workers.

Study 1: The structure of relationships between dormitory locations, employers, and migrant workers in COVID-19 transmission

This study sought to understand the drivers of COVID-19 transmission by constructing an ecological network to examine the structure of relationships between migrant worker dormitory locations, employers, and the rise in infections. It aimed to help policymakers make informed decisions on the deployment of resources for testing and intervention, as well as to formulate housing policies that fortify the population against the spread of diseases. The ecological network enabled HOMER researchers to demonstrate a method to stratify risks of migrant workers' living locations, employers, and work locations. The study received a National Medical Research Council grant to undertake further work to bolster pandemic preparedness.

Study 2: Migrant workers' perceptions on the shift towards Regional Medical Centres (RMCs) for their healthcare needs

The HOMER team designed a multilingual survey to understand health-seeking behaviours of the migrant workers in the context of the transition to RMCs. The survey collected anonymous findings over one month from thousands of migrant workers residing in dormitories. The findings were presented to the Ministry of Manpower (MOM) and took into account the cultural sensitivities of migrant workers, especially in the provision of care to those who experienced acute respiratory infection symptoms.



Right: Illustrations provided by Temasek Foundation, under the Stay Prepared Initiative.

HONOURING EDUCATION EXCELLENCE TO EMPOWER OUR WORKFORCE

NHG RESIDENCY MVP AWARD

Fifty-two NHG residents – junior doctors training to be specialists – were recognised with the Most Valuable Player (MVP) award for stepping up to volunteer on the COVID-19 frontline, on top of their clinical commitments. The MVP award, given out by NHG Residency, acknowledged residents who have gone beyond the call of duty for their patients and their peers. Awardees were nominated by their colleagues, peers, and senior doctors.



GROUP EDUCATION

CLINICAL EDUCATORS ACKNOWLEDGED DURING THE PANDEMIC

Two hundred and thirteen Teaching Awards were presented at the 2020 NHG Teachers' Day celebrations, up from 190 presented in 2019. A Special Commendation Award was also introduced to recognise 40 educators who went the extra mile to champion change, develop solutions to minimise disruptions to learning, and create innovative learning opportunities amid the COVID-19 pandemic.

"The new normal is no longer new. Group Education has risen to the challenge, focusing on what we could control and negotiating areas which were unknown. Our people are our strength in weathering this storm."

Associate Professor Michelle Jong
Group Chief Education Officer, NHG



Above: Award winners from KTPH and Woodlands Health.



CONTINUED ACCREDITATION AND FULL COMPLIANCE FOR NHG RESIDENCY PROGRAMMES

NHG Residency, NHG Surgery-In-General Residency Programme, and NHG Urology Residency Programme achieved full compliance with accreditation standards. NHG Residency received another five years of continued full accreditation by Accreditation Council for Graduate Medical Education International (ACGME-I) and was commended for its substantial compliance with institutional requirements. Additionally, the NHG Surgery-In-General Residency Programme and NHG Urology Residency Programme were awarded the maximum four-year accreditation by the Joint Committee on Specialist Training.



"IN THE PAST, MANY SCIENTISTS AND CLINICIANS WOULD RARELY WORK ON A SHARED GOAL AT THE NATIONAL LEVEL. COVID-19 HAS BROUGHT THE IMPETUS AND FOCUS FOR ALL TO WORK TOGETHER, AND TO BUILD UP A COLLECTIVE CAPABILITY IN SINGAPORE'S RESPONSE TO THE PANDEMIC. TODAY, FEW RESEARCH CAPABILITIES IN THE MEDICAL FIELD EXIST ON THEIR OWN, THEREFORE, PARTNERSHIP IS INTEGRAL TO DEVELOP NEW AND BETTER WAYS OF DOING THINGS. IT IS ALSO IMPORTANT TO WORK BEYOND SINGAPORE, WITH OTHER COUNTRIES IN THE REGION, TO DEAL WITH THE THREAT OF NEW INFECTIOUS DISEASES COLLECTIVELY."

Professor Benjamin Seet Deputy Group CEO (Education & Research), NHG, & Assistant CEO (Corporate Services), Tan Tock Seng Hospital & Central Health

HEALTH SERVICES AND OUTCOMES RESEARCH

In 2020, Health Services and Outcomes Research (HSOR) directed its efforts towards supporting decision-making and generating evidence-based data for cluster and national COVID-19 initiatives, while continuing to evaluate clinical and population health programmes. During the pandemic, HSOR helped curate daily dashboard information, study disease dynamics and projection, and plan for capacity assurance and operational execution.

HSOR COVID-19 TRACKER

Since January 2020, HSOR monitored the COVID-19 situation internationally and locally. Information was collated from multiple sources and summarised into regular epidemiology reports. Daily updates, comprising the latest local and global news of the disease, were presented as an interactive dashboard (<https://hsor.shinyapps.io/covid19/>).

The local update covered daily epidemic curves and a detailed breakdown of cases stratified by different factors, e.g., community, dormitories, and imported; Singapore Citizens, Permanent Residents, work- and long-term visit pass holders. It also provided a comparison of weekly numbers of acute respiratory infections (ARI) and dengue surveillance. All local data was extracted from the Ministry of Health (MOH) COVID-19 Situation Reports (<https://www.moh.gov.sg/covid-19>).

The global update consisted of daily epidemic curves and trajectories by regions and countries. It tracked cumulative and daily cases, cumulative and daily deaths, case fatality rates, and mortality rates per million population. The global update also comprised a table that ranked the severity of the COVID-19 situation in countries around the world. This allowed the classification of regions and countries by different indicators, e.g., cumulative cases, daily cases, case fatality rates, latest doubling times, etc. The global update derived data mainly from Johns Hopkins University (<https://coronavirus.jhu.edu/map.html>), and was supplemented by information from Worldometers (<https://www.worldometers.info/coronavirus/>).

Figure 1: Local Epidemic Curve of Last 30 Days.

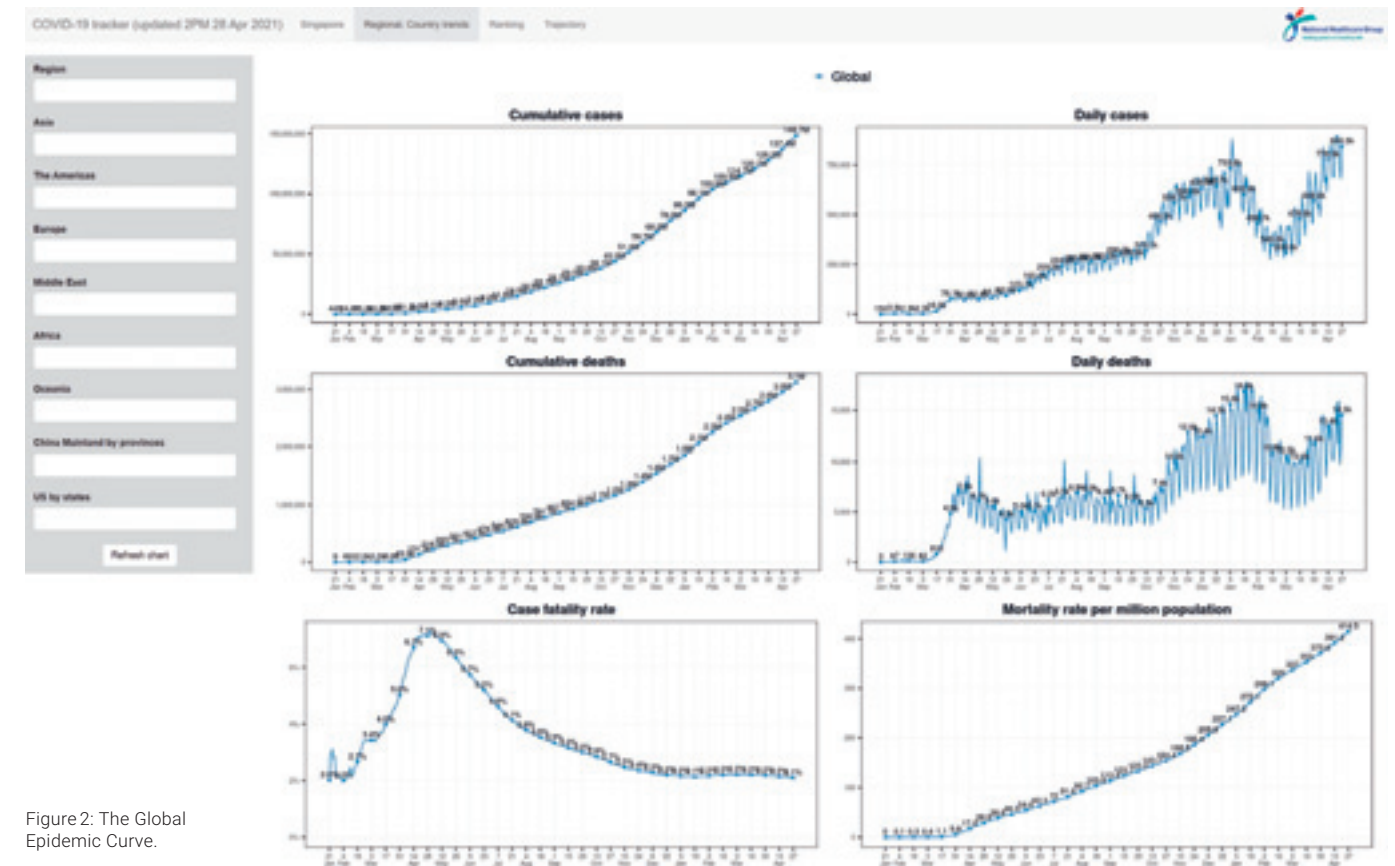
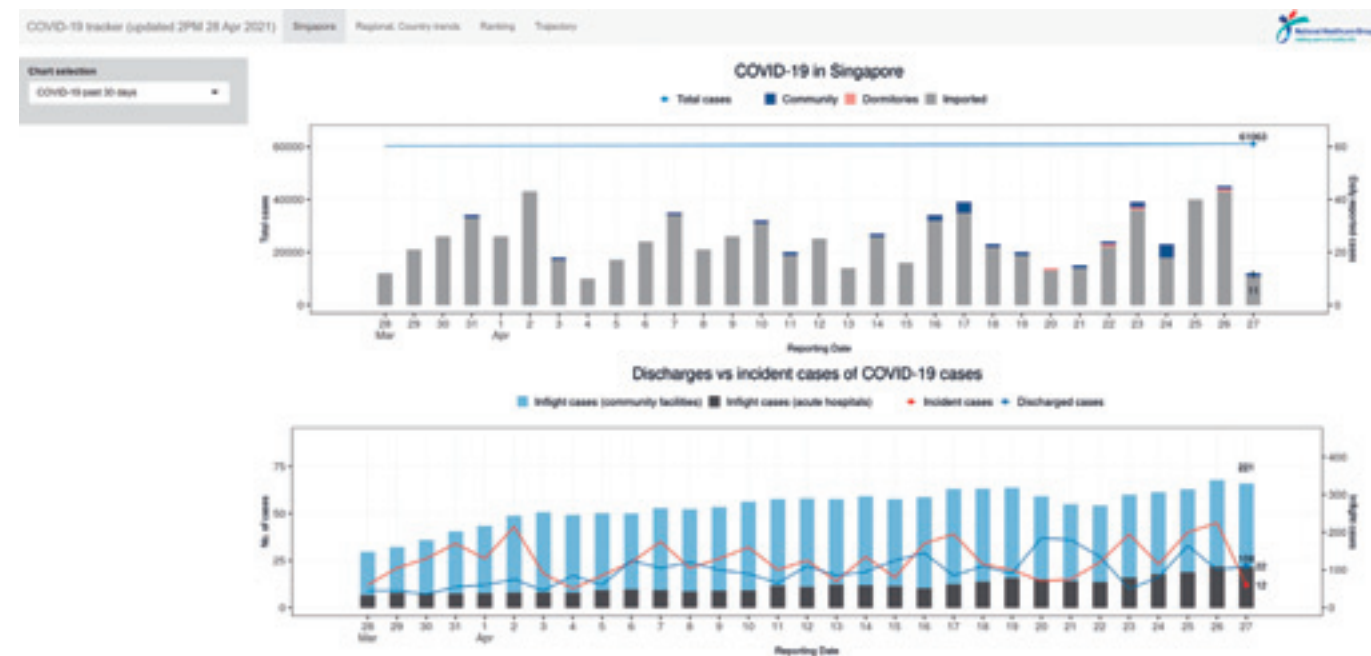


Figure 2: The Global Epidemic Curve.

ESTIMATING TRANSMISSION PARAMETERS OF COVID-19 CLUSTERS IN SINGAPORE

HSOR collaborated with the National Centre for Infectious Diseases (NCID) and the University of Hasselt, Belgium, to examine the underlying disease transmission dynamics of COVID-19, pertinent in guiding the use of outbreak control measures and minimising the impact of the pandemic. The basic reproduction number (R_0) of an epidemic denoted the average number of people a person infected in a completely susceptible population. However, knowing the R_0 alone was insufficient. Other parameters, like the incubation period, serial interval (i.e., the length of time between symptom onset of two cases) and generation interval (T_g) (i.e., the length of time between the points of infection for two linked cases), provided critical insights on the transmission chain.

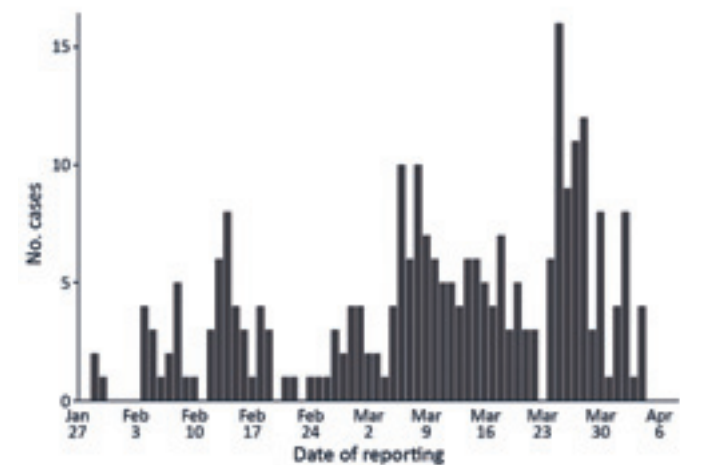
Additionally, as conventional outbreak control measures are centred on isolation, contact tracing, and treatment of symptomatic cases, the prevalence of pre-symptomatic transmission (p) in a population would help steer measures to address potential transmission among those with no apparent symptoms. Hence, estimates of R_0 , T_g , and p were generated using published symptom onset data of cases in Singapore.

The data used covered the outbreak in Singapore from 23 January 2020 to 6 April 2020 (Figure 3). Specifically, information from confirmed COVID-19 cases classified by MOH and linked to local clusters, was studied. Date of symptom onset (DOOs) were extracted, and cases with DOOs unavailable were excluded from the analysis (Figure 4). Index cases were identified and potential infectors of each case were based on available

information of the cases' known contacts and published case links. Applying a heuristic technique, potential infectors who could have transmitted the COVID-19 infection to the confirmed cases were sensibly included.

The infector-infectee pairs constructed were subsequently used to estimate the serial and T_g distribution for established clusters in Singapore. Through a Bayesian Markov Chain Monte Carlo procedure and its estimated parameters, the corresponding distribution of R_0 , and subsequently p , were established by simulating infections and computing the proportion of pre-symptomatic transmissions.

Figure 3: Epidemic Curve of COVID-19 Clusters (Singapore), January-April 2020.



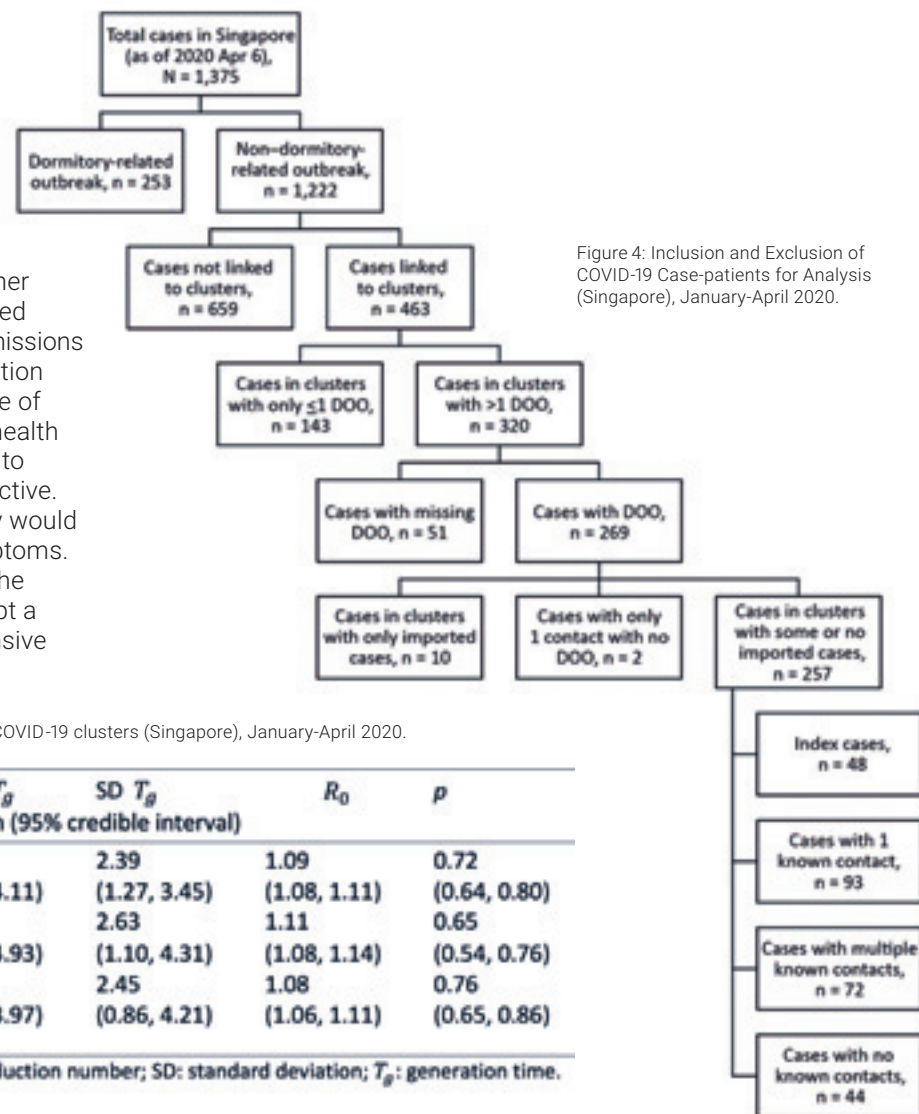


Figure 4: Inclusion and Exclusion of COVID-19 Case-patients for Analysis (Singapore), January-April 2020.

A person infected with COVID-19 was estimated to pass the infection to another individual in 3 days, and 72% of simulated infections were pre-symptomatic transmissions (Table 1). Due to the short mean generation interval and consequent high prevalence of pre-symptomatic transmission, public health control measures had to be responsive to these characteristics in order to be effective. Universal masking up in the community would limit transmission independent of symptoms. Contact tracing would have to include the period before symptom onset, and adopt a digital approach to be more comprehensive and less labour-intensive.

Table 1: Estimates of Transmission Parameters of COVID-19 clusters (Singapore), January-April 2020.

| Infectee type | Mean T_g Median (95% credible interval) | SD T_g (1.27, 3.45) | R_0 (1.08, 1.11) | p (0.64, 0.80) |
|--|--|--------------------------|-----------------------|----------------------|
| All cases (N=209) | 3.44 (2.79, 4.11) | 2.39 (1.27, 3.45) | 1.09 (1.08, 1.11) | 0.72 (0.64, 0.80) |
| Cases with only 1 known contact (N=93) | 3.93 (3.00, 4.93) | 2.63 (1.10, 4.31) | 1.11 (1.08, 1.14) | 0.65 (0.54, 0.76) |
| Cases with only multiple or no known contact (N=116) | 3.03 (2.13, 3.97) | 2.45 (0.86, 4.21) | 1.08 (1.06, 1.11) | 0.76 (0.65, 0.86) |

p : pre-symptomatic proportion; R_0 : basic production number; SD: standard deviation; T_g : generation time.

ESTIMATING INTENSIVE CARE UNIT BED CAPACITY DURING THE COVID-19 PANDEMIC USING WHAT-IF ANALYSIS

COVID-19 mortality rates across the globe were affected by multiple factors, including hospital resources, healthcare manpower, and intensive care unit (ICU) bed capacity, etc. Due to limited data in the early phase of the pandemic, it was challenging to make informed decisions in the management of critical healthcare resources, such as ICU bed capacity. To provide information for decision makers to plan surge bed capacity to meet the needs of critically ill patients requiring ICU care, surge demand on ICU beds from COVID-19 patients was estimated, based on patient data during the early phase of the pandemic (23 January to 19 March 2020) in Singapore.

The average number of cases was estimated using local COVID-19 admissions, and the What-If Analysis was applied to assess the associated ICU bed demand. The values of the underlying parameters, i.e., ICU admission rate and average length of stay (ALOS), were either estimated from Singapore reports, or referenced from population data in China. In the analysis, it was assumed that 5% to 20% of confirmed COVID-19 cases

would be admitted to ICU, and that the ALOS in ICU ranged from 7 to 15 days. For brevity, we considered scenarios of lower and upper bounds of ICU admission rates and ALOS, that is, ICU admission rates were 5%, and 20%; and ALOS were 7 and 15 days, respectively. If 5% of new COVID-19 cases were admitted to the ICU, the hospital would need 4 to 30 ICU beds. Similarly, the hospital would require 14 to 120 beds for a 20% admission rate (Table 2).

Table 2: Estimation of ICU Bed Capacity Required.

| Bed estimation for an ICU admission rate of 5% | | |
|---|--------------|---------------|
| Daily cases | ICU ALOS = 7 | ICU ALOS = 15 |
| 10 | 4 | 8 |
| 40 | 14 | 30 |
| Bed estimation for an ICU admission rate of 20% | | |
| Daily cases | ICU ALOS = 7 | ICU ALOS = 15 |
| 10 | 14 | 30 |
| 40 | 56 | 120 |

MATCHING OF MIGRANT WORKER DORMITORIES TO PUBLIC HEALTH PREPAREDNESS CLINICS (PHPCS)

As part of planning of COVID-19 operations, it was necessary to organise the medical needs of unwell migrant workers efficiently. They were housed in dormitories of varying sizes at different locations across Singapore, and specific Public Healthcare Preparedness Clinics (PHPCs) were appointed to take care of their medical needs. The migrant workers were usually sent to the nearest PHPCs if they required care. However, planning was needed to ensure these clinics were not overwhelmed.

In April 2020, at the height of the outbreak in the dormitories, HSOR was asked to study the adequacy of coverage of some 300 PHPCs for about 1000 dormitories. A mathematical model based on Mixed Integer Programming (MIP) was developed for this purpose using IBM ILOG CPLEX Optimization Studio.

Using this model, all dormitories were assigned to the nearest PHPCs with the condition that no PHPC needed to manage more than a given number of workers. Some larger dormitories needed more than one PHPC to cover their medical needs. The results from this project were shared with the Joint Task Force, comprising MOH, Ministry of Manpower (MOM), and Ministry of Defence (MINDEF). This helped facilitate their operations and planning during the outbreak in the dormitories.

FORECASTING STEADY STATE PREVALENCE OF COVID-19 IN MIGRANT WORKER DORMITORIES

HSOR reported a forecast of infections in migrant worker dormitories (as at 24 May 2020) using infectious disease transmission modelling and assumptions on baseline parameters.

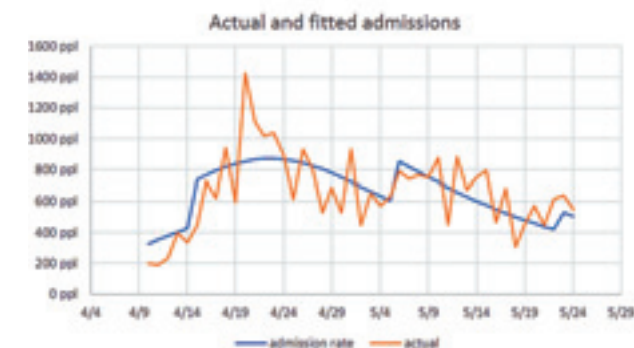
A 2-flow (asymptomatic and symptomatic) Susceptible-Infectious-Recovered (SIR) model was built to calculate baseline parameters and forecast COVID-19 transmissions in these dormitories. Baseline historical transient incidences from April to May 2020 were used in the model (Figure 5). Baseline model parameters were calibrated or based on assumptions from literature (Table 3). A system dynamic modelling software was implemented to derive transmission flows with pre-specified assumptions (Figure 6).

Key assumptions of the model were:

- There was a large pool of infected and infectious cases in migrant worker dormitories at the end of March 2020.
- There were separate streams for symptomatic and asymptomatic patient pathways.

The steady state SIR model forecast by HSOR, as of 24 May 2020, reported 45,000 Polymerase Chain Reaction (PCR) cases (new infections) and 106,000 seropositive cases (past infections). Results generated were reasonably close to publicly available data published by MOH – On 14 December 2020, MOH announced that there were 54,000 PCR cases and 98,000 seropositive cases in the migrant worker dormitories. The model results were similar when we simulated varying testing capacities of the migrant worker dormitories.

Figure 5: Baseline Historical Transmissions.



| Parameters | Value | Remarks |
|---|-----------------|---|
| Population | 320,000 | FW population |
| Basic reproduction number (R_0) | 2.6 | Assume natural R_0 |
| Initial asymptomatic patients | 55,000 | Assume to reach based on $R_0=4$ from 20 April 2020 |
| Initial symptomatic patients | 400 | Function of initial asymptomatic state |
| Ratio of asymptomatic: symptomatic infection rates | 8:1 | Anecdotal assumption/calibrated |
| Infectious period | 5 days | |
| Time to isolate symptomatic patient | 2.5–3 days | 2 days as pre-symptomatic, 1 day to isolate |
| Mean duration of infection in asymptomatic patient | 25 days | Patient will be PCR+ for 25 days |
| Swab test capacity | 1,000–3,000/day | Ramped up from 10 April 2020 |
| Average length of stay (ALOS) in Community Isolation Facility | 25 days | |

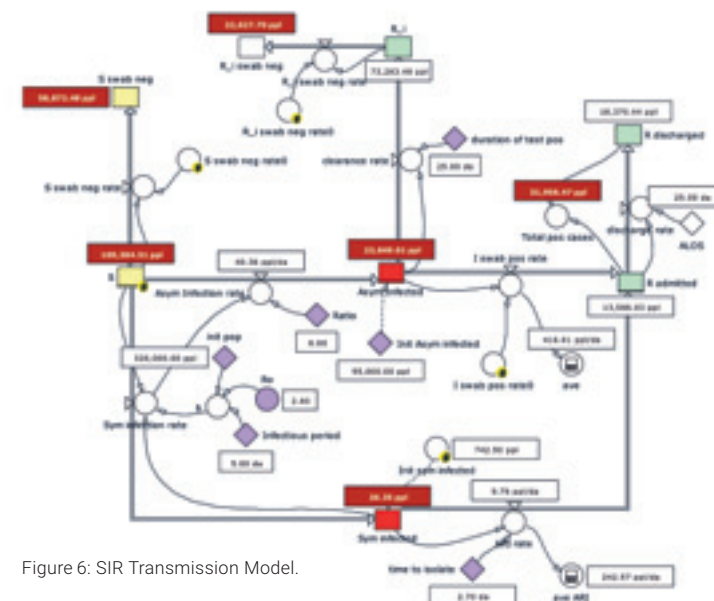


Figure 6: SIR Transmission Model.

Table 3: Baseline SIR Model Parameters .

GROUP QUALITY AND CLINICAL GOVERNANCE

NHG's Group Quality and Clinical Governance (GQCG) develops, implements, and evaluates corporate strategies and plans to achieve quality and patient safety, and manages clinical risk across the Group and in the Regional Health System. While the COVID-19 pandemic disrupted standard operating processes, it also presented opportunities for process redesign, and in turn, for GQCG to provide leadership and guidance to staff, the community, and the healthcare fraternity in matters of safety, risk, improvement, and innovation.

STEPPING UP TO FIGHT COVID-19

VOLUNTEERING ON THE FRONTLINES

When COVID-19 cases started to surge, more than 50 per cent of staff from GQCG stepped forward to help out at the frontlines. Between February and November 2020, they were deployed across NHG Institutions, migrant worker dormitories, and the Community Care Facility (CCF) at Singapore EXPO, to augment manpower and support the nationwide effort to contain the virus. They took on various roles and duties, including managing crowds, screening patients and visitors, packing and checking medications, and process auditing.

ENHANCING HEALTH AND SAFETY OF MIGRANT WORKERS

When COVID-19 outbreaks were detected among the migrant worker population in Singapore, NHG helped set up Medical Centres for Migrant Workers (MCMW) in the dormitories. GQCG worked with the Ministry of Manpower (MOM) to create a new audit framework, train staff in auditing practices, and audited 13 MCMW.

"All patients desire to be heard, understood, and shown empathy when seeking medical care. The human touch is essential in building trust and relationships, and helps patients achieve desired outcomes."

Ms Tracy Gan Director, Service Leadership & Patient Relations, National Healthcare Group Polyclinics



FRONTLINE EXPERIENCE

Mr Edrei Quek, Senior Executive, GQCG, was deployed to Institute of Mental Health's (IMH) Pharmacy Service Centre (PSC) between February and June 2020. He and team were responsible for checking medications prior to dispatch to patients' homes.



UPLIFTING STAFF DURING COVID-19

Staff working on the frontlines and in care settings not only faced a higher risk of exposure to the virus, but also heightened levels of stress, anxiety, and fear. GQCG together with Group Human Resource (GHR) implemented a peer support programme for staff at NHG HQ to provide psychological support for staff.

GQCG staff learnt virtual collaboration, including new tools and tips on working remotely. There were also team-bonding activities to bring cheer to staff. The department regularly connected over social media and virtual activities such as group walks, *Jukebox Over Lunch*, and *Kopichat* to share topics of interest.

Left: A/Prof Tai Hwei Yee, Group Chief Quality Officer, NHG, (centre) leading the NHG team to audit Medical Centres for Migrant Workers.

PRESSING ON WITH QUALITY

ENHANCING SAFETY AND QUALITY IN CLINICAL CARE

The NHG Harm Reduction Collaborative unit held its on-boarding meeting in July 2020 to welcome members of the Implementation Committee and Expert Panel. Helmed by institution representatives and in partnership with external experts, the unit aims to implement enhanced safe practices in clinical care.

As part of on-going efforts to strengthen risk awareness, GQCG launched a new publication, *Quality Bulletin*, which shares bite-size information on patient safety and quality improvement across NHG. In addition, training resources on the management of clinical risks were developed for the first time to complement training programmes at NHG Institutions.

In April 2021, Associate Professor Tai Hwei Yee, Group Chief Quality Officer, NHG, shared NHG's journey in building a culture of safety and management of clinical incidents with leaders from the Singapore Armed Forces (SAF) Medical Corps.



NHG Quality Webinar 2021.

NHG QUALITY DAY

In April 2021, the annual NHG Quality Day was conducted as a webinar, titled *Person-Centred Care in the New Normal*. Experts and panellists discussed topics such as influencing the making of national policies for person-centred care, preventive health, caring for vulnerable groups, and home care.

INAUGURAL INSTITUTE OF HEALTHCARE QUALITY VIRTUAL WORKSHOP

During the COVID-19 pandemic, the Institute of Healthcare Quality (IHQ), GQCG's training arm, leveraged on technology to train and share best practices among staff through virtual and hybrid platforms. Educators and administrators across IHQ reformatted existing curriculums and built capabilities to conduct effective virtual training programmes and workshops. In October 2020, IHQ held its first virtual workshop on "Measurement", to determine if changes implemented to processes/programmes have led to improvement in outcomes.

"At times, there will be external challenges or changes in our environment that may detract us from our core values. Especially during crisis when faced with the pressure to respond fast to the situation at hand, we need to bear in mind that patients are at the front and centre of what we do."

Associate Professor Tai Hwei Yee
Group Chief Quality Officer, NHG

GROUP NURSING

NHG Group Nursing was established in October 2020 and is led by NHG Group Chief Nurse (GCN), Associate Professor Yong Keng Kwang. As nursing is the core of healthcare, Group Nursing aims to elevate the profession by facilitating best practices and attaining excellence in patient care across NHG Institutions by focusing on three key areas: (i) Talent Management and Manpower Optimisation (ii) Nursing in Population Health and (iii) Nursing Standards and Policies. Group Nursing also serves as the administrative arm of the NHG Nursing Council, NHG Nursing Strategic Map, and NHG Community Nursing.

NHG NURSING STRATEGIC MAP

The NHG Nursing Council was established in 2017 and is a platform for nursing leaders to synergise efforts to improve nursing standards and drive transformation of the profession across the cluster to meet the current and future needs of Singapore's healthcare system. Aligned to NHG's and Ministry of Health's (MOH) key population health priorities, the NHG Nursing Council oversees strategic development in the areas of Productivity and

Innovation, Education and Career Development, Quality, and Research. In November 2020, the NHG Nursing Council held a Strategic Retreat, facilitated by the NHG Clinical Governance team and NHG Group Nursing. It was attended by NHG Senior Management, Chief Nurses of the institutions, and nurses across the board. Based on collective discussions from the Strategic Retreat, Group Nursing developed the NHG Nursing

Strategic Map to achieve the strategic goal: "NHG Nurses are trusted and chosen to provide expert advice, decisions, and care." This would be attained through four strategic thrusts across the five care segments of NHG's River of Life framework:

- Relationship-Based Care** establishes trust-based relationships with patients and their families to ensure continuity of care.
- Nurses beyond Nursing, Nursing beyond Nurses** encourages staff to gain mastery of nursing practice, and adopt trans-disciplinary competencies to add value to the care of patients and their families.
- Digitally-Enabled Workforce** harnesses technology to enable timely solutions and interventions at any time and place, and continually spurs innovation in the way we deliver care.
- Positive Practice Environment** builds a shared governance culture that engages, encourages, embraces, and empowers NHG Nurses.

The NHG Nursing Council will sponsor the NHG Nursing Strategic Map, while Group Nursing will helm the development and implementation of action plans to actualise the strategic goal in the next three to five years.



"The COVID-19 pandemic has taught NHG nurses the need to be agile in learning and for our practice scope to be broader. We must be trans-disciplinary in mindset, approach, and practice, and go beyond nursing to leverage on the strengths of patients, relationships, and technology to make this shift."

Associate Professor Yong Keng Kwang Group Chief Nurse, NHG

NHG COMMUNITY NURSING

The NHG Community Nursing Committee was set up in end-2017 to harness best practices and develop holistic, patient-centred, and nurse-led care in the community. It serves as a central platform to oversee strategies, provide actionable resolutions, and continuously improve the standards of community nursing across the care continuum. This is underpinned by the 2S+2C concept and The Omaha System, embedded in our community nursing's clinical protocols, workflows, and nursing competency.

2S+2C Concept

SENSING

Encourages community nurses and lay extenders (or community care associates) to consolidate data on at-risk individuals/clients to address their needs proactively/preventively in a timely manner. This is achieved by connecting with individuals, families, grassroots organisations, and providers in the community.

STRENGTHENING

Focuses on improving the knowledge and skills of individuals and families to exercise self-managed care, and equipping community partners with the capability to better support and complement health and social care.

CARE

Hones in on developing the required competency to provide appropriate clinical and social care through assessment, care planning, interventions, and escalation/de-escalation of care.

COORDINATION

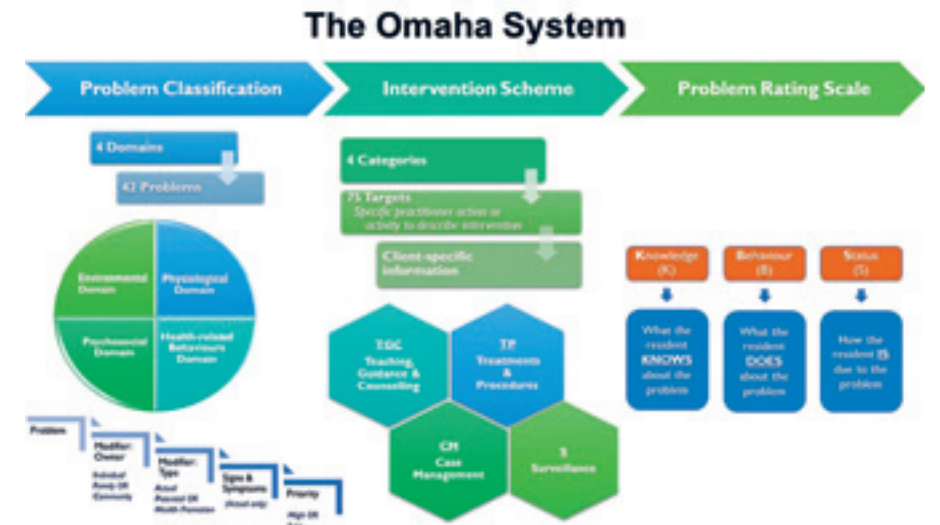
Enhances seamless care by working closely with the various levels of community of carers and partners to maintain the optimal function of individuals in the community.



The NHG Healthy Planet Build Team designed and developed the IT requirements of NHG Population Health and NHG Community Nursing for the NGEMR.

The Omaha System

The NHG Community Nursing Committee adopted The Omaha System to augment community nursing standards of practice. It is a standardised framework to document problems, interventions, plans and evaluations (for an individual, family or community). It comprises a Problem Classification Scheme, Intervention Scheme, and a Problem Rating Scale for Outcomes. The Omaha System has been built into the Epic Healthy Planet module of the Next Generation Electronic Medical Record (NGEMR).



Development of Clinical Workflows

The NHG Community Nursing developed four clinical workflows to manage functional ability and falls, cognition, diabetes, and depression in the community. These nurse-led clinical workflows guide the care delivery for clients and/or caregivers with existing chronic diseases such as dementia and diabetes, and enable clients who are potentially at risk of developing these conditions to have timely access to health services and interventions. The interventions were derived from the harmonisation of best practices across various institutions and settings, including Institute of Mental Health (IMH), and community and primary care providers.

The workflows consist of trigger questions where clients at risk will be identified and evaluated using assessment tools. Interventions are planned and appraised based on the clients' risk profiles and are aligned with The Omaha System framework. Where necessary, community nurses escalate and coordinate referrals to specialist care for high-risk clients. The first three clinical protocols on managing functional ability and falls, cognition, and diabetes were piloted in early 2021, while the fourth clinical protocol on managing depression is work-in-progress.

GROUP NURSING

“The scope of work and training will be broadened to allow nurses to play a wider role in providing care and improving the health of our population.”

Dr Janil Puthucheary Senior Minister Of State,
Ministry Of Communications And Information & Ministry Of Health

Serving Our Population

As at December 2020, the NHG Community Nursing team comprised 85.5 registered nurses and 32 lay extenders (or community care associates):

- The team served more than 15,000 unique clients in the Central zone, and some 13,000 unique clients in the Yishun and Woodlands zones collectively.
- Community nursing programmes rolled out include the Community Nursing Pilot Programme, Ageing-in-Place Community Care Team (AIP-CCT), Hospital-to-Home (H2H), Community Health Post (CHP-Health Coach), Community Health Team (CHT-Nursing and Health Coaches), Community Screening (P5, Functional Screening), Project CARE, Coaching for Health Action and Management Programme-CHAMP (CHP), and Programme IMPACT.
- The team managed 114 Community Nursing Posts (CNPs) co-located at Senior Activity Centres (SACs), Residents' Committees (RCs), Community Centres (CCs), etc.

NHG Community Nursing shared best practices regarding The Omaha System with the NUHS Community Nursing team.



EMPOWERING OUR NURSES

With effect from 1 July 2021, 'Assistant Nurse' has been redesignated as 'Enrolled Nurse' across all NHG Institutions. This better reflects the expanding and empowered roles of our nurses in providing care. It is also more strategically aligned to their professional development and career aspirations.



NHG PHARMACY

National Healthcare Group Pharmacy (NHGPh) strives to make a difference in the care of our patients by advocating the safe and responsible use of medicine and helping patients achieve the best health outcomes for their prescribed therapy. During the COVID-19 pandemic, our pharmacists continued to support and enable patients and caregivers to manage their health and medications safely at home.

AUGMENTING MEDICATION DELIVERY SERVICES

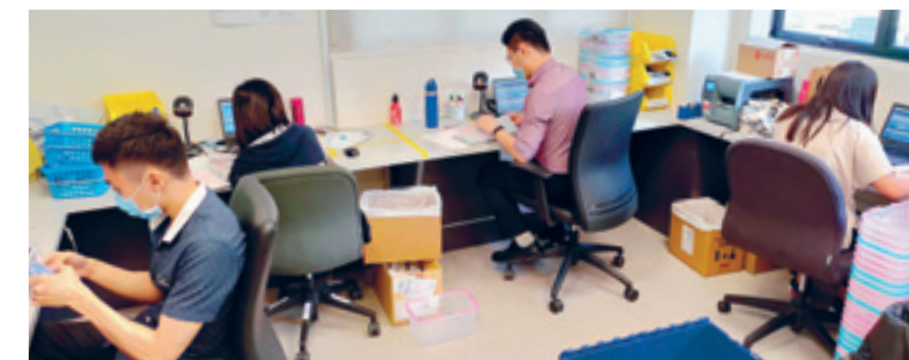
During the COVID-19 outbreak, NHGPh together with National Healthcare Group Polyclinics (NHGP) and National University Polyclinics (NUP) extended the medication supply and provided medication delivery services for patients with stable chronic conditions. This enabled continued care for patients while keeping them safe at home. In early February 2020, dedicated teams set up enhanced efficiency of medication delivery at polyclinic pharmacies. NHGPh headquarters also provided additional manpower and more couriers were engaged to support the surge in demand of the service.

To better manage workloads at the outpatient pharmacies, the Pharmacy Services Centre (PSC) at the Institute of Mental Health (IMH) expanded its Central Fill Pharmacy (CFP) capabilities. The PSC converted a meeting room into a satellite pharmacy equipped to capture prescription, and pick and pack medications. It also created a new dispensing area for pharmacy technicians and pharmacists to conduct clinical and quality control for packed medications before delivery.

By mid-February 2020, the CFP handled 40 per cent of prescriptions requiring delivery, thereby easing the load at polyclinic pharmacies. In 2020, NHGPh on average fulfilled 12,800 medication deliveries per month as compared with 400 deliveries per month in 2019. At the height of the pandemic in July 2020, NHGPh handled a record 21,000 deliveries that month.

SETTING UP ON-SITE DISPENSARIES AT THE COVID-19 FRONTLINE FACILITIES

In April 2020, NHGPh set up on-site dispensaries at the 14 migrant worker dormitories and four Swab Isolation Facilities (SIFs) assigned to NHG. These dispensaries were manned either by a pharmacy technician or a nurse. During the Circuit Breaker period and up until July 2020, the Yishun Polyclinic pharmacy team handled the logistics of the central supply for medication and pharmacy consumables like packaging materials and multi-lingual drug labels. This covered filling of prescriptions written by doctors at the medical posts and SIFs, and delivery of medication to migrant workers who had chronic diseases but were unable to visit their usual doctor, or obtain their medication.



Top: Volunteers pre-packing medication for on-site dispensaries at migrant worker dormitories. Below: A pharmacy technician dispensing medication at a migrant worker dormitory.

“Emerging from our COVID-19 experience, we will be leveraging on technology and thinking of new ways to collaborate with others to engage, activate, and deliver care to the different segments of the population, so that medications will always be used safely and appropriately to provide the best health outcomes.”

Ms Chan Soo Chung
Executive Director, NHG Pharmacy

ORGANISING INFORMATION FLOW

In June 2020, FasXpress was introduced at the CFP to enable organised information flow from the source system, which helped eliminate manual transcription.

This resulted in an estimated time savings of 8.3 man hours per 1,000 prescriptions. The system used barcode and drug images to validate and verify medications. It improved medication safety by ensuring the right drugs were picked and packed, and delivered to patients.



DRUG DISPENSING SYSTEM (DDS) GOES “LIVE” AT ANG MO KIO AND YISHUN POLYCLINIC PHARMACIES

To automate workflows, NHGPh introduced robotics to handle non pre-packed blister strips with variable quantities. The Drug Dispensing System (DDS) and Automated Tote Handler (ATH) were rolled out at the pharmacies in Ang Mo Kio and Yishun Polyclinics in April and June 2020, respectively. The DDS packed medication blister strips on demand into Ziploc bags and printed patient-specific instructions. Boxed medications could also be picked and affixed with patient-specific labels. The ATH aided in the seamless consolidation of these Ziploc bags and boxes, readying them for dispensing to patients. Both systems increased the pharmacy automated workload to 80 per cent, and improved overall accuracy.

National Healthcare Group Diagnostics (NHGD) played a key role in Singapore’s battle against COVID-19. It added three units to the nation’s Mobile X-ray fleet, extending X-ray services to Community Care Facilities (CCFs) across the island. In April 2020, NHGD’s Mobile X-ray trailer (MX1) was deployed to the CCF@EXPO to provide timely X-ray diagnosis of patients with acute respiratory symptoms.



MOBILE X-RAY ON THE FRONTLINE

With increased demand for on-site X-ray services at CCFs, NHGD converted its Mobile Bone Mineral Densitometry (BMD) trailer into a second Mobile X-ray (MX2) trailer in late April 2020, and deployed it to CCF@Tuas South. The Mobile BMD was retrofitted with a new mobile X-ray system within 12 days despite the global supply chain disruption and manpower restrictions during the Circuit Breaker.

The other two units, designed and built in collaboration with Temasek Foundation, were the first in Singapore to be equipped with a Negative Pressure System (NPS). The Mobile X-ray services helped ease the COVID-19 patient load for X-rays in hospitals, and minimised risk of cross-infection.



X-RAY SERVICES AT MIGRANT WORKER ONBOARDING CENTRES

In March 2021, the MX1 was deployed to the Migrant Worker Onboarding Centre (MWOC) @ Punggol to provide on-site X-rays. Two months later, it was deployed to the MWOC @ Eunos. The MWOC was a one-stop service that integrated Stay-Home Notice (SHN) with medical examinations and a “settling-in” programme for migrant workers before they started work in Singapore. It minimised community infection from COVID-19 cases and brought convenience to employers. NHGD radiographers performed chest X-rays for the workers, a medical requirement in application for a work pass.



Mobile X-ray at MWOC@Punggol.

NHG DIAGNOSTICS

LABORATORY SUPPORT FOR NATION'S COVID-19 TESTING EFFORTS

To boost nationwide COVID-19 laboratory testing capabilities, NHGD carried out swab sample delivery, blood sample collection, and antibody testing.



COVID-19 antibody testing at an NHGD laboratory.



Above: NHGD staff volunteers at NHG Pharmacy.

Volunteering at NHG Institutions

About 10 per cent of NHGD clinicians and administration staff volunteered at NHG institutions that were facing manpower needs. Allied health professionals were deployed to reinforce X-ray and laboratory operations at Tan Tock Seng Hospital (TTSH)/National Centre for Infectious Diseases (NCID), CCFs, as well as dormitories for serology testing. NHGD staff also supported operations at NHG Pharmacy, where medication had to be packed for home delivery and for medical posts at dormitories.



Augmenting national COVID-19 antibody testing capacity

In June 2020, NHGD implemented COVID-19 antibody testing at its laboratory at Buangkok Green Medical Park, where up to 400 tests were conducted each day.

Delivering swab samples from polyclinics to COVID-19 testing laboratories

When the polyclinics started to conduct swab tests in early 2020, NHGD medical couriers were activated to deliver swab samples safely and quickly from the polyclinics to COVID-19 testing laboratories located in hospitals for timely processing. Strict infection control measures were put in place to safeguard the safety of staff and members of the public, as well as to maintain the integrity of the samples.

BOOSTING TRAINING CAPACITY FOR RADIOGRAPHY STUDENTS

In June 2020, there was a national shortage of radiography clinical postings, as hospitals had to reduce their intake of undergraduate students to cope with the COVID-19 crisis. In view of this, NHGD helped fulfil the students' graduation requirements by hosting its largest cohort of radiography students and increasing placement sites. This exercise concluded successfully as students gave good feedback on their experiences.



Supporting serology testing at migrant worker dormitories

In May 2020, NHGD led a team of phlebotomists to support serology testing operations by NHG for some 30,000 migrant workers at the dormitories. NHGD helped recruit and coordinate manpower, ran competency checks, and trained more than 20 phlebotomists, who were volunteers from public/private organisations and locums. NHGD also established workflows and guidelines to ensure the implementation of infection control measures on-site. For more than 1.5 months, the team drew some 1,200 blood samples daily, which were subsequently sent to hospital laboratories for COVID-19 antibody testing. This operation facilitated the early return of migrant workers to work.

“COVID-19 has disrupted our lives. Yet, it has created new opportunities, fuelled development and progress, and uncovered exciting potential that we may not have known before as individuals or as a team.”

Ms Lim Soh Har Executive Director, NHG Diagnostics

INNOVATIONS AND DIGITAL TRANSFORMATION

NHGD embarked on various innovations and digitalisation projects to meet the evolving needs arising from the pandemic.

New self-service appointment system increases screening uptake

In September 2020, NHGD implemented a new 24/7 self-service Interactive Voice Response System that improved access to appointment booking for preventive health screenings such as mammograms and bone mineral density tests. The number of bookings made via e-forms increased by 70 per cent within the first month of the launch.



New Electronic Collection Module supports NGEMR “Go-Live” in polyclinics

NHGD implemented a new Electronic Collection Module (ECM), a one-stop system for collection of laboratory test orders, to support the “Go-Live” of Next Generation Electronic Medical Record (NGEMR) in polyclinics. The ECM generated ready-to-use specimen labels and had in-built verification checks. This ensured the labels corroborated with the right patients.

Faster and safer scans with a new X-ray system at Geylang Polyclinic

In November 2020, NHGD upgraded the static X-ray system at Geylang Polyclinic. The new ceiling-suspended full-digital radiography system with a height-adjustable examination table allowed patients to remain in their wheelchair or trolley bed for most X-ray examinations, thus cutting down examination turnaround time and minimising discomfort. The risk of injury to staff was also reduced as no additional manpower was required to transfer the patient to the examination table.

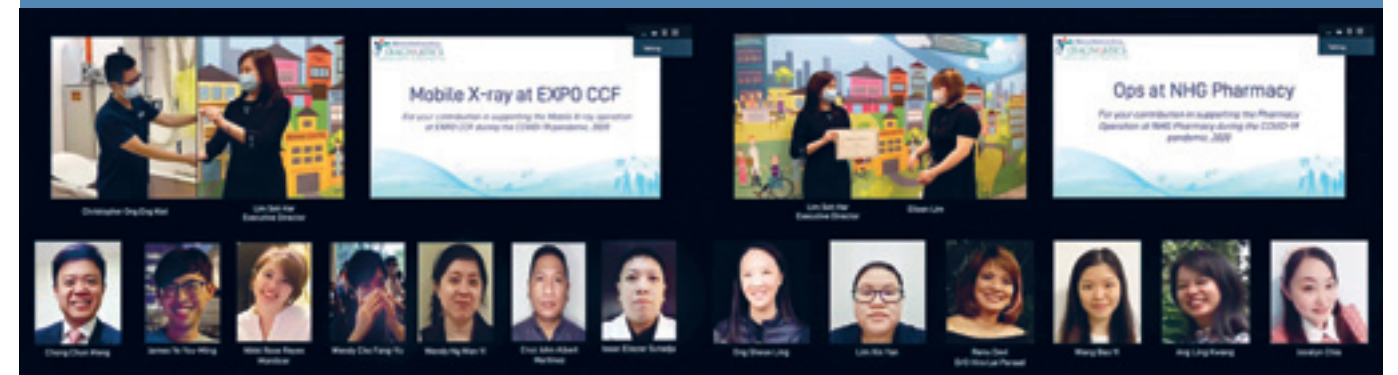


Mammovest simulator for safe training during the pandemic

When mammogram services were suspended during the Circuit Breaker, NHGD mammographers enhanced their training with Mammovest, a breast simulator made of soft silicone that mimics the anatomy and feel of a real breast. Thus, even without real-life patients, training demonstrations could be conducted in a safe and timely manner.

NHGD AWARDS CEREMONY 2021

The NHGD Awards Ceremony 2021 was held during the inaugural virtual New Year Party in January 2021, where 100 frontline and backroom staff were recognised for their efforts and contributions toward the COVID-19 pandemic. These included operations support at CCFs, dormitories, TTSH/NCID and NHG Pharmacy, logistics support for the mobile fleet, and procurement support for medical/infection control supplies.



GROUP CORPORATE DEVELOPMENT

Group Corporate Development (GCD) provides planning support for NHG and is the key liaison office with the Ministry of Health (MOH) on corporate governance and work plans. GCD also helms NHG's Enterprise Risk Management, Crisis Management, and Data Protection Office.

RALLYING NHG IN THE FIGHT AGAINST COVID-19

SUPPORTING OPERATIONS AT MIGRANT WORKER DORMITORIES

In April 2020, when COVID-19 cases surged among migrant workers residing in dormitories, the Government initiated a Whole-of-Nation response to manage the outbreak. NHG was asked to provide medical support and operations for more than 50,000 workers living in 14 purpose-built dormitories (PBDs). GCD, together with Institutions, worked with multi-agency partners to set up medical posts in the PBDs. Despite the scale, complexity, and urgency of the crisis, NHG rose to the challenge – the first medical post was operational within three days, and all 14 sites were seeing patients within a week.

On the ground, GCD and National Healthcare Group Polyclinics (NHGP) also organised and led the mobile mass swabbing operations in the community. Teams were deployed island-wide to conduct swabbing for at-risk and vulnerable individuals, including migrant workers.



“2020 pushed us out of our comfort zones and accelerated learning and development. Driven by a common purpose, we found joy in work and operationalising our core values.”

Mr Darion Chong Group Chief Corporate Development Officer & Group Chief Data Protection Officer, NHG

MOUNTING CLUSTER-WIDE VACCINATION EFFORTS

Singapore received its first batch of COVID-19 vaccines in December 2020, and started its national vaccination programme in the same month. Some 40 staff from the National Centre for Infectious Diseases (NCID) were among the first to receive their jobs.

GCD worked with Institutions to coordinate staff vaccination efforts across the cluster. NHG's vaccination exercise commenced in January 2021, with Senior Management taking the lead.



Prof Philip Choo, Group CEO, (middle) with NHG senior management and staff showing support for vaccination.

SHARING BEST PRACTICES IN HEALTH TECHNOLOGY AND DATA

NHG ENTERPRISE RISK MANAGEMENT AND DATA PROTECTION WEBINAR

The annual NHG Enterprise Risk Management Seminar organised by GCD was conducted virtually in December 2020. The webinar featured invited speakers from the NHG Group Information Security Office (GISO), ALPS, and MOH Holdings (MOHH) Group Internal Audit (GIA). Attended by some 500 participants, it covered topics on emerging risks, such as supply chains, cybersecurity, fraud as well as internal controls and data protection.



Left: The Group Corporate Development team at the NHG Enterprise Risk Management and Data Protection Webinar.



Left: The NHG Digital Health Platform Virtual Workshop.

NHG DIGITAL HEALTH PLATFORM VIRTUAL WORKSHOP

In July 2020, NHG GCD and Group Data & Strategy Digital Apps Office jointly organised a virtual workshop to brainstorm ideas for NHG's first digital health platform and mobile applications. Themes such as patient journey and wellness, tele-sensors, and the Next Generation Electronic Medical Record (NGEMR) were discussed.

“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

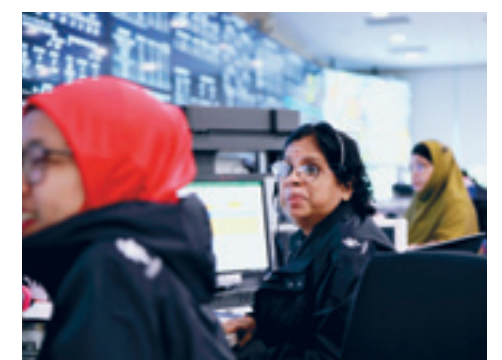
The TTSH Operations Command Centre (OCC), which features the C3 (Command, Control, and Communications) Smart Hospital System, went fully operational in December 2019. Through the analysis of data from Real-Time Location System sensors and CCTV video footage, and use of artificial intelligence (AI) to 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.

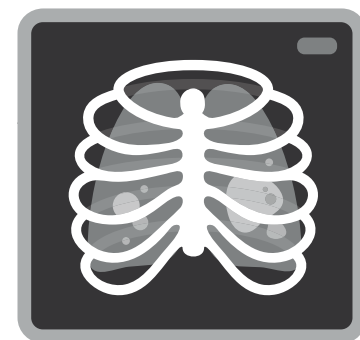
PIONEERING TREATMENT OF ARTERIAL BLOOD CLOTS IN COVID-19 PATIENTS

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.



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.



"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

NATIONAL CENTRE FOR INFECTIOUS DISEASES

The National Centre for Infectious Diseases (NCID) is a purpose-built facility designed to strengthen Singapore's capabilities in infectious disease prevention and management. Alongside TTSH, it has been the epicentre of Singapore's battle against the COVID-19 pandemic – providing clinical care and outbreak management, and leading in diagnostic testing, surveillance, and infectious disease research.

AT THE FOREFRONT OF THE NATIONAL COVID-19 RESPONSE

SCREENING OPERATIONS

The NCID Screening Centre started operations in late January 2020 to screen suspect COVID-19 cases. Protocols, COVID-19 screening and infection controls, and safe distancing measures were implemented to ensure the safety of patients and healthcare workers.

When COVID-19 cases spiked in March 2020, the Screening Centre was expanded, with tentages set up to meet the increasing demand. When the COVID-19 cases eased in December 2020, COVID-19 screening was integrated with NCID's outpatient Clinic J.

INPATIENT MANAGEMENT

To accommodate the surge in COVID-19 patients, the Centre rapidly ramped up bed capacity from 330 to 586, which allowed NCID to care for more patients. NCID staff were well-prepared to manage the outbreak as they had been thoroughly trained during peacetime and were equipped with the necessary skills and knowledge. At the peak of the pandemic, NCID housed 500 suspect and confirmed COVID-19 cases in its wards.

To prevent healthcare institutions from being overwhelmed, patients who were recovering well were transferred to Community Care Facilities (CCFs) before being discharged. This process freed up bed resources for critical and high-risk patients admitted to NCID. The medical, nursing, pharmacy, infection control, security, and operations teams also worked closely with MOH to ensure the safe transfer of patients between sites.

To augment patient care, National Heart Centre Singapore (NHCS)/ Singapore General Hospital (SGH) and National University Hospital (NUH) provided support for Extracorporeal Membrane Oxygenation (ECMO) treatment for COVID-19 patients warded in NCID. To gear up for such scenarios, hybrid teams comprising staff from NCID, NHCS, and NUH participated in EMCO drills conducted in February and March 2020. There were three COVID-19 patients who received ECMO support in NCID's ICU in 2020.



OUTPATIENT SERVICES

Clinic J provides holistic, integrated, and multidisciplinary outpatient clinical services, including medical consultation, pharmacy, care and counselling, and diagnostic radiology.

During the course of the pandemic, Clinic J continued to sustain essential business-as-usual (BAU) services while supporting the Ministry of Health (MOH) in other public health functions, such as swab and serology procedures for COVID-19 patients. Clinic J also served as a site for convalescent plasma therapy screening.

As COVID-19 cases gradually declined, Clinic J progressively expanded its BAU services in August 2020, including resuming clinic sessions and patient consultations. To enhance efficiency, clinicians leveraged technology and tele-consultation to ensure patients continued to receive care. Specialty services such as Psychiatry, Dermatology, and Ophthalmology were gradually restored in September 2020.



Prof Leo Yee Sin in discussion about a patient with the clinical team at an isolation ward in NCID.



#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



RESEARCHING THE VIRUS AND DEVELOPING TREATMENTS

COVID-19 RESEARCH WORKGROUP

In January 2020, NCID responded swiftly to the COVID-19 outbreak with the formation of the National COVID-19 Research Workgroup (RWG). The Workgroup is chaired by Professor Leo Yee Sin, Executive Director, NCID, and advised by Professor Tan Chorh Chuan, Chief Health Scientist, MOH, and includes members from NCID, Agency for Science, Technology and Research (A*STAR), National University of Singapore (NUS), Duke-NUS Medical School, MOH, National Research Foundation, NUH, Nanyang Technological University (NTU), National Medical Research Council (NMRC), DSO National Laboratories, Singapore Clinical Research Institute, and NHG. The Workgroup's research efforts to understand COVID-19 transmission in Singapore have since contributed immensely to the nation's success in managing and controlling the pandemic.

A critical component of the RWG's research was "PROTECT" – a multi-centre prospective study to detect novel pathogens and characterise emerging infections. This protocol, covering all public hospitals in Singapore, enabled the collection of information and biological samples for research. The first PROTECT subject was recruited on 24 January 2020, a day after Singapore reported its first confirmed COVID-19 case. As of December 2020, more than 600 COVID-19 patients were recruited for the study.

The RWG made significant research contributions to the battle against COVID-19, including: rapid development and validation of diagnostic tools, a greater understanding of virus pathogenesis and transmission patterns, elucidation of biomarkers of infection, pathogenesis and disease severity, investigation of COVID-19 clusters in Singapore, characterisation of environmental contamination with the SARS-CoV-2 virus, development and evaluation of potential therapeutic agents, and greater understanding of the socio-behavioural aspects of the pandemic on healthcare workers and other segments of the community.

To-date, the RWG has contributed to numerous local and international research publications, including top-tier scientific journals such as the *New England Journal of Medicine*, *The Lancet*, and *JAMA*.

CLINICAL THERAPEUTICS FOR COVID-19 PATIENTS

The COVID-19 Therapeutic Workgroup led by NCID was formed to evaluate and recommend the use of existing (repurposed drugs) and novel therapeutics to treat patients with COVID-19, including antivirals, immunomodulators, and humoral therapies such as convalescent plasma and biologics, and vaccines. From February 2020, the multidisciplinary workgroup, comprising clinicians from different hospitals, reviewed available evidence as it emerged from trials conducted both locally and globally, and made recommendations for COVID-19 therapy.

NCID participated in various multi-centre randomised controlled trials to investigate potential treatments. This included conducting clinical trials to determine the efficacy of remdesivir as a treatment for the disease, and participating in the United States National Institutes of Health's (NIH) *Adaptive COVID-19 Treatment Trial* (ACTT) that tested the efficacy of a combination of remdesivir with existing drugs – such as baricitinib, interferon-beta-1a, and dexamethasone which are used to treat other diseases – as a treatment for COVID-19. In October 2020, NCID took part in another NIH-led clinical trial, *Accelerating COVID-19 Therapeutic Interventions and Vaccines* (ACTIV-3), which investigated multiple monoclonal antibodies as therapeutic agents for COVID-19 treatment.

NCID, together with TTSH's Department of Haematology, Health Sciences Authority (HSA), and Duke-NUS Medical School, started a national convalescent plasma programme for the treatment of patients with COVID-19 in March 2020. Under the programme, patients who recovered from COVID-19 were invited to be plasma donors, and underwent stringent checks to ensure that the donated plasma was safe and carried sufficient quantities of COVID-19 antibodies. Blood plasma treatment is based on the principle that recovered patients have protective antibodies that may help to fight against infection. Preliminary reports indicated that convalescent plasma therapy may have a role in the treatment of patients with severe COVID-19, and could be considered when these patients were not eligible for other treatments.

IDENTIFICATION OF CRITICAL ANTIBODY TARGET SITES IN SARS-COV-2 VIRUS

In July 2020, NCID and A*STAR's SigN disclosed research findings that antibodies found in recovered COVID-19 patients in Singapore were able to limit the spread of SARS-CoV-2 in the body by counteracting (neutralising) four specific sites (epitopes) of the virus. Epitopes are specific parts located on the surface spike proteins of the virus, which are recognised and bound by antibodies produced by human immune systems.

Key findings of the two studies:

- Tests on more than 100 recovering COVID-19 patients showed evidence that these four epitopes were recognised in COVID-19 patients, indicating that they were good detection markers to identify patients who had been exposed to the virus.
- Antibodies in these COVID-19 patients demonstrated the ability to neutralise more than 50 per cent of the virus, and were able to prevent the virus from entering the human body by counteracting two epitopes.
- Usage of the epitopes to measure antibody responses could serve as useful indicators for the degree of infection in COVID-19 patients, and function as highly specific and sensitive sero-immunosurveillance tools for recent or past COVID-19 infections. The flexibility of these epitopes to be used alone or in combination will allow for the development of improved point-of-care-tests (POCTs).

These epitopes will be used by A*STAR in a multi-centre collaborative study for the development of the World Health Organization (WHO) International Standard and Reference Panel for COVID-19 antibody. Further studies will be conducted to enable the design of diagnostic tools and the development of vaccines and therapeutics.

DISCOVERY OF NEW SARS-COV-2 VARIANT THAT CAUSES LESS SEVERE INFECTIONS

In August 2020, NCID, A*STAR's Singapore Immunology Network (SigN) and Duke-NUS Medical School announced research findings that COVID-19 patients infected with a new variant of SARS-CoV-2 had better clinical outcomes, including a lower proportion of patients developing low blood oxygen (hypoxia) or who required intensive care. This variant ($\Delta 382$) has a large deletion in its genome that removed the ORF8 gene. It was first detected in travellers who arrived in Singapore and Taiwan from Wuhan, China; and was transmitted across several clusters in Singapore from January to March 2020, before being contained.

Similar deletions were also detected with SARS in 2003, but the exact function of this protein was obscure. Laboratory studies with the $\Delta 382$ -variant of SARS-CoV-2 indicated that despite the deletion, the virus was not defective and replicated similarly to the wildtype virus.

131 individuals, who participated in NCID's PROTECT study and had been infected with either the $\Delta 382$ -variant or the wild-type virus, were studied. Among them, 92 patients were infected with the wild-type virus while 39 patients were infected with the $\Delta 382$ -variant.

Key findings of the study revealed that:

- Clinical outcomes were considerably better in patients infected with the $\Delta 382$ -variant than with the wild-type virus. None of the patients infected with the variant required supplemental oxygen or ICU care.
- Patients infected with the variant had less systemic release of pro-inflammatory cytokines and lower levels of growth factors associated with lung injury.
- Patients infected with the variant had more effective T-cell responses and platelet regulation during the early phase of the infection. T-cell responses correlate with disease severity in COVID-19.

Further studies to understand the function of the ORF8 protein, and the impact of its removal at the cellular level and on the immune response to infection are on-going.



SUMITOMO MITSUI BANKING CORPORATION DONATES TO NHG FUND

In October 2020, the NHG Fund received a donation from the Sumitomo Mitsui Banking Corporation (SMBC), for COVID-19 research projects conducted by NCID. The donation was from SMBC Asia Pacific Division's "SMBC Together with You Fund". It was launched as an immediate response to support people and businesses in the region during the COVID-19 pandemic.

"As we continue the battle against the virus and progress towards a state of endemic COVID-19, the road ahead may be long and winding but NCID's mission remains unchanged – to protect the people of Singapore from infectious diseases. NCID will continue working with our partners in the healthcare sector, academic and research institutions, and the community to safeguard Singapore's public health."

Professor Leo Yee Sin
Executive Director, National Centre for Infectious Diseases

PARTNERING THE COMMUNITY

PROVIDING INFECTION CONTROL TRAINING

NCID provided training to public and private organisations in adopting best practices for managing COVID-19. NCID collaborated with CCFs, Swab Isolation Facilities (SIFs), and private and community hospitals to train staff on PPE, N95 mask fitting, infection control measures, hand hygiene, and nasopharyngeal, nasal, and throat swabbing. In addition, NCID advised on facility design and process flows to enhance infection control and reduce infection risk at CCFs, SIFs, and cruise ships.

PUBLIC EDUCATION PROGRAMMES ON DISEASE OUTBREAKS

NCID's Training and Education Office (T&E) worked with community partners on public education programmes aimed at enhancing community preparedness against disease outbreaks. Also covered were the benefits of influenza and pneumococcal vaccination. In 2020, T&E engaged close to 2,700 members of the public through its outreach efforts.

"The majority of the COVID-19 patients I cared for recovered from the infection. For those who required deeper emotional and psychological support, I helped them acknowledge their grief, make sense of their loss of health or loved one, and journeyed with them to find new meaning in their lives. I am glad I was able to comfort them during their times of anxiety and loneliness."

Mr Daniel Chee Medical Social Worker, National Centre for Infectious Diseases



BRINGING CHEER TO PATIENTS

EXERCISING WITH MIGRANT WORKERS

NCID nurses organised exercise sessions for migrant workers admitted for COVID-19 infection in April and May 2020. All patients, except those on oxygen support or who were breathless, were encouraged to get out of bed for some light physical activity. This helped uplift their mood and spirits.

DISTRIBUTING SNACK PACKS

To bring comfort to migrant worker patients, NCID staff prepared food familiar to the patients. Initiated by doctors, medical social workers, and nurses, the care team distributed snacks to patients admitted to the wards between April and July 2020.

"EVERY OUTBREAK BEHAVES DIFFERENTLY. IT'S IMPORTANT FOR US TO CREATE EFFECTIVE PROTOCOLS DURING PEACETIME THAT CAN BE EASILY SCALED AND ADAPTED TO MEET DIFFERENT INFECTIOUS DISEASE OUTBREAKS. NCID HAS BROUGHT CLINICIANS AND RESEARCHERS WITH DIFFERENT EXPERTISE, AS WELL AS STATE-OF-THE-ART FACILITIES, UNDER ONE ROOF – THUS ENABLING THE CRUCIAL COMMUNICATION AND FLEXIBILITY NEEDED TO FUNCTION DURING THIS COVID-19 CRISIS."

Professor Leo Yee Sin Executive Director,
National Centre For Infectious Diseases

“AMID THE GRUELLING AND ON-GOING CHALLENGES OF THE PAST YEAR, **OUR TEAMS RESPONDED TO THE TEST OF COVID-19 WITH COURAGE, COMPASSION, AND CREATIVITY.** THIS PANDEMIC HAS SHOWN THAT WE HAVE THE CAPACITY TO CREATE SOLUTIONS AND TURN CHALLENGES INTO OPPORTUNITIES. YISHUN HEALTH HAS SURVIVED WELL, DISCOVERING IN OURSELVES NEWFOUND RESILIENCE AND RESOURCEFULNESS THAT WE HAVE CHANNELLED PRODUCTIVELY TO BRING ABOUT BETTER HEALTH TO OUR POPULATION IN THE NORTH.”

Professor Chua Hong Choon

Deputy Group CEO (Strategy & Transformation), NHG,
& CEO, Khoo Teck Puat Hospital & Yishun Health

YISHUN HEALTH



YISHUN HEALTH

Yishun Health's system-wide effort to contain the COVID-19 pandemic and care for patients has brought out the best in its people. Every member of Yishun Health has played an invaluable role and stepped up to keep hospital operations going and deliver quality care amid challenging times.

RESPONDING TO THE COVID-19 PANDEMIC

ACING THE SCREEN TEST

Throughout the crisis, Yishun Health was determined to strike a balance between caring for COVID-19 patients and those with acute conditions, as well as keeping healthcare workers safe.

On 24 January 2020, just a day after Singapore confirmed its first case of COVID-19 infection, Yishun Health's Acute & Emergency Care Centre (A&E) had already set up an Expanded Screening Wing (ESW) to manage the surge in COVID-19 cases. Five holding areas were also set up to accommodate those awaiting swab test results for discharge or admission. The ESW and holding areas played a critical role in right-siting COVID-positive patients to specially-converted COVID wards at Yishun Health or Community Isolation Facilities.

Additional steps were rolled out to protect patients visiting the A&E. Workflows and spaces were quickly reorganised to minimise interactions and infection risks between patients and staff.

The Department of Laboratory Medicine kept pace with the surge in demand for testing, by redeploying staff and adjusting work-shifts in the Molecular Diagnostics section. Eight volunteers from the National University of Singapore (NUS) Faculty of Medicine were trained and deployed in April 2020. These measures enabled the lab to increase its test-load from 120 to 800 samples per day.



Above: A/Prof Pek Wee Yang, CMB, KTPH & Yishun Health, at the KTPH Patient Safety Webinar in July 2020.

Left: An Expanded Screening Wing (ESW) at the Acute & Emergency Care Centre.



Left: Holding areas for clinically-well COVID-19 patients before they are transferred to Community Care Facilities.



COLLABORATIONS AND CONVERSIONS

To handle the clinically-well COVID-19 patients post-screening, Yishun Health collaborated with Nee Soon Sports Centre to house these patients before they were transferred to Community Care Facilities. The futsal facility was converted into a 336-bed facility for this purpose. Thirty medical staff were deployed to man the site under a collaborative agreement with Fullerton Health Group (FH). Additionally, the owner of FutsalArena@Yishun offered the premises for the same purpose while Tzu Chi Singapore opened its Humanistic Youth Centre as a conducive space for FH staff to eat, rest, and freshen up.

Multiple wards at Khoo Teck Puat Hospital (KTPH) and Yishun Community Hospital (YCH) were converted into COVID-19-related and operationally ready ICU wards to cope with the surging numbers of COVID-19 cases. Yishun Health's clinicians from various departments worked closely with nursing leaders and Inpatient Services to adapt to new workflows and duties. More than 60 per cent of the wards in KTPH were progressively converted to meet the needs of the situation then – from a medical ward to a pre-swab ward, then to a mixed pre- and post-swab ward, and finally to a COVID-19-positive ward. At YCH, the team discharged its patients to the Ang Mo Kio-Thye Hua Kwan Hospital so that all its beds could be used by COVID-19 patients.



Left and above: Visitors being screened as they enter YCH. Disinfectant mats were installed at KTPH and YCH COVID-19 wards as an added measure to keep staff safe.

CRITICAL EXPANSIONS

Increasing critical care capacity and capabilities is a key priority of Yishun Health's outbreak plans. A multidisciplinary team was formed to manage an Intensive Care Unit (ICU) surge if required. The plan was implemented when the number of COVID-19 cases rose in Singapore early last year. In April 2020, KTPH's 22-bed ICU capacity was progressively increased to 90 beds by converting wards and the Post-Anaesthesia Care Unit.

One hundred and twenty nurses were mobilised in March 2020 to support the ICU. These nurses from various disciplines were trained by their ICU colleagues to look after patients requiring critical care. Some 40 doctors from other specialties were also trained on the fundamentals of ICU management, intubation, ventilator-setting, and trouble-shooting, to support the increased workload in the ICU.



Beds in the Post-Anaesthesia Care Unit were used by non-COVID-19 patients who required ICU care.

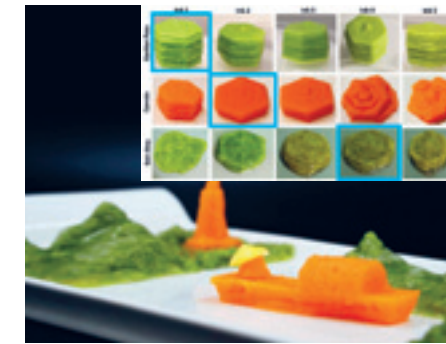


A team huddle to discuss ways to deal with the bed surge and to convert wards even before Singapore's Circuit Breaker in 2020.

COVID-19 VACCINATION PORTAL
 The Human Resource Department collaborated with Operation Administration and the Staff Clinic to develop the *Safe Staff COVID-19 Vaccination* online portal that allows staff to register and complete their COVID-19 vaccination. Staff are able to declare the required personal information, book their first and second COVID-19 vaccination within the mandated 21-day period, and update critical vaccination data. The data is also captured in NHG's intranet S3 system on the same day of the vaccination, for reporting to the Ministry of Health (MOH). The portal was implemented in both Yishun Health and Woodlands Health vaccination centres.

“The protection of frontliners was the single most important priority. Communication was essential to ensure staff knew they were being supported and cared for, and that we were doing everything to keep them safe. As an integrated campus, we had designed and planned for such crises – all our wards and clinical areas can be scaled according to varying needs.”
Associate Professor Pek Wee Yang Chairman Medical Board, Khoo Teck Puat Hospital & Yishun Health

EMPOWERING CARE AND TRAINING THROUGH TECHNOLOGY



ENABLING DIGITAL GASTRONOMY WITH 3D FOOD PRINTING

The KTPH Nutrition & Dietetics (N&D) collaborated with the National Additive Manufacturing Innovation Cluster, Singapore University of Technology and Design, and Nanyang Technological University, Singapore (NTU) to harness 3D printing technology to create pureed food items. These 3D foods were made visually more appealing and palatable for frail and elderly patients with dementia or stroke, and who had developed chewing and swallowing difficulties. In FY2020, the N&D embarked on designing fresh plant-based food inks.

ADVANCING STAFF DEVELOPMENT

Despite disruptions caused by the COVID-19 pandemic, Yishun Health continued to develop and sponsor its staff for higher education, executive education, and leadership development.

While overseas Health Manpower Development Programme (HMDP) Fellowships were suspended due to travel restrictions, it awarded 99 in-service education scholarships and sponsorships in FY2020. Nurses who embarked on the Specialist Diploma and Advance Diploma in Nursing programme with Nanyang Polytechnic in late-2019 successfully completed their courses.

In leadership development, the Mavis Khoo Nursing Leaders Scholarship for FY2020 and FY2021 was awarded to two nurses from KTPH. Yishun Health also awarded the newly-launched Community Care Nursing Leadership Programme sponsorship to two staff from YCH.

ENHANCING THE LEARNING JOURNEY

In FY2020, two major changes were implemented in courseware and training automation. First, the cluster-wide eLEARN system was upgraded in mid-June 2020 so that e-courses could be viewed with more enhanced features. The eLEARN 2.0 started with 58 trainers and 83 courses, and has since grown to 109 trainers and 150 courses/quizzes.

To further enhance the learning effectiveness and experience, Human Resource Development (HRD) partnered Nursing Education, Data Protection Office (DPO), and Office of Clinical Governance (OCG) to develop and roll out more interactive e-learning courses in eLEARN, such as the Annual PDPA Refresher 2020 series and OCG's Patient Safety Simulation.

Second, the annual Learning Needs Analysis process, which took place between September and October 2020, was fully automated with the Learning Needs Exercise (LNE) web Portal on the Intranet. The Portal achieved a 94 per cent organisation-wide submission rate and garnered positive feedback from leadership. In addition, HRD introduced core programmes online, which included e-Orientation, e-Speaking Up for Safety™ and 7 Habits of Highly Effective People.

TRAINING FOR MANAGERS

In 2020, competency-based programmes for supervisors, executives, and managers were introduced at Yishun Health. About 300 staff across all family groups attended targeted managerial skills modules, such as *Driving Change, Coaching for Peak Performance and Communicating with Impact*.

Managerial Learning Journeys were also customised for emerging and promising managers in Nursing and Allied Health. Results of an internal survey showed higher team productivity and engagement with the organisation against global norms. Scores on intra-unit relationship improvement and achievement of goals increased between 27 and 33 per cent, post-training.

EARNING A FIRST-CLASS DEGREE WHILE FIGHTING THE COVID-19 PANDEMIC

KTPH Senior Staff Nurse Ms Bindeeya Chandran attained her first-class degree from King's College London while juggling between motherhood and working on the frontline of the COVID-19 pandemic. Ms Chandran was one of 70 students in Singapore who completed their part-time nursing degree courses, offered in partnership with local private institution Ngee Ann Academy, in January and March this year. Ms Chandran was motivated to pursue a nursing degree to better help palliative care patients, "I was initially uncertain about being able to cope with a part-time degree programme while working full-time as a nurse in the intensive care unit (ICU), but I was motivated to learn more about end-of-life care, as it's relevant to my job." The fact that her three-year-old son was cheering her on helped her stay the course, "He helped me to remain focused on my goal because I wanted to show him that anything is possible if you set your mind to it."



“SETTING UP OUR COMMUNITY CARE FACILITY (CCF) AT THE EXPO PRESENTED A HUGE CHALLENGE, AS THE VENUE WAS DESIGNED FOR SHOWS AND EXHIBITIONS, RATHER THAN HEALTHCARE SERVICES. WE HAD NO TEXTBOOK TO FOLLOW. BUT NEVERTHELESS, **THROUGH HARD WORK, CREATIVITY, DEDICATION, AND COMMITMENT, WE PULLED IT OFF, NAVIGATING THROUGH UNCHARTERED TERRITORIES.**”

Dr Jason Cheah Deputy Group CEO (Accountable Care), NHG & CEO, Woodlands Health

WOODLANDS HEALTH



WOODLANDS HEALTH

When COVID-19 outbreaks were detected among the migrant worker population in Singapore, Woodlands Health (WH) rose up to the national call to set up the first-of-its-kind Community Care Facility (CCF) at the Singapore EXPO. With WH at the helm, expertise and capabilities were harnessed and synergised across NHG, supported by public and private partners.

NAVIGATING THROUGH UNCHARTERED TERRITORIES

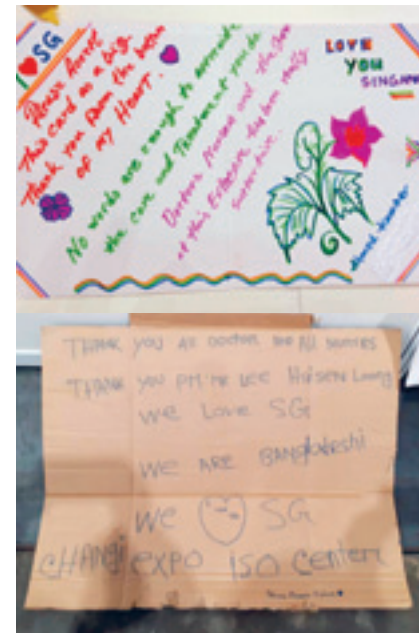
PROVIDING CARE AT THE CCF@EXPO

When COVID-19 infected the migrant worker population, WH redirected its focus, manpower, and resources to contribute to the national COVID-19 response. The CCF@EXPO was set up in record time, and the medical teams helped manage thousands of cases with mild symptoms. At its peak, the CCF@EXPO housed more than 8,000 patients, easing the load of hospitals across Singapore.

Below: Notes of appreciation from migrant workers cared for at CCF@EXPO.

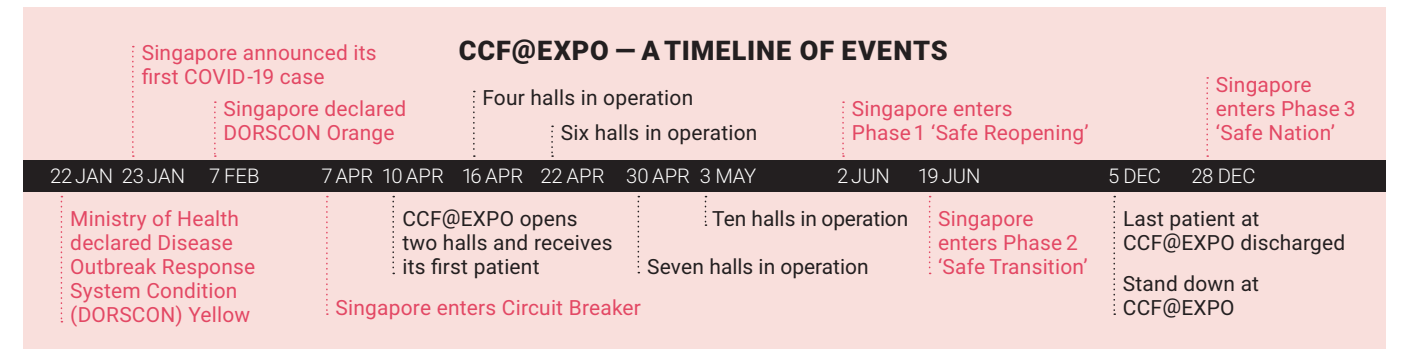


From left to right: Dr Jason Cheah, Deputy Group CEO (Accountable Care), NHG, & CEO, WH; Dr Wong Kirk Chuan, COO, WH; Prof Philip Choo, Group CEO, NHG; A/Prof Nicholas Chew, CMB, WH.



“The year that was defined by the coronavirus pandemic presented us with an opportunity to witness how the WH Family could rise to the challenge when called upon by the nation. From setting up the first CCF at D’Resort, the Singapore EXPO, to our pre-operations wards and various nested locations, everyone worked professionally and tirelessly to ensure the wellness of patients and the community. The work we did embraced our values of *People-Centredness, Integrity, Compassion, and Stewardship* (PICS). This spirit has enabled WH to continuously adapt to the evolving public health landscape and to reach out to our community.”

Dr Jason Cheah Deputy Group CEO (Accountable Care), NHG & CEO, Woodlands Health



PULLING TOGETHER AS A TEAM

While the CCF@EXPO was being set up, WH gathered a team of medical professionals and operations staff to provide round-the-clock care for patients. Doctors and nurses worked 12-hour shifts to manage admission and triage, conduct swab tests, monitor patients’ vital signs, and provide treatment.

Many partners and organisations responded readily to support this mission. The Health Promotion Board (HPB) deployed 60 nurses and dental therapists from the School Health Service to help with the initial opening phase of the CCF@EXPO. Nurses from the Institute of Mental Health (IMH) and the National Skin Centre (NSC) also lent their support along with private, freelance, and retired nurses through the SG Healthcare Corps.

Doctors were split into two tiers – one for general monitoring, and the other for patients who required escalated care. The Nursing team, led by Ms Pua Lay Hoon, Chief Nurse, WH, ensured nurses at the CCF@EXPO were trained in infection control, performing swabs, documentation system, and handling of essential equipment.

Non-clinical staff from WH also provided logistics and administration support to ensure smooth operations.

As patient numbers grew and more halls were opened, the Singapore Armed Forces Medical Corps and SingHealth stepped in to manage two and four halls respectively, while WH managed four halls.



Above: The care team at the CCF@EXPO conducted exercise sessions to keep patients energised and engaged.

CARING FOR THE WELL-BEING OF STAFF AND PATIENTS

PROVIDING PATIENT-CENTRIC CARE

To improve communication with the migrant workers treated at the CCF@EXPO, WH Allied Health, Nursing, Operations, and Corporate Communications worked together to translate basic key information into Bengali, Tamil, and Hindi. Health booklets, videos, and posters which contained useful medical terms and other relevant information were also produced.

Apart from recording their vital signs at self-monitoring stations, patients were also taught to perform a six-minute walk test, which served to alert nurses when medical assistance was required. It also surfaced chronic conditions which patients had, to facilitate nurses in educating them on managing their health.

Additionally, the nursing and allied health teams collectively organised activities that kept patients engaged throughout their recovery. These included mass exercise sessions, art competitions, and festive celebrations.

CARING FOR STAFF WELL-BEING

The Staff Resilience and Organisational Growth (STRONG) Taskforce was formed to promote collective resilience in individuals and teams during the COVID-19 pandemic. Toolkits were developed to help staff manage burnout, promote adaptive coping, and access support resources.





RALLYING TOGETHER

WH doctors, nurses, allied health professionals, as well as laboratory and pharmacy teams nested in various public healthcare institutions helped to care for COVID-19 patients. Some key initiatives included:

- The WH team helped convert two pre-ops wards at Yishun Community Hospital (YCH) to COVID-19 wards in response to the surge in patients.
- The Physiotherapy team worked together with colleagues from Khoo Teck Puat Hospital (KTPH) to produce educational videos to aid COVID-19 patients in their recovery.
- A townhall session to provide information, address questions, and allay concerns on COVID-19 vaccines.



ADVANCING BETTER PATIENT CARE

- In February 2021, WH organised its first INSPIRE Congress (INnovation, Safety, Performance, Improvement, REsearch Congress). It brought together teams from different specialties, to discuss the importance of adopting a multidisciplinary team-based approach to achieve the best outcomes for trauma patients.
- The SPROUTS (Small PROjects Utilising Teams) research grant aims to improve processes in various specialties, and help formulate best practices. 12 teams were awarded this grant, receiving up to \$10,000 funding for each successful application.



MOVING TOWARDS THE OPENING OF WOODLANDS HEALTH

The COVID-19 pandemic has significantly impacted the construction of WH, which will open progressively from 2023. The WH team remained focused on preparing for the opening of the Campus, by refining critical clinical and operational processes, and applying the learnings from the pandemic outbreak.

WH actively engaged the Woodlands and regional community; and participated in job fairs to attract Singaporeans who aspire to build a career in the healthcare industry. At the close of FY2020, there were more than 1,700 staff members in the WH Family.



INSTITUTE OF MENTAL HEALTH



INSTITUTE OF MENTAL HEALTH

Mental health is an integral component of every individual's overall state of health and well-being. It affects people of all ages and from all walks of life, and is thus a critical aspect of strengthening NHG's *River of Life* framework. The Institute of Mental Health (IMH) supports individuals across various dimensions of mental health. It goes beyond treating the ill to keeping the well mentally healthy, and reducing the stigma on mental illness.

STEPPING UP DURING THE COVID-19 PANDEMIC

ENSURING PATIENT SAFETY

At the start of the COVID-19 pandemic, IMH repurposed three wards in the hospital to better detect and prevent COVID-19 infection among patients. A Step-down Medical Ward was created for patients who needed to be transferred to the general wards after they were treated for acute medical conditions. Patients were cared for and observed in this ward for up to 72 hours to ensure they were COVID-19-free before they returned to their original wards.

In addition, an Enhanced Screening Ward was set up for patients at medium risk for COVID-19 infection – those who were admitted from nursing homes, other public hospitals, or serving Stay-Home Notice (SHN). Patients who were COVID-19 positive and needed mental healthcare were placed in the Ward Isolation Facility, an environment optimised for the care of patients with mild symptoms. With this system in place, IMH was better equipped to ensure the safety of patients during the on-going pandemic.



Clockwise from below: The Sayang Wellness Centre (SWC) Clinic at IMH; IMH Ward 82A and Ward 23A staff refresher training.



FOR THOSE FACING A MENTAL HEALTH CRISIS, HERE ARE SOME HELPLINES:

- National Care Hotline: 1800-202-6868
- Samaritans of Singapore: 1800-221-4444/1-767
- Silver Ribbon Singapore: 6386-1928
- IMH's Mental Health Helpline: 6389-2222
- Singapore Association for Mental Health: 1800-283-7019
- Community Health Assessment Team: 6493-6500/1



PROVIDING PSYCHOLOGICAL FIRST AID

On 10 April 2020, the National CARE Hotline was launched to offer psychological first aid to people who felt stressed and anxious about the COVID-19 pandemic. Associate Professor Lee Cheng, Clinical Director, Population Health, IMH, and Associate Professor Clare Yeo, Senior Principal Clinical Psychologist, IMH, were activated as Chief, CARE, and Head of CARE, Ministry of Health (MOH), respectively.

105 staff volunteers comprising clinical psychologists, medical social workers, case managers, counsellors, occupational therapists, and a nurse clinician, took on eight-hour shifts as Duty CARE Officers (DCOs).

The hotline managed some 30,000 calls five months after it was introduced. Common issues faced by the callers included concerns about isolation, finances, family conflict, and worries about their health and future. Based on the issues the callers faced, DCOs linked them up with social service agencies and specialised services to ensure they received appropriate help.

In the second half of 2020, MOH partnered IMH to form the 'COVID-19 Mental Wellness Taskforce' to address the mental health impact of COVID-19 on the Singapore population. The Taskforce brought together key ministries and agencies involved in mental health to ensure a coordinated national response to the mental health needs of Singapore. In mid-2021, the Taskforce evolved into an inter-agency platform to oversee mental health and well-being efforts beyond the pandemic.



DEVELOPING MENTAL HEALTH RESOURCES ONLINE

IMH was part of a multidisciplinary team that launched *mindline.sg* in June 2020. The team included clinicians, as well as social and data scientists from the MOH Office for Healthcare Transformation (MOHT), the Ministry of Social and Family Development (MSF), and the National Council of Social Service (NCSS). An online tool developed in response to the social, economic, and psychological impact of the COVID-19 pandemic, *mindline.sg* facilitated the health and emotional wellness of Singaporeans by providing users convenient access to a wide variety of help and support resources. A key feature of *mindline.sg* is a clinically-validated self-assessment tool designed by Dr Jimmy Lee, Senior Consultant, IMH. Users who engaged the tool were directed to local help resources that match their needs. The platform was enhanced in October 2020 by collaborating with Wysa, an AI-powered mental health app that combines an "emotionally intelligent" chat platform and digital self-help techniques.

IMH also organised various webinars in FY2020 to assist various groups of people to better manage their own mental health, or help others, during these challenging times. IMH trained frontline workers in "Psychological First Aid", equipping them with basic knowledge and skills to help distressed migrant workers. Organisations such as Jamiyah Singapore and Republic Polytechnic worked with IMH to organise talks for different groups of people affected by the pandemic.



LEVERAGING DIGITAL PLATFORMS FOR MENTAL HEALTH

In June 2020, IMH Mood Disorders Unit organised a webinar, *Coping with Mood Disorders during the Pandemic*, which was attended by 160 members of the public. The forum addressed how individuals living with mood disorders, as well as their caregivers, could overcome challenges and build resilience during such unprecedented times.

From mid-September to end-October 2020, IMH together with the Agency for Integrated Care (AIC) and close to 30 agencies came together to organise virtual webinars, workshops, and activities in conjunction with World Mental Health Day 2020. Themed *Emerging Mentally Stronger Together – Strategies for a New Normal*, the events aimed to help participants overcome the challenges caused by the COVID-19 pandemic and adapt to a new normal. In addition, IMH held the Mental Health Film Festival and a run to raise awareness on youth mental health.

INSTITUTE OF MENTAL HEALTH

BATTLING AT THE FRONTLINES

IMH supported the nation's fight against COVID-19 on the frontlines by deploying 48 Registered Nurses and 25 Medical Officers to the various medical posts at migrant worker dormitories, Community Isolation Facilities (CIFs), and Community Care Facilities (CCFs). The nurses helped with registration, triaging, dispensing medication, and performing swab procedures.

From April to September 2020, IMH Nursing Education and nurses from the Infection Control Department organised hospital-wide training for clinical staff to ensure the hospital was operationally ready to conduct COVID-19 swab tests. 629 nurses were trained and certified competent to perform the procedure.

CARING FOR INDIVIDUALS WITH SPECIAL NEEDS

In June 2020, IMH Child Guidance Clinic's Neurobehavioural Clinic (Autism Services), with support from MOH and in collaboration with the National University Hospital (NUH) and KK Women's and Children's Hospital (KKH), produced a Special Care Kit for individuals with special needs who have to go through COVID-19 procedures.

The care kit included visual materials and an animated video, designed to help them cope better with the procedures of testing, diagnosis, and treatment. Caregivers and healthcare workers also used these materials to better communicate with, and manage these individuals. These materials were accessible through the websites of IMH, KKH, and NUH.

In June 2020, IMH's Department of Developmental Psychiatry shared its expertise in a webinar for caregivers of children with special needs, focusing on managing anxiety during the COVID-19 pandemic. The webinar was part of a four-session digital series by the Lien Foundation in partnership with the Child Development Unit at NUH, SG Enable, and Superhero Me, a non-profit inclusive arts organisation.



MENTAL HEALTH TIPS

Recognising that many staff were juggling family responsibilities beyond working hours, the IMH Psychology Department produced 17 e-posters that contained mental health tips which were sent out to staff on a weekly basis between March and July 2020. Topics covered included the importance of building resilience and adapting to change, and managing anxiety.

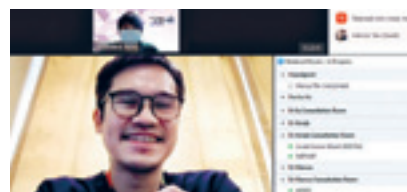
APPRECIATING OUR STAFF AND PARTNERS

SAYANG AWARDS 2020

On 24 December 2020, the Sayang Awards 2020 (Special Edition) was held in conjunction with a virtual Christmas celebration. The awards honoured 50 staff who made significant contributions during the pandemic and exemplified NHG's core values of People-Centredness, Integrity, Compassion and Stewardship. A Special Sayang Award was presented to Professor Chua Hong Choon, then-outgoing CEO of IMH (now, CEO of KTPH & Yishun Health), in recognition of his tremendous contributions to mental health in Singapore during his 27-year career with the hospital.



Prof Chua Hong Choon, Deputy Group CEO (Strategy & Transformation), NHG, and CEO, KTPH & Yishun Health, and A/Prof Daniel Fung, CEO, IMH, with staff at the Sayang Awards 2020.



TRANSFORMING CARE

EXPANDING ACCESS TO PSYCHIATRY CARE THROUGH TELE-TREATMENT

IMH adopted the use of tele-treatment to reduce infection risks for patients and staff during the COVID-19 pandemic. Building from the experience of providing tele-treatment services to nursing homes since 2016, IMH started a trial of the service for outpatients in March 2020 and it went "live" from August 2020. Between April 2020 and January 2021, 1,085 patients benefitted from the service.

IMH also stepped up teleconsultations to nursing homes during the pandemic – from 267 sessions in January 2020 to 473 in January 2021. The number of nursing homes that subscribed to the service increased from 24 in January 2020 to 36 in January 2021.



"It has been more than a year since the COVID-19 pandemic started and I am proud of our colleagues for their selfless service in the face of such a long-drawn adversity. Our goals in the last year are consistent with our aspirations for beyond 2020; recovery, hope, and independence for patients, wellness, resilience, and happiness for the people of Singapore and meaningful, rewarding, and joyful work for staff and partners."

Associate Professor Daniel Fung CEO, Institute of Mental Health

RESEARCH & EDUCATION

UPDATING HEALTHCARE PROFESSIONALS ON MOOD DISORDERS AND OBSESSIVE COMPULSIVE DISORDER

In December 2020, the Mood Disorders Unit at IMH hosted the second edition of the annual Mood Disorder Updates for Professionals via a webinar. The event provided updates on interventions for depression and bipolar disorder. Topics covered also included the management of perinatal mental health, neurostimulation, virtual cognitive behavioural therapy groups, and an introduction to art therapy.

Separately, the annual workshop on obsessive compulsive disorder (OCD) for mental health professionals with an interest in working with families or individuals with OCD was held in January 2021, with a second session organised in February 2021. Topics covered included pharmacological and psychological treatment options such as Exposure and Response Prevention (ERP) therapy, as well as practical ways of applying the ERP principles to cases.

CODE BLUE GAMIFICATION PROJECT

IMH nursing collaborated with Temasek Polytechnic via the Health Innovation Challenge to use gamification for code blue training of nurses. The first prototype of the application, released in May 2018, showed good results, with nurses reporting increased confidence and retention of learned content.

In 2020, the team was awarded the ALIVE Serious Game Grant of \$15,000 to improve the game application together with the Lee Kong Chian School of Medicine. With technical support from Nanyang Polytechnic, the team redesigned the game in January 2021. The game was rolled out to all nurses during the Emergency Resuscitation training course in May 2021.

IMPROVING MENTAL HEALTH OF CAREGIVERS

The *Well-being of the Singapore Elderly* (WISE) study conducted in 2013, found a 10 per cent prevalence of dementia among those aged 60 years and above, and that caregivers of older adults with dementia were more likely to experience higher caregiver's burden. In this regard, knowledge of dementia was shown to be a protective factor against caregiver's distress. From January 2017 to December 2018, Dr Yuan Qi, Research Fellow at IMH Research Division, led a study to investigate the extent of dementia knowledge among caregivers in Singapore using the Dementia Knowledge Assessment Scale (DKAS). This enabled the team to identify knowledge gaps about dementia among caregivers that needed to be addressed. The other aim of the study was to identify how certain caregivers' characteristics affected their knowledge about dementia.

282 primary caregivers between the ages of 24 and 85 were recruited from IMH, its satellite clinics, and Changi General Hospital. Findings from the study suggested a need for knowledge of dementia to be improved among caregivers. Additionally, being a male caregiver and having a lower education were associated with poorer scores. Notably, duration of caregiving did not significantly predict better scores on any factors.

These findings highlighted the importance of introducing more educational interventions on dementia tailored for caregivers, especially male caregivers and those with lower education. The findings also indicated that experienced caregivers may benefit from such interventions. The study was published in the *Journal of Mental Health and Aging* in March 2020.



INVESTIGATING THE CAUSES OF STIGMA TOWARDS MENTAL ILLNESS IN SINGAPORE

Researchers from IMH Research Division conducted a study to understand the causes and reasons of stigma towards mental illness in Singapore, and investigated the cultural influences of stigma from the public's perspective.

Nine focus group discussions were conducted between February and September 2018 with 63 Singaporean participants from the public. The study team identified 11 themes for the causes and reasons of stigma and conceptualised them into a sociological model to show how stigma was influenced by culture and environment. The generic causes of stigma such as the 'fear towards a person with mental illness (PMI)' and the 'intergroup bias' were universal and similar to what was reported in studies conducted overseas. The cultural influences of stigma identified in this study included the 'Chinese culture of 'face' and 'Asian's conservative values'. The themes that were more unique to Singapore's context were the 'elitist mindset among Singaporeans' and the 'perceived inability to handle interactions with PMI'. These findings would be helpful in shaping the design of future anti-stigma interventions in Singapore. The study was published in the *BMC Psychiatry Journal* in August 2020.



The socioecological explanatory model for stigma.

ADVANCING MENTAL HEALTH

ENGAGEMENT, REHABILITATION, AND PLACEMENT (ERP) FOR PATIENTS WITH INTELLECTUAL DISABILITY

In February 2020, IMH piloted a rehabilitation programme for IMH long-stay adult patients with intellectual disability (ID) to improve their functional, cognition, and emotional status. The multidisciplinary team in the ward introduced a range of clinical and recreational interventions including domestic and basic conversational skills. The patients were then put on a Ward Work Rehabilitation Programme (WWRP) to receive simple work training, a stepping stone for employment in the future. A year into the programme, 46 per cent of the 11 clients showed improvement in rehabilitation potential. A patient who had stayed in IMH for seven years showed significant improvement and was discharged home. This pilot programme will be further improved and refined as more patients get enrolled, with plans for it to become a mainstream initiative at IMH.

SUPPORTING NURSING HOMES

In March 2019, IMH started a pilot Virtual Ward Programme with Econ Nursing Home, aimed at creating a support system for nursing home partners to better manage residents with mental health conditions. Econ Nursing Home identified patients with frequent relapses to the Virtual Ward Team. The team would then conduct an on-site review to help the nursing home staff gain competency to manage the patients. For patients who had to be admitted to IMH, the Virtual Ward Team continued to provide support virtually. Approximately 100 patients were enrolled in the programme from March 2019 to March 2021, with the addition of Sunlove Nursing Home. Since the programme started, there was a significant reduction of more than 50 per cent in the readmission rate of patients from the two nursing homes. Those who were admitted to IMH had a shorter length of stay of more than 50 per cent. The Virtual Ward Programme was awarded the Health Services Development Programme Funding, which will be used in FY2021 to expand this initiative to other nursing home partners.

IMH organised IACAPAP 2020.



BOLSTERING MENTAL HEALTH SUPPORT FOR THE YOUNG

IMH organised the 24th World Congress of the International Association for Child and Adolescent Psychiatry and Allied Professions (IACAPAP) 2020, which was held virtually in December 2020. The opening ceremony was graced by Guest-of-Honour President Halimah Yacob. The biennial event attracted 1,572 child and adolescent psychiatrists and Allied Health Professionals, from 85 countries. Associate Professor Daniel Fung, President of the IACAPAP and CEO of IMH, shared insights on developing children-centric mental health policies.

EDUCATING PARTNERS AND THE COMMUNITY ON OBSESSIVE COMPULSIVE DISORDER

In December 2020, the team from the Assessment Shared Care Teams (ASCAT) conducted a session on OCD for 40 community partners. It focused on symptoms of OCD and effective methods to manage and detect the condition. IMH also gave a virtual talk on “Scrupulosity: When religious or moral beliefs become OCD” at the Catholic Youth Mental Health Festival (also known as BRAVE conference). Insights into the differences between scrupulosity (a subtype of OCD) and normal healthy spiritual practices were presented, accompanied by treatment interventions.



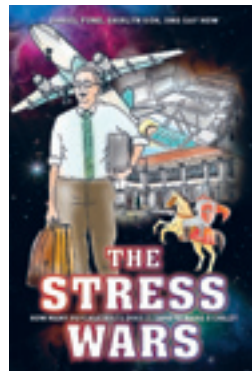
BETTER MENTAL HEALTH THROUGH ART

In March 2019, the IMH Mood Disorders Unit started the Art Therapy programme with its team of art psychotherapists to facilitate recovery for patients with mood disorders. Art therapy emphasises non-verbal expression, providing less threatening ways for patients to contemplate their experiences and feelings. It also helps patients to explore new perspectives and build resilience. The art pieces gave the team insights into the patients’ state of mind, allowing for more appropriate interventions in their journey to recovery. 400 patients took part in the Art Therapy programme between March 2019 and March 2021.

50 YEARS OF CHILD PSYCHIATRY

The Child Guidance Clinic (CGC) commemorated its 50th year with the publication of a graphic book which captured its 50-year journey. Titled *The Stress Wars: How Many Psychiatrists Does It Take To Raise A Child?*, the book was written by Associate Professor Daniel Fung, CEO, IMH, and Associate Professor Ong Say How, Chief, Department of Developmental Psychiatry, and illustrated by design students from Nanyang Polytechnic.

The history of child psychiatry in Singapore was also featured in the “Singapore Policy History Project” in collaboration with the National Archives of Singapore. It provided a glimpse into the early years of child mental health services in Singapore and the policies that shaped the CGC’s development through a curated collection of newspaper clippings, photographs, and government records.



NATIONAL HEALTHCARE GROUP POLYCLINICS

Primary care is the bedrock of Singapore’s care transformation journey. For more than two decades, the National Healthcare Group Polyclinics (NHGP) has been working hard to achieve a future-ready primary care ecosystem, one that is sustainable, accessible, and effective in improving population health. The COVID-19 pandemic has accelerated NHGP to operate in a new norm of care, where innovation and technology are key to quality care for our patients while adhering closely to restrictions and safety measures.

CONTRIBUTIONS IN THE BATTLE AGAINST COVID-19

Since COVID-19 was detected in Singapore, NHGP swiftly responded to, and remains dedicated to supporting the nation’s fight against the pandemic. The polyclinics took active measures to prevent and contain infection risk to staff and patients. Outside of the polyclinics, NHGP set up and managed different care facilities around Singapore.

Prevention and Containment of Infection

In response to COVID-19, NHGP swiftly implemented comprehensive safe distancing measures, deferred non-critical appointments, triaged and segregated patients into three colour zones – red, orange, and green. Possible suspect cases were isolated and managed in the red zone.

In line with the Ministry of Health’s (MOH) workflows, all patients who matched MOH’s suspect case definition, or had an acute respiratory infection, underwent a swab test. As of 31 March 2021, NHGP completed more than 96,000 Swab And Send Home (SASH) swabs at its six polyclinics. This enabled earlier diagnosis of patients, and also alleviated the swab workload at the National Centre for Infectious Diseases (NCID) and hospital emergency departments.



Patients were triaged and segregated into colour zones to minimise COVID-19 transmission risk.



Forward Medical Posts at Dormitories

NHGP set up and operated 14 Forward Medical Posts (FMP) in Purpose-Built-Dormitories (PBD) in Northern Singapore, caring for more than 50,000 migrant workers. The teams manning the medical posts comprised doctors and nurses. They provided triage services and clinical care, and conducted swab tests on migrant workers. Non-clinical staff supported the administration duties. These FMPs were handed over to private healthcare providers in September 2020.



Swab Isolation Facilities

NHGP led operations at four Swab Isolation Facilities (SIFs), which offered patients who were waiting for the results of their swab tests a safe space to self-isolate. The teams manning the SIFs comprised medical, nursing, allied health professionals (AHPs), and operations staff from NHGP, NHG HQ, and NHG Pharmacy, and they took care of close to 5,000 migrant workers.



NHGP managed Forward Medical Posts in dormitories and cared for migrant workers.



Mass Swabbing Efforts

NHGP worked closely with NHG HQ to conduct mass swabbing operations. Two teams of NHGP dentists, care coordinators, nurses, AHPs, and administration staff took part in 100 mass swabbing missions for migrant workers. NHGP nurses also conducted Personal Protective Equipment (PPE) refresher briefings for non-clinical support staff, including SAF personnel, to ensure everyone was adequately equipped.

NATIONAL HEALTHCARE GROUP POLYCLINICS

COVID-19 Vaccination Operations

In January 2021, NHGP commenced COVID-19 vaccinations for its staff at all six polyclinics under Phase 1 of the National Vaccination Programme. While staff vaccinations continued, three polyclinics – Ang Mo Kio, Hougang and Woodlands – piloted COVID-19 vaccinations for external healthcare and frontline workers. On 27 January, Ang Mo Kio Polyclinic piloted COVID-19 vaccinations for seniors aged 70 and above as part of the national vaccination effort. Prime Minister Lee Hsien Loong visited the Polyclinic on the same day to observe COVID-19 vaccinations for 200 seniors.

In February, the remaining five polyclinics started to administer vaccinations. As of 31 March 2021, NHGP administered 56,000 doses of COVID-19 vaccinations to members of the public and staff.



ADVANCING TELEHEALTH SERVICES

Adapting to the new normal of delivering care, NHGP rolled out new/enhanced existing telehealth services in April 2020, including:

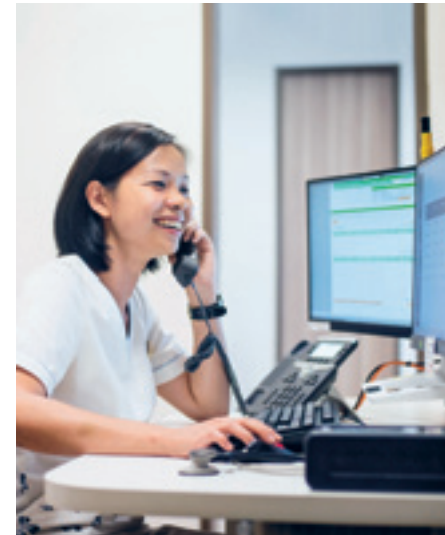
Teleconsultations (with Doctors)

The teamlet care model was extended beyond face-to-face consultations to encompass video sessions in view of safe distancing measures in the clinics. Patients with well-controlled chronic conditions such as diabetes, hypertension and high cholesterol were offered the option of a video or phone consultation with a Family Physician instead of a visit to the polyclinic. The Family Physician would assess the patient's medical condition and review the results of the latest laboratory tests. For the medications prescribed, patients could have them delivered to their homes. As of 31 March 2021, NHGP conducted some 70,000 doctor-led teleconsultations.

A patient experience survey showed that 98 per cent had good overall experience with doctor-led teleconsultations, and 94.5 per cent expressed willingness to use this virtual mode of care again.

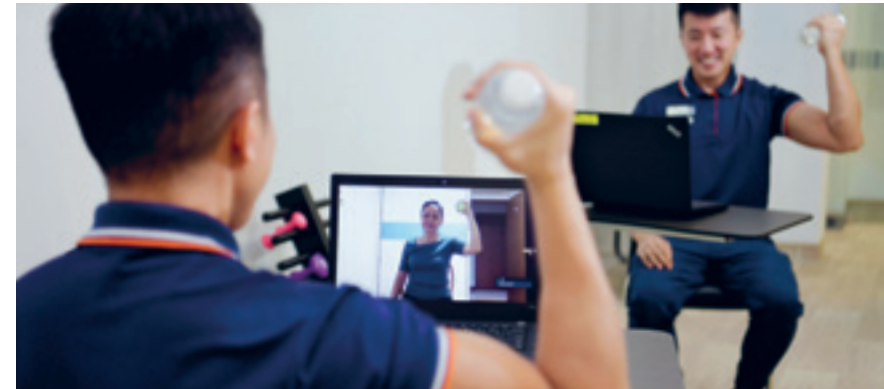


Telehealth services allowed patients to receive care at home, instead of visiting the polyclinic.



Teleconsultations (with Care Managers)

Patients with well-controlled chronic conditions could opt for a teleconsultation with a Care Manager instead of a visit to the polyclinic. The Care Manager would assess patients' home monitoring readings and adherence to medications, and keep track of recent hospitalisations and new symptoms reported by patients, if any. Medication refills could also be delivered to patients' homes.



Tele-Physiotherapy

Eligible patients with appointments for a physiotherapy review were offered a virtual therapy consultation with an NHGP physiotherapist. This gave patients convenient access to physiotherapy services in the comfort of their homes. The physiotherapist would observe patients' movements, and guide and prescribe exercises during the video consultation.

Tele-Psychology

Eligible patients ascertained through a pre-screening were offered this service to enable essential mental health support and timely interventions to be provided over the phone. This allowed patients to better manage depression, anxiety, insomnia or other stress-related problems, and facilitated early detection and risk management of their conditions. Patients with complex psychological issues continued with their face-to-face consultations.

Tele-Direct Observed Therapy (DOT)

NHGP was the first public healthcare institution to implement the Tele-DOT service to patients with tuberculosis. Available at its polyclinics since June 2020, patients who fulfilled the criteria set by the Tuberculosis Control Unit (TBCU) for Tele-DOT could substitute face-to-face DOT at polyclinics with a video consultation from a nurse, within the safety and convenience of their homes.

Tele-Dietetics

Patients with chronic conditions as well as paediatric patients with feeding and nutritional needs could receive dietetic consults via video calls with NHGP dietitians. Besides convenience and time-savings for patients, Tele-Dietetics also facilitated closer intervals between reviews, allowing the dietitians to introduce specific dietary interventions to patients in a timely manner, and according to their individual environments.



NGEMR GOES LIVE AT NHGP

In February 2021, Geylang Polyclinic's Next Generation Electronic Medical Record (NGEMR) system went "live", as part of MOH's IT Master Plan to deliver seamless and holistic care to patients. The other five clinics transited to the new system in May 2021.





“Many of our staff on the frontline worked tirelessly to contain the outbreak, be it at the polyclinics, or as part of teams deployed to provide medical support at the dormitories, Swab Isolation Facilities (SIFs), or mass swabbing missions. In knowingly putting themselves at risk to save lives and reduce the number of patients affected, they are our heroes. This strong team spirit and dedication demonstrated will definitely bring us a long way during this tough period.”

Associate Professor Chong Phui-Nah
CEO, National Healthcare Group Polyclinics & Primary Care

CONTRIBUTING TO PRIMARY CARE RESEARCH AND EDUCATION

- **MAY 2020** Associate Professor Chong Phui-Nah, CEO of NHGP & Primary Care, was invited to speak at a four-part webinar series titled *Experiences from the Front Lines: The Global Primary Healthcare Response*. The webinar was jointly organised by The Harvard Medical School Department of Global Health and Social Medicine’s Program in Global Primary Care and Social Change, the Center for Primary Care, and members of the World Health Organization’s Primary Healthcare Young Leaders Network. A/Prof Chong gave an overview of Singapore’s response to COVID-19, and outlined the strategies adopted by NHGP, including harnessing technology to expand the suite of telehealth services to patients.
- **JUN 2020** As an invited guest speaker to an online seminar titled *Telemedicine – Continued Care in a COVID-19 World* organised by the Singapore Medical Association, Dr David Ng, Family Physician, Consultant and Head of Special Projects (Primary Care), shared NHGP’s experience in scaling up teleconsultations from the start of the COVID-19 Circuit Breaker. The seminar was graced by MOH’s Director of Medical Services, Associate Professor Kenneth Mak, and was attended by 1,400 participants.
- **JAN 2021** NHGP and the Singapore University of Social Sciences (SUSS) signed a Master Collaboration Agreement (MCA) to co-develop and deliver a six-week health and wellness coaching module for undergraduates. This partnership, the first of its kind between a primary care organisation and an academic institution in Singapore, aims to nurture a pipeline of local graduates equipped to conduct person-centred health and wellness coaching. By 2023, the course would be offered to a wider group including working professionals under SUSS’ Centre for Continuing and Professional Education.



NHGP CELEBRATES 20 YEARS OF PRIMARY CARE

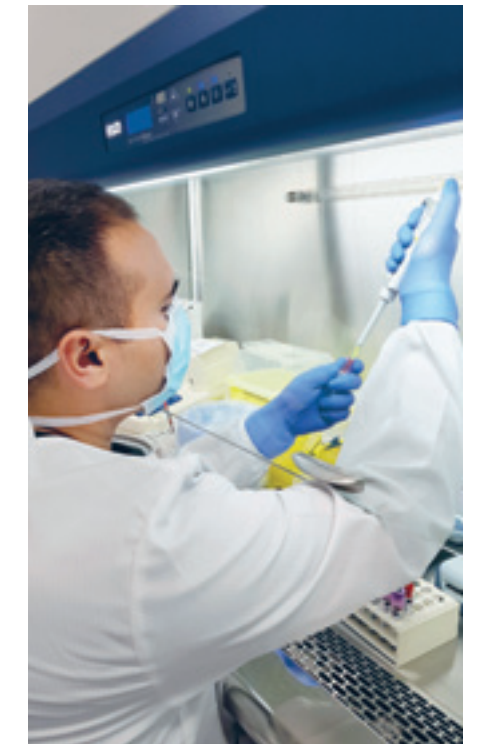
In November 2020, NHGP held its 20th Anniversary celebration, graced by President Halimah Yacob and then Health Minister Gan Kim Yong. During the virtual event, President Halimah conferred the COVID-19 Warrior Awards to six NHGP staff in recognition of their courage and dedication in the fight against COVID-19. A fabric mosaic art piece, comprising 2,020 photos contributed by NHGP staff was also unveiled. It set a new record for the ‘Largest Fabric Photo Mosaic’ in the *Singapore Book of Records*.



NATIONAL SKIN CENTRE

“WHEN THE CALL FOR HELP WENT OUT, WE RECEIVED AN OVERWHELMING RESPONSE FROM OUR STAFF. DESPITE IT BEING VOLUNTARY, **MANY NSC STAFF STEPPED UP AND VOLUNTEERED** TO GO WHERE THEY WERE MOST NEEDED – TO SERVE IN BOTH THE ACUTE HOSPITALS AND THE COMMUNITY.”

Professor Tan Suat Hoon Director, National Skin Centre



NATIONAL SKIN CENTRE

The National Skin Centre (NSC) improves and advances the skin health of the population by setting the highest standard of excellence in dermatological care, education, and research. NSC's continued efforts extend into the community, collaborating with partners to deliver holistic care to frail patients in nursing homes. When COVID-19 emerged in Singapore, NSC staff stepped up to meet the nation's needs, providing exemplary care at the frontlines.

SUPPORTING THE NATIONAL COVID-19 RESPONSE

When the number of COVID-19 infections surged in Singapore last year, NSC together with the other NHG Institutions augmented the medical and nursing manpower at the frontlines. From April to October 2020, close to 70 Medical, Nursing, Ancillary, Allied Health, and Administration staff were deployed or seconded across Singapore at the Community Care Facility (CCF) at Singapore EXPO and medical posts at the migrant worker dormitories, as well as at the National Centre for Infectious Diseases (NCID), Tan Tock Seng Hospital (TTSH), Khoo Teck Puat Hospital (KTPH), and Admiralty Medical Centre (AdMC).



Top left: NSC doctors rallied Singaporeans to stay home to protect themselves and their loved ones. Bottom left and top: A/Prof Steven Thng, Senior Consultant, NSC, attending to migrant workers at the dormitories.

"We have entered a new normal, where practices such as wearing masks, routine testing, and hybrid work arrangements are here to stay. NSC has ramped up teleconsultations to ensure continuity of care for our patients, while ensuring their safety and well-being. We will continue to partner primary care and community partners to reach out to patients, as well as invest in innovation and research to achieve impactful dermatological outcomes that will help improve population health."

Professor Tan Suat Hoon Director, National Skin Centre

REVAMPING WORKFLOWS

NSC Taskforce

A multidisciplinary Taskforce across departments was formed to align operations with the Ministry of Health's (MOH) and NHG's COVID-19 measures. The Taskforce held regular meetings to ensure the Centre kept pace with, and responded appropriately to the latest developments of the disease. Precautions taken included team segregation and safe distancing measures. Activities were also reconfigured to focus on priority areas, such as reviewing patients' notes and diagnosis to defer non-urgent appointments, and transitioning services to home-based treatment, such as liquid nitrogen for viral warts and targeted phototherapy for vitiligo.

Set-up of Triage Area and Fever Clinic

NSC observed strict segregation of patient and staff zones to minimise transmission. It set up a triage area in the basement to monitor patients' and visitors' temperatures, and assist patients and their next-of-kin with electronic travel and health declarations. Administration staff supported the screening of patients and visitors.

Personal Protective Equipment (PPE) Refresher Training

PPE refresher training was conducted for all staff, as well as blood spillage management.

Adjustment of Clinic Operations

As a preventive infection control measure, NSC scaled down operations in February 2020 to focus on essential services, and to safeguard patient and staff safety. It suspended non-essential services and replaced face-to-face consultations with remote tele-dermatology sessions for vulnerable patients.

The Operations and Infection Control teams worked closely to establish a new Fever/Upper Respiratory Tract Infection (URTI) Clinic. It is a designated isolation area for patients with fever or URTI symptoms and deemed to be high-risk, requiring medical attention.

The Nursing team managed caseloads by scheduling appointments for treatments based on essential and non-essential (non-medical) services. They also monitored and identified potential high-risk patients that might not have been detected at the triage screening stations.



Medication Delivery Services

To ensure seamless care delivery for patients with prescriptions, the NSC pharmacy increased medication deliveries across the island. To pre-empt against drug shortages and potential supply chain disruptions due to the pandemic, pharmacy staff closely monitored and managed stocks, and applied dispensing restrictions.

Patient and Staff Communication

The Corporate Development and Communications teams supported the NSC Taskforce by updating staff and patients on the latest COVID-19 announcements through advisories across platforms, including the NSC website, staff newsletters, and social media.

Education and Academic Activities

Medical education and training was reconfigured as e-learning via Zoom for medical undergraduates, and Continuing Medical Education (CME) programmes.



INNOVATIONS IN CARE

Teleconsultations For Patients

When Singapore entered into the Circuit Breaker in April 2020, NSC doctors, nurses, and staff from clinic operations and pharmacy worked together to coordinate teleconsultation sessions for patients and ensured the smooth home delivery of medication. This enabled patients to receive timely reviews and diagnosis of their medical conditions remotely, while keeping them safe with reduced contact and waiting times. It also saved cost and made care more convenient for patients who were frail or bedridden.



NSC Retail Pharmacy Launches Electronic Shelf Labels

In August 2020, NSC introduced the Electronic Shelf Label system at its retail pharmacy. The new price labels were fully graphic, with E-ink displays which could be updated wirelessly and in real time. This system eliminated manual tasks such as the printing and changing of paper tags, allowing staff to better focus on inventory management. It also helped reduce NSC's carbon footprint.

Ensuring Care Continuity Through Tele-Dermatology Nursing Services

In February 2020, when Singapore raised its Disease Outbreak Response System (DORSCON) level to Orange, the dermatology nursing services at three nursing homes were suspended. To ensure care continuity, NSC converted its physical visits into tele-nurse consultation sessions in June 2020. Nurses from the nursing homes worked closely with NSC dermatology nurses to discuss appropriate care and treatments for residents' conditions. Cases that required further assessment were escalated to the medical team for consultation.

BOOSTING STAFF MORALE

NSC WeShare Session 2020

In July 2020, NSC held its annual WeShare session virtually with some 280 participants. Professor Tan Suat Hoon, Director, NSC, shared on the global impact of COVID-19, NSC's various roles during the pandemic, and the challenges foreseen in the near future. The Human Resource department introduced a counselling hotline to support staff mental well-being. An appreciation video featuring staff in action at the different CCFs was also screened.

Donating Moisturisers To Frontline Healthcare Workers

In April 2020, NSC appealed to the public for donations of moisturisers to support healthcare professionals experiencing skin problems while battling COVID-19. As a result, NSC received some 1,320 tubes of moisturisers from donors, which were distributed to healthcare workers deployed at the CCF@EXPO.

Nurses' Day Celebration 2020

In August 2020, NSC commemorated Nurses' Day virtually, with all nurses and Senior Management in attendance. A special video montage put together by Nurse Clinician Norlaila Kamarudin and her team highlighted memorable moments captured during their deployment at various institutions and contributions to the fight against COVID-19. Professor Tan Suat Hoon, Director, NSC, expressed her appreciation for the nurses – about 40 per cent of nursing staff were seconded to support public health institutions at the various CCFs to care for COVID-19 patients. The nurses who remained in NSC continued to provide essential services and carried on with daily operations with unwavering dedication.



PRESCHOOL CHILDREN GIVE THANKS TO HEALTHCARE HEROES

In April 2020, frontline staff at NSC received handmade cards, with words of encouragement and appreciation from the children at Averbel Child Development Centre Pte Ltd and My First Skool (Woodlands Circle).



NSC Townhall 2021

In January 2021, NSC held a virtual Townhall to address the COVID-19 vaccination exercise. The session enabled participants to better understand and address their concerns about the Pfizer-BioNTech vaccine. After the Townhall, there was an increase of 8.4 per cent in the vaccination take-up rate among staff and partners who previously declined or were undecided.



OUR PEOPLE

Throughout the COVID-19 pandemic, our staff remained the backbone of the care delivery system for our patients, population, and the nation. The NHG Family rallied together to overcome many challenges, encouraging each other and staying connected virtually. Even as our workplace practices continue to evolve, NHG is committed to our staff to foster a safe and collaborative environment for them to perform their roles effectively.

TOGETHER WE GROW

MOVING TO ONLINE PLATFORMS

The disruptions caused by the COVID-19 pandemic meant having to equip staff with new digital platforms and tools. Employees had to adapt to virtual meetings, classes, e-conferences, webinars, and e-learning modules. To build an online learning community at the workplace, Group Human Resource (GHR) rolled out bite-size learning content and articles via NHG Workplace.

EMERGING TRAINING NEEDS

The COVID-19 pandemic reinforced the importance of good leadership at multiple levels. With the majority of NHG HQ staff working from home, supervisors had to learn how to engage, communicate, and lead their teams.

The Managers' Capability Development (MCD) Framework, a self-help learning guide, is an effective tool for first-line management. Piloted through eLEARN, MCD fostered knowledge exchange among supervisors through virtual workshops. Cross-institution focus group discussions were conducted to determine the learning needs of our NHG leaders. Virtual Facilitation and Building Resilience workshops were also organised, empowering staff to co-create new solutions by tapping on various tools and techniques for virtual collaboration.



Picture was taken pre-COVID-19.



SYNERGISING NETWORKS

In June 2020, the 'Leaders Network' (LN), a group-level engagement platform, was conducted virtually, bringing together eight cohorts of NHG Healthcare Leadership College (HLC) programme participants to build relationships, and foster greater learning and collaboration amid challenging times. NHG senior management also shared their personal leadership journeys and insights during these sessions. The LN will be expanded to more NHG leaders as the organisation advances its care transformation efforts.



COLLECTIVE LEADERSHIP IN BATTLING A PANDEMIC

In 2020, NHG turned 20. Instead of celebrations, we were called upon by the nation to respond to the biggest health crisis in a century. And we rose to the challenge. Since the first case of COVID-19 was identified in Singapore on 23 January, staff across the NHG Family have been working tirelessly to battle the pandemic. In a video produced by Group Corporate Communications, titled *Collective Leadership in Battling a Pandemic: The NHG Story*, leadership across NHG and our Institutions shared the challenges, strategies, and lessons learned in the fight against COVID-19. They also saluted all the frontliners who went beyond their call of duty to help contain the spread of COVID-19 in Singapore.





TOGETHER WE CONNECT

HQ TOWNHALL

Professor Philip Choo, Group CEO, NHG, chaired a virtual townhall in May 2020 to motivate staff on adapting to the new normal. GHR shared heart-warming stories of NHG HQ employees who supported the national COVID-19 response effort, and updated on work arrangements that were aligned to the Ministry of Health's (MOH) COVID-19 measures. Useful resources were also posted on NHG Workplace to help staff become adept at working virtually.

MINISTER-NHG TOWNHALL

In June 2020, a Minister-NHG Townhall was held virtually, with some 500 attendees. Mr Gan Kim Yong, then Minister for Health, chaired a panel discussion, joined by Mr Amrin Amin, then Senior Parliamentary Secretary (Home Affairs & Health) and Professor Philip Choo, Group CEO, NHG. Professor Chua Hong Choon, Deputy Group CEO (Strategy & Transformation), NHG and CEO, KTPH & Yishun Health, moderated the session. It focused on MOH's key efforts in the fight against COVID-19 and gave appreciation to NHG staff for their contributions.

MOH-NHG TOWNHALL ON COVID-19 VACCINATION STRATEGY

In December 2020, MOH and NHG jointly organised a Townhall, following news of the Health Sciences Authority's (HSA) approved use of the Pfizer-BioNTech COVID-19 vaccine in Singapore. The session shared vital information on Singapore's vaccination strategy as well as the operational roll-out of the national vaccination programme. The event was attended by MOH leaders, and about 500 NHG management and staff.



APPRECIATING OUR PEOPLE

A "staff treats" initiative was introduced in 2021 to appreciate and uplift our staff. GrabFood and Decathlon e-vouchers were presented to staff, and departments were encouraged to share how they sustained teamwork and camaraderie while working from home.

HEROES OF OUR TIME ART EXHIBITION: A TRIBUTE TO FRONTLINERS

In March 2021, the *Heroes Of Our Time* art exhibition, co-organised by NHG and the Singapore Art Society (SAS), officially opened with Senior Minister of State for Communications and Information, and Health Dr Janil Puthuchery gracing the event as Guest-of-Honour.

The exhibition held at ION Art Gallery featured more than 200 artworks that paid tribute to healthcare and essential workers during the COVID-19 pandemic. The 1.8m (H) x 3m (L) central artwork, titled *Heroes of Our Time* features images of Singapore's battle against COVID-19. The acrylic painting was created by 18 artists from SAS. It was presented to the National Centre for Infectious Diseases (NCID), which has been at the forefront of Singapore's efforts to manage the pandemic. The exhibition was organised in partnership with HealthServe, a non-profit organisation that seeks to improve the well-being of migrant workers, and *Asian Scientist Magazine* which staged the "Celebrating our Healthcare Heroes" national art competition. The art event was supported by Temasek Trust's oscar@sg fund, Pfizer Singapore, and ION Orchard. It attracted more than 1,200 visitors, including art competition participants and their family members, Prime Minister Lee Hsien Loong and his wife Ms Ho Ching, as well as NHG senior management and staff.



Clockwise from above: Prime Minister Lee Hsien Loong and Ms Ho Ching at the *Heroes of Our Time* art exhibition; Artworks displayed in the ION Art Gallery; The central artwork titled *Heroes of Our Time*; NHG Senior Management with Guest-of-Honour Senior Minister of State for Communications and Information, and Health Dr Janil Puthuchery at the official opening of the exhibition.

OUR PEOPLE

COMING TOGETHER

In January 2021, Tan Tock Seng Hospital (TTSH) and NCID held a *Stronger Together, Better Together – Staff Appreciation* event to commemorate the first year of COVID-19 response. Guest-of-Honour Madam Kay Kuok, then Chairman of NHG, visited the Art and Photography Exhibition at the TTSH Atrium, and unveiled five sculptures by artist Victor Tan, dedicated to TTSH and NCID staff. The sculptures depict various healthcare professional groups and community partners Coming Together as one in our fight against COVID-19. Thousands of wires weaved together make up the sculptures – symbolising Unity, Strength, and Resilience.



LIFEWISE SPECIAL ISSUES

Jul-Sep 2020: Together, We Shall Overcome COVID-19

Our on-going battle with COVID-19 on the frontlines is a tremendous test of leadership, stewardship, perseverance, teamwork, tenacity, and fortitude. This issue gives a glimpse into how we as the NHG Family is rallying together with the whole-of-Singapore to cure the sick, and proactively keeping our people and population safe. Even as Singapore progressively lifts restrictions and opens up, the battle is far from over.

Oct-Dec 2020: Circuit Breaker Journal

This bumper issue features Singapore's Circuit Breaker 2020 – as seen through the lens of Group Corporate Communications. Our Circuit Breaker Journal comprises quotes, pictures, drawings, publications, and social media musings to mark the singularly unique chapter of our history, and gives a glimpse of the united efforts of the Government, frontline workers, and the community to contain the spread of COVID-19 in Singapore.

Jan-Mar 2021: A special tribute to Madam Kay Kuok for her Defining Tenure as NHG Chairman

This issue highlights Madam Kay Kuok's visionary leadership of NHG for the past 12 years. Under her chairmanship, NHG achieved several milestones of care delivery – from championing disease management programmes, to laying the groundwork for population health management, laying the foundation of the National Mental Health Blueprint and encouraging an on-going culture of continuous improvements in collaborative and team-based care models in our *River of Life* framework.

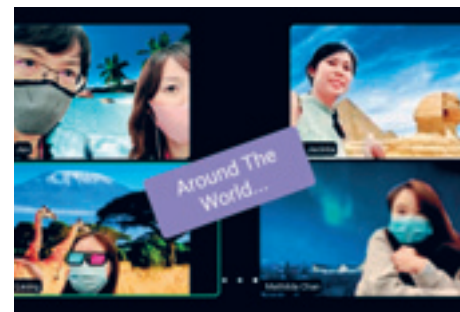
TOGETHER WE CARE

ENHANCING STAFF WELL-BEING

To engage staff and boost employee resilience and promote Joy in Work, the NHG Staff Well-Being Committee (NHG-SWC) introduced a Co-Funding Scheme for Staff Mental Well-Being in FY2020. It supported the scale-up of mental health initiatives in response to the pandemic. The NHG-SWC is chaired by Professor Chua Hong Choon, Deputy Group CEO (Strategy & Transformation), NHG, and CEO, KTPH & Yishun Health, and Mrs Olivia Tay, Group Chief Human Resource Officer, NHG. To-date, five Institutions have sought support from the scheme to augment well-being efforts. Additionally, a survey was conducted in August 2020 as part of MOH's collaborative efforts with healthcare clusters to monitor staff well-being. The results served to guide the design of interventions to improve staff wellness.

New workplace health initiatives under NHG's *Zest For Life* framework continued to be rolled out to improve employees' physical, emotional, and psychosocial well-being. In October 2020, the inaugural virtual Mental Wellness Campaign themed "Are You Okay?" was launched in NHG HQ. The campaign benefitted 209 staff, strengthening their capacity for empathy and resilience through psychological aid, and mindfulness workshops.

The HQ Mental Wellbeing Initiative was piloted between January and March 2021, with the objective of raising awareness on burnout. Staff videos on managing stress were curated. Activities were also organised to enhance camaraderie among staff and encourage team-bonding.



Picture was taken pre-COVID-19.



TORCH OF HOPE

The "Torch of Hope" music video was composed by Group Corporate Communications with national singers to galvanise all healthcare workers in our fight against COVID-19. It rallied all to help one another through the pandemic, and emerge even stronger to *add years of healthy life*. TOGETHER, WE SHALL OVERCOME!

HQ FITNESS FOR CHARITY

Fitness for Charity (FFC) was launched in NHG HQ to raise funds for charity. Participants were encouraged to achieve fitness challenge goals, with colleagues pledging donations to spur them on. In FY2020, a sum of \$18,252 was raised for our charity-of-choice, Care Corner Seniors Services.



TOGETHER WE CELEBRATE



NATIONAL MEDICAL EXCELLENCE AWARDS 2020

Two individuals from the NHG Family were honoured at the National Medical Excellence Awards (NMEA) 2020. The award recognises efforts of outstanding clinicians, clinician-scientists, and other healthcare professions for contributing towards care quality, patient safety, research, education, and training.

- Associate Professor Sum Chee Fang, Senior Consultant, Division of Endocrinology, KTPH and Senior Consultant, Diabetes Centre, Admiralty Medical Centre, was bestowed the National Outstanding Clinician Award. He was acknowledged for his exemplary contributions and unwavering commitment to developing and advancing diabetes and endocrinology care.
- Associate Professor Nicholas Chew, then NHG Group Chief Education Officer, and Chairman Medical Board, Woodlands Health, received the National Outstanding Clinician Educator Award. A/Prof Chew was lauded for his dedication and contributions in advancing graduate medical education.



HEALTHCARE HUMANITY AWARDS 2020

Ninety-five individuals were honoured at the 17th Healthcare Humanity Awards (HHA) 2020. Associate Professor Lim Poh Lian, Director, NCID was named one of the eight 'Honourable Mention' winners. The event was graced by President Halimah Yacob.

TWO NHG NURSES RECEIVE PRESIDENT'S AWARD FOR NURSES 2021

Ms Lim Voon Hooi, Chief Nurse, National Healthcare Group Polyclinics (NHGP), and Mr Christopher Soh, Assistant Director of Nursing, Emergency Department, TTSH, were two of seven nurses presented the President's Award for Nurses 2021, the highest accolade in Singapore's nursing profession. The winners received their awards from President Halimah Yacob at a virtual ceremony on 14 July.



Left: Mr Christopher Soh, Assistant Director of Nursing, Emergency Department, TTSH; Far left: Ms Lim Voon Hooi, Chief Nurse, NHGP.

NURSES' MERIT AWARDS 2021

In July 2021, 125 nurses were presented with the Nurses' Merit Award (NMA). The award recipients hailed from various care settings, spanning the community care sector, private hospitals, and public healthcare institutions. There were 30 recipients across our NHG Family. The Nurses' Merit Award started in 1976 and acknowledges nurses who have displayed noteworthy and exceptional performance, participated in professional development, and contributed to raising the nursing profession.



Picture was taken pre-COVID-19.

NHG RESEARCH & INNOVATION AWARDS 2020

The NHG Research and Innovation Awards 2020 recognised six individuals and teams who made outstanding contributions to improve health outcomes or care delivery in NHG. The NHG Research Mentor of the Year Award was presented to Associate Professor Leong Khai Pang, TTSH, and the NHG Innovator of the Year Award was conferred to Associate Professor Tey Hong Liang, National Skin Centre.

The team led by Dr Valerie Teo, Family Physician, Consultant and Deputy Head of Ang Mo Kio Polyclinic, won the NHG Healthcare Innovation Award for its work in developing Primary Tech-Enhanced Care (PTEC) for patients with hypertension.

The NHG Research Impact Award was presented to:

- The team led by Dr Desmond Mao Renhao, KTPH, on the psychological comfort of paramedics with field death pronouncement.
- The team led by Associate Professor David Lye, NCID, for its research work as part of the National COVID-19 Research Workgroup (RWG).
- The team led by Dr Lee Eng Sing, Principal Clinician Researcher of NHGP's Clinical Research Unit, for its epidemiology study on the magnitude and the common patterns of multi-morbidity in Singapore.



APEX 2021 AWARDS

NHG and Institutions clinched seven awards across multiple categories at the APEX 2021, an annual US-based competition which recognises excellence in publishing. This year, APEX 2021 received some 1,200 entries from professional communicators worldwide.

Lifewise, *Transforming Primary Care*, and *Together@NHG* serve as channels to educate our population on health matters, including innovation, collaboration, and news in our Institutions. The publications inspire readers to LIVE WELL and STAY WELL by featuring newsy reads on medical breakthroughs, health, fitness, and wellness, and providing insights into NHG's vision of *Adding Years of Healthy Life*.

The NHG Family won the following APEX 2021 awards:

- Grand Award for NHG *Lifewise* publication in the "Magazines, Journals & Tabloids" category;
- Grand Award for *Together@NHG* (23 Oct 2020) in the "Newsletters" category;
- Grand Award for NHGP's Efforts during the COVID-19 Pandemic (Facebook) in the "COVID-19 Media" category;
- Award of Excellence for NHG *Lifewise* Jul-Sep 2020 Issue 85 (*Together We Shall Overcome COVID-19*) All Hands on Deck article in the "COVID-19 Media - Newspaper/Magazine Articles" category;
- Award of Excellence for NHG *Lifewise* Jul-Sep 2020 Issue 85 (*Together We Shall Overcome COVID-19*); *Lifewise* Oct-Dec 2020 Issue 86 (*Surviving the Circuit Breaker*); *Lifewise* Jan-Mar 2021 Issue 87 (*Honouring Kay Kuok*) in the "Magazines, Journals & Tabloids - Magazine Series" category;
- Award of Excellence for NHGP *Transforming Primary Care* Issue 10 (*Tele-Health Services: Virtual Platforms, Real Outcomes*) in the "Newsletters - Writing" category;
- Award of Excellence for NHGP *Transforming Primary Care* Issue 9 (*Combating COVID-19: The United Fight*) in the "Newsletters - Design & Layout (entire issue)" category.



AWARDS & ACCOLADES FY2020

INTERNATIONAL AWARDS

| | |
|--|----------|
| INTERNATIONAL HOSPITAL FEDERATION AWARD 2020 | 1 |
| IHF Beyond the Call of Duty for COVID-19 | 1 |
| 20TH CCAS* INTERNATIONAL CONTACT CENTRE AWARDS | 1 |
| Contact Centre Champion of the Year Award | 1 |
| INTERNATIONAL ACADEMY FOR DESIGN AND HEALTH AWARDS | 1 |
| EUROPEAN HEALTHCARE DESIGN AWARDS | 1 |

NATIONAL AWARDS

| | |
|--|------------|
| AIC COMMUNITY CARE EXCELLENCE AWARDS | 39 |
| BCA CONSTRUCTION EXCELLENCE AWARD | 1 |
| COMMUNITY CHEST AWARDS 2020 | 2 |
| HEALTHCARE HUMANITY AWARDS 2020 | 16 |
| NATIONAL DAY AWARDS | 321 |
| NATIONAL MEDICAL RESEARCH COUNCIL AWARDS | 13 |
| NATIONAL MEDICAL EXCELLENCE AWARDS | 2 |
| NATIONAL HEALTHCARE INNOVATION & PRODUCTIVITY MEDAL | 3 |
| NURSES MERIT AWARD 2020 | 25 |
| PRESIDENT'S AWARD FOR NURSES | 1 |
| PUBLIC SECTOR TRANSFORMATION AWARD | 2 |
| RESILIENCE AWARD BY GREAT PLACE TO WORK | 1 |
| TAN CHIN TUAN NURSING AWARD 2020 | 3 |

TERTIARY EDUCATION INSTITUTION AWARDS

| | |
|--|-----------|
| NHG-LKCMEDICINE | 16 |
| Nanyang Education Award (School) | 1 |
| NHG-LKCMedicine Clinician-Scientist Preparatory Programme (CSPP) | 13 |
| NHG-LKCMedicine Clinician Scientist Career Scheme | 1 |
| NHG-LKCMedicine Clinician Scientist Career Scheme (Junior) 2020 | 1 |
| NUS YONG LOO LIN SCHOOL OF MEDICINE (NUS YLLSOM) | 99 |

NHG AWARDS

| | |
|--|------------|
| SINGAPORE PATIENT ACTION AWARDS (ORGANISED BY TAN TOCK SENG HOSPITAL) | 8 |
| Singapore Patient Caregiver Award (Individual) | 3 |
| Singapore Patient Advocate Award (Individual) | 1 |
| Singapore Patient Support Group/ Volunteer Group Award (Group) | 2 |
| Singapore Community Engagement Initiative Award (Team) | 1 |
| Singapore Patient Engagement Initiative Award (Team) | 1 |
| STRATEGIC NURSING DEVELOPMENT PROGRAMME (TEAM-BASED) | 2 |
| NHG DEVELOPMENT AWARDS | 95 |
| HMDP (Team-Based) | 22 |
| HMDP (Medical) | 56 |
| HMDP (Administrator) | 1 |
| HMDP (Admin – Executive Development Programme (EDP)) | 8 |
| HMDP (Allied Health Professionals) | 4 |
| HMDP (Nursing) | 1 |
| NHG Management Scholarship (NMS) | 1 |
| Postgraduate Self Development Programme (PSDA) | 2 |
| NHG RECOGNITION AWARDS | 6 |
| Distinguished Senior Clinician Award (DSCA) | 6 |
| NHG TEACHING EXCELLENCE AWARDS 2020 | 352 |
| NHG Education Leaders Award | 9 |
| NHG Inter-professional Teaching Award | 19 |
| NHG Outstanding Education Partners Award | 1 |
| NHG Teaching Award for Senior Doctors | 56 |
| NHG Teaching Award for Junior Doctors | 19 |
| NHG Outstanding Nurse Teachers Award | 34 |
| NHG Teaching Award for Nursing Preceptors | 89 |
| NHG Teaching Award for Pharmacy Senior Preceptors | 6 |
| NHG Teaching Award for Pharmacy Preceptors | 22 |
| NHG Teaching Award for Allied Health Senior Educators | 24 |
| NHG Teaching Award for Allied Health Educators | 27 |
| NHG Special Commendation Award | 46 |
| NHG RESEARCH & INNOVATION AWARDS 2020 | 6 |
| NHG Research Mentor of the Year Award | 1 |
| NHG Healthcare Innovation Award | 1 |
| NHG Research Impact Award | 3 |
| NHG Innovator of the Year Award | 1 |
| NHG EDUCATION | 2 |
| AY2019/2020 Teaching Recognition | 2 |

*Contact Centre Association of Singapore (CCAS)

“AS THE NATION OPENS UP AND RALLIES TO BECOME “COVID RESILIENT”, IT IS THE DAWN OF A NEW ERA – NOT JUST FOR NHG BUT FOR PUBLIC HEALTHCARE AS A WHOLE, AND INDEED FOR SINGAPORE. I WOULD LIKE TO THANK EVERY ONE OF YOU FOR GOING ABOVE AND BEYOND IN THE NATION-WIDE EFFORTS TO KEEP SINGAPORE SAFE. AS WE EMBARK ON THE NEXT PHASE OF OUR JOURNEY, LET US UPHOLD THE NHG VALUES OF *PEOPLE-CENTREDNESS, INTEGRITY, COMPASSION, AND STEWARDSHIP* TO DELIVER OUR VISION OF *ADDING YEARS OF HEALTHY LIFE* FOR OUR FELLOW SINGAPOREANS.”

Mr Tan Tee How Chairman, NHG

PREPARING LIFE'S COURSE

Establishing strong foundations in physical and mental health starts in the critical window of a child's first 1,000 days.

Our genetic coding has a lot to do with our overall development and health. It is, after all, the blueprint that dictates how our body is built — whether we have curly or straight hair, brown eyes or blue, or are prone to a certain type of illness. Yet, the current state of our physical and mental well-being is dependent on many other external factors such as the environmental stimuli we were exposed to in the past, including our life choices and experiences.

For example, what started out as a strong pair of lungs could have been compromised by exposure to second-hand smoke at the prenatal stage of life. Conversely, a genetic propensity to obesity could have been defrayed by healthy eating habits developed from young.

The first 1,000 days of a child's life — from the time of conception to two years of age — is a critical

phase that can have a profound long-term impact. Divided into three stages — pregnancy, infancy, and early childhood — it is a period of transformation when external factors exert a powerful influence. As much as it is a time of vulnerability, when long-term harm can be done, it is also a time of tremendous potential to positively impact a child's all-rounded well-being to last his lifetime.

THE BUILDING BLOCKS TO PHYSICAL HEALTH

Even when a baby is sleeping, a phenomenal amount of activity is happening within his/her body. For one, a newborn's brain doubles in size in the first year and grows to about 80 per cent of adult size by three years of age. Even faster, a foetus' brain grows at an exponential rate — from 10,000 cells during the first trimester of pregnancy, to an astounding 10 billion cells by the 24th week. While our genes give our body the blueprint, nutrition provides it with the building blocks for rapid growth. It is thus important to feed a young life with the right nutrients — and this starts from early pregnancy.

Nutrition is essential for growth and development in the brain. For example, folate (a source of vitamin B9) is needed for brain and spinal cord development, even in the first weeks of pregnancy; and long-chain polyunsaturated fatty acids promote brain health. "Just as having the right nutrients can be a boost, poor nutrition can negatively impact a person's brain development, immune system, and IQ," says Dr Angelia Chua Hwee Ling, Family Physician and Consultant at Yishun Polyclinic.

A mother's nutrient stores are the only source of nutrition for a child in utero, so starting a child's first 1,000 days right translates to an emphasis in making sure that pregnant women have the right nourishment. All too often, pregnant women are urged to "eat for two". But Dr Chua cautions against excess. "Chronic malnutrition in utero or early childhood may predispose the baby to poor growth, such as stunting or failure to thrive. But overweight pregnant women also have a higher risk of developing gestational diabetes (read *Life with Diabetes Can Still Be Fruitful*, page 24) and their babies are likely to have

higher average birth weight, which is associated with an increased risk of diabetes and obesity in both childhood and adulthood," she says.

Studies also show that a pregnant woman's diet, weight gain, and lifestyle habits can, in the long term, affect a child's metabolism, immune system, and organ functions. There are statistics linking diseases such as diabetes, hypertension, and stroke to prenatal nutrition. The World Health Organization (WHO) further recommends babies to be exclusively breastfed in their first six months, as breast milk is rich with live cells that an infant's body utilises for the healthy development of organs and bone tissue. In early childhood, good nutrition continues to play a critical role in ensuring healthy growth, and helps set the foundation for lifelong eating habits that can impact well-being in adulthood.

NURTURING MENTAL WELLNESS

Humans are emotive creatures shaped by our relationships and life experiences. "The way a brain moulds and adapts to its environment contributes to the sort of person the baby will grow into," says Ms Leah Tan, Senior Clinical Psychologist at the Institute of Mental Health (IMH).

While right nutrition during pregnancy and in early childhood assist in the proper development of a baby's learning, physical skills, and emotions, a stimulating and caring environment with loving, secure relationships are also vital in its growth. "It's through their relationships that babies learn to think, understand, communicate, show emotions, and cultivate behaviours. These relationships also affect how they see the world and how they fit into society," says Ms Tan.

Developmental milestone checklists provided in a child's Health Booklet issued by MOH can help ascertain a child's social, fine motor-adaptive, language, and gross motor development.

A child builds fundamental trust in himself/herself, his caregivers, and his/her environment from birth until his/her first birthday, and at 12 to 15 months old, is able to show empathy towards others. All of these happen before a child develops mastery over physical movement and a rudimentary mastery over their environment at three years of age, therefore proving that psychological development happens at a much earlier stage.

In fact, the mental development of a child starts during pregnancy. A mother's poor mental health during pregnancy can affect her child's brain development and function. "Mothers who are subjected to excessive, unhealthy levels of stress would also subject the newborn to developing long-term negative outcomes such as cognitive delays, attention disorders, poor coping skills in school, and emotional problems," says Dr Chua.

At infant and toddler stages, a parent's mental health continues to impact the child's psychological well-being. Poor mother-infant interactions have been linked to behavioural and emotional problems later in the child's life, such as attention-deficit-hyperactivity, anxiety, and depression. So while parents juggle work and parenting commitments, they should still take time for self-care to manage their stress levels or seek professional help if needed. Doing so will go a long way in preventing tension at home, which in turn can negatively impact a child's psychological well-being.

Conversely, loving relationships help create an environment that promotes a sense of safety and security. Through stress-free interactions such as reading, playing, singing, or just talking, parents

and caregivers can help infants and toddlers develop their first positive relationships. Studies have shown that secure, responsive, and predictable relationships with at least one caregiver can influence the formation of neural structures in the brain of an infant, and contribute to their well-being. It can also help him or her regulate stress later in life.

EFFECTS THAT RIPPLE THROUGH A LIFETIME

Developmental milestone checklists provided in a child's Health Booklet issued by the Ministry of Health (MOH) can help ascertain a child's social, fine motor-adaptive, language, and gross motor development. Dr Chua advises parents to consult a doctor for assessment and evaluation of all the recommended touch points found in the Health Booklet. This helps to monitor the growth and development of the child from birth to the age when they go to school.

Dr Chua points out that parents continue to play an integral part in strengthening the foundation of a child's well-being beyond that early stage. "It is important for parents to take ownership of their health and adopt healthy lifestyles for themselves and their children. Parents can also upskill caregivers, such as grandparents, so that they can contribute to creating a healthy environment conducive to support expectant parents and children."

Beyond family, the well-being of an individual has a ripple effect on the community and in turn, the country too. A healthy individual is better able to contribute to society and is less likely to burden the healthcare system. Studies have shown that the cost of failing to invest in the well-being of women and children in their first 1,000 days can be huge: apart from higher health costs, countries lose billions of dollars to lower economic productivity.

Thus, investing in the right care during the first 1,000 days of a child's life is more than just an approach in paving the way for his/her progressive future. It is also a vital strategy in creating prosperity for the community and country, beyond a single generation.



IN CONSULTATION WITH
MS LEAH TAN
SENIOR CLINICAL PSYCHOLOGIST //
INSTITUTE OF MENTAL HEALTH



DR ANGELIA CHUA HWEE LING
FAMILY PHYSICIAN AND CONSULTANT //
YISHUN POLYCLINIC



VOICES OF OUR PEOPLE

“IF YOU THINK ALL IS HOPELESS, YOU ARE NOT ALONE. NEVER GIVE UP. BUILD ON WHAT WE HAVE. NEVER LOSE HOPE.”

Dr Ronald Chong Resident,
Advanced Internal Medicine, NHG

“MY COLLEAGUES REGULARLY CHECK ON ME TO ASK IF I AM COPING WELL. THESE SIMPLE WORDS MAKE A LOT OF DIFFERENCE – THEY GIVE ME RENEWED ENERGY TO PULL THROUGH A BAD DAY.”

Sister Imrana Banu Nursing Manager,
National Centre for Infectious Diseases

“I’VE LEARNT TO STAY TRUE TO MY PROFESSION EVEN IF I HAVE TO TAKE ON UNFAMILIAR TASKS. HAVING THE RIGHT MINDSET HELPED ME WHEN I SUPPORTED THE MIGRANT WORKER DORMITORIES. I AM GRATEFUL FOR THE OPPORTUNITY TO PLAY A PART IN THE FIGHT AGAINST COVID-19.”

Ms Vithya Govindasamy Pharmacy Technician,
NHG Pharmacy

“THE STRESS LEVEL WAS HIGH BUT KNOWING THAT WE WERE DOING EVERYTHING WE COULD FOR PATIENTS AND STAFF MADE IT ALL WORTHWHILE.”

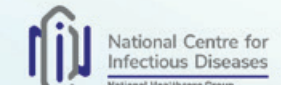
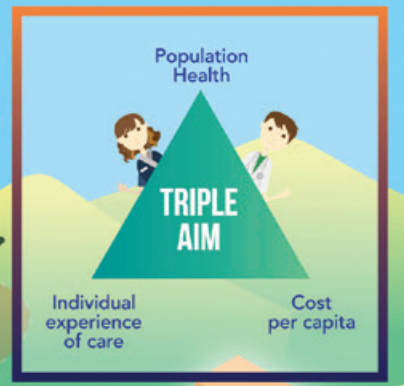
Ms Kelly Tan
Assistant Director, Inpatient
Services, Yishun Health

“I AM PROUD OF HOW THE NHG FAMILY HAS ADAPTED TO THE EVOLVING COVID-19 SITUATION, AND **EMBRACED COLLECTIVE LEADERSHIP TO STEER OUR PEOPLE WELL.** LET US CONTINUE TO REMAIN FOCUSED, VIGILANT, AND ADAPTABLE, AND STAY GROUNDED IN OUR CORE VALUES TO SERVE OUR NATION.”

Professor Philip Choo Group CEO, NHG

RIVER OF LIFE™

Shaping Our New Model of Care Together

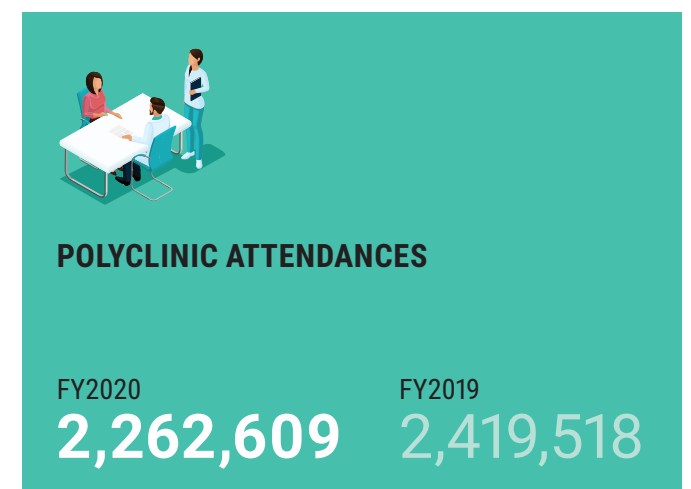
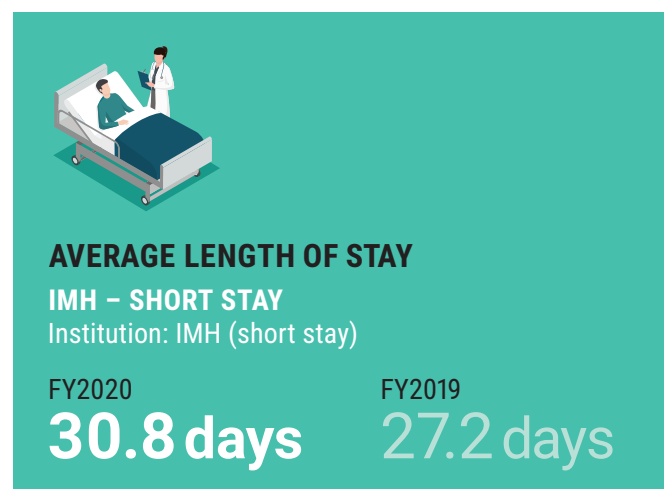
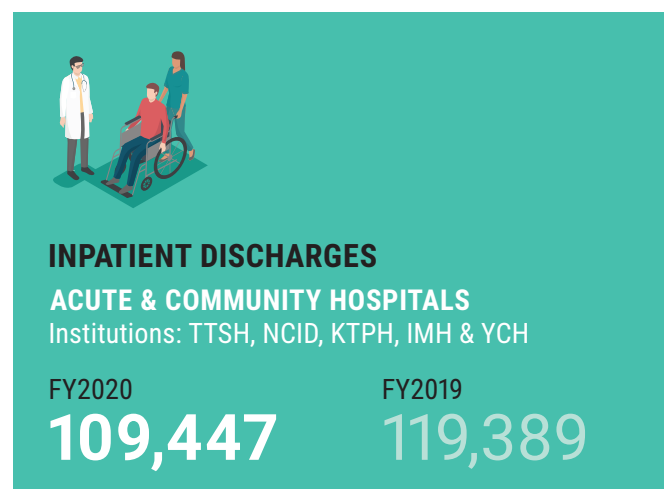
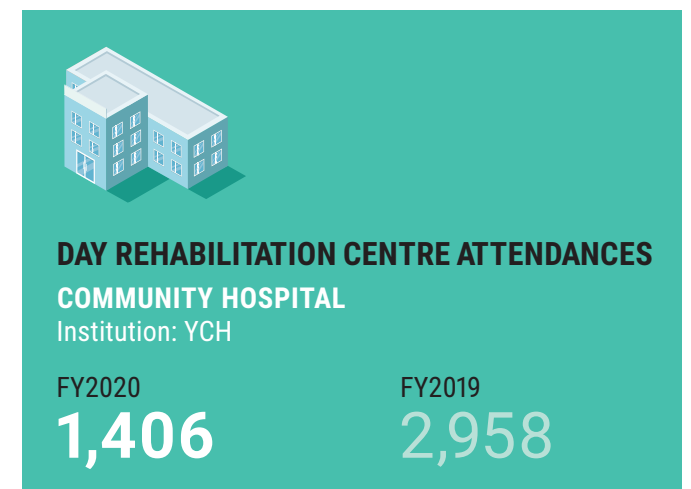
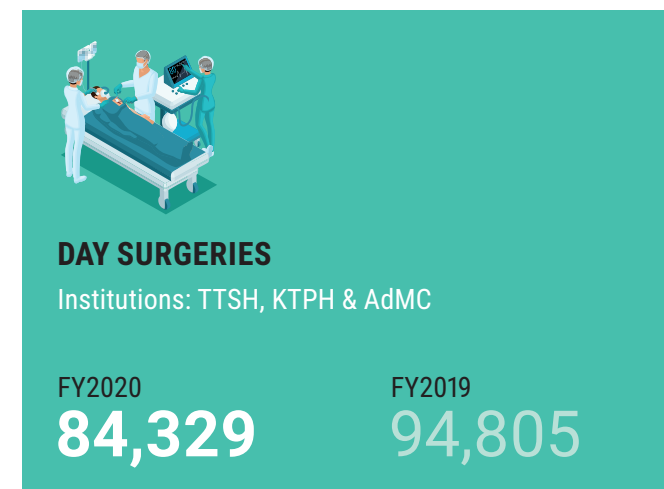
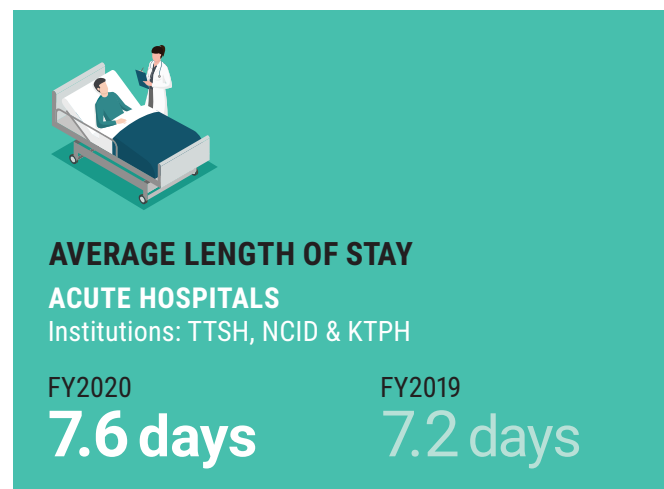
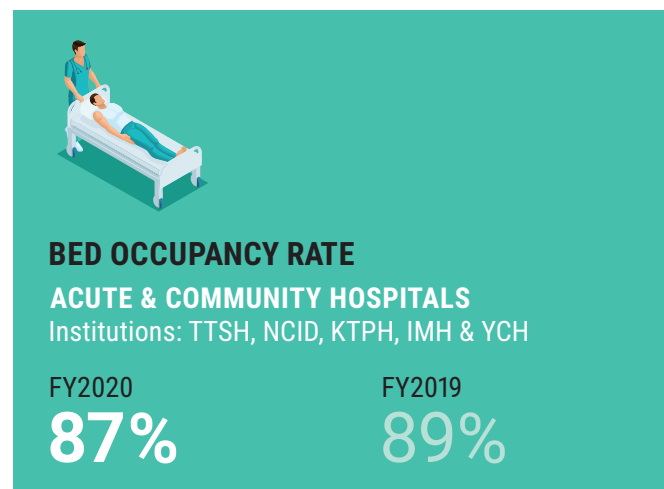
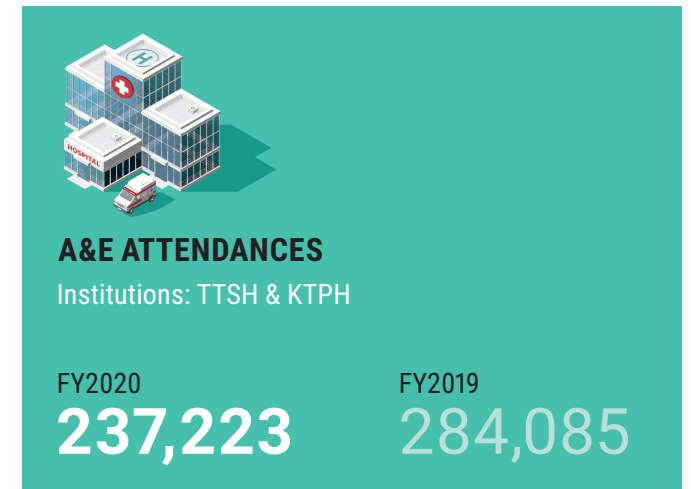
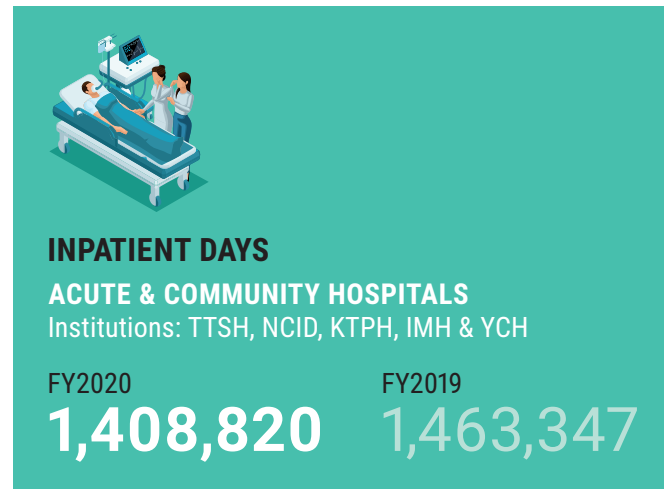


Designed by NHG Group Corporate Communications (adapted from Central Health Model of Care by Tan Tock Seng Hospital). This diagram is meant for NHG and its staff for use in their work. It is not to be reproduced elsewhere for other purposes without the permission of NHG Group Corporate Communications.

www.nhg.com.sg
 nationalhealthcaregroup
 @nhgig

STATISTICS

WORKLOAD FIGURES FY2020 FY2019

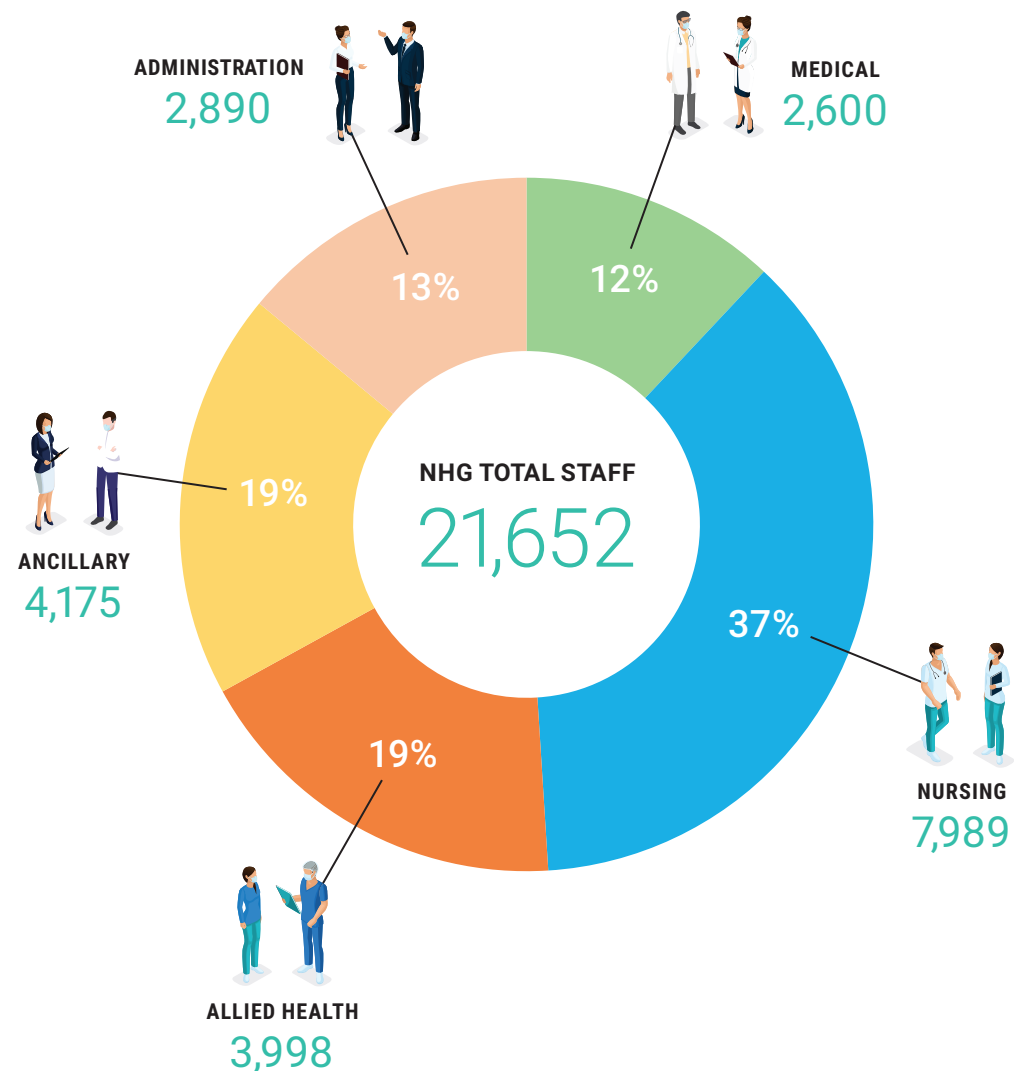


IMH (long stay) for FY2020 is 753.0 days (FY2019: 558.3 days) and this relates to the average length of stay of long-staying patients who were physically discharged during the year.

STATISTICS

DISTRIBUTION OF STAFF

As of 31 March 2021 (FY2020)



“FOR US IN NHG, BATTLING THE COVID-19 PANDEMIC FOR THE PAST TWO YEARS HAS BEEN A TREMENDOUS TEST OF LEADERSHIP, STEWARDSHIP, TEAMWORK, DISCIPLINE, TENACITY, PERSEVERANCE, AND FORTITUDE.”

Professor Philip Choo Group CEO, NHG

DIRECTORY

ABOUT OUR INSTITUTIONS



Adding years of healthy life



TAN TOCK SENG HOSPITAL

11 JALAN TAN TOCK SENG
SINGAPORE 308433
TEL: 6256 6011
www.ttsh.com.sg

Tan Tock Seng Hospital (TTSH) is the flagship hospital of NHG and part of Singapore’s public healthcare system. As a pioneering hospital with strong roots in the community for over 175 years, TTSH is recognised as the People’s Hospital, serving a resident population of 1.4 million living in Central Singapore.

Together, with 70 community partners and 80 community health posts, it brings care beyond the hospital into the community as an Integrated Care Organisation – Central Health.

As one of the largest multidisciplinary hospitals in Singapore, TTSH operates more than 1,700 beds with centres of excellence including the National Centre for Infectious Diseases (NCID), Institute for Geriatrics & Active Ageing (IGA), NHG Eye Institute (NHGEI), TTSH Rehabilitation Centre, and Ang Mo Kio Specialist Centre (AMKSC).

TTSH’s 600-bed Integrated Care Hub will be ready in 2023 to provide for subacute care and rehabilitation. As a healthcare leader in population health, systems innovation, health technologies and workforce transformation, TTSH hosts Singapore’s largest purpose-built innovation centre for healthcare – the Ng Teng Fong Centre for Healthcare Innovation (CHI) and its Co-Learning Network of 37 local and international partners.



NATIONAL CENTRE FOR INFECTIOUS DISEASES

16 JALAN TAN TOCK SENG
SINGAPORE 308442
TEL: 6256 6011
www.ncid.sg

The National Centre for Infectious Diseases (NCID) is a purpose-built facility designed to strengthen Singapore’s capabilities in infectious disease management and prevention. NCID houses clinical services, public health, research, training and education, and community engagement functions under one overarching structure. In addition to the clinical treatment of infectious diseases and outbreak management, the expanded roles and functional units of NCID include the National Public Health and Epidemiology Unit, the National Public Health Laboratory, the Infectious Disease Research and Training Office, the Antimicrobial Resistance Coordinating Office, and the National Public Health programmes for HIV and Tuberculosis. Benchmarked to international standards and best practices, NCID will enhance Singapore’s ability to effectively manage infectious diseases.



KHOO TECK PUAT HOSPITAL

90 YISHUN CENTRAL
SINGAPORE 768828
TEL: 6555 8000
www.ktph.com.sg

Khoo Teck Puat Hospital (KTPH) is a 795-bed general and acute care hospital which opened in June 2010. Serving more than 550,000 people living in the north of Singapore, KTPH combines medical expertise with high standards of personalised care, set within a healing environment, to provide care that is good enough for our own loved ones. From intuitive wayfinding to logical clustering of services, KTPH's design is focused on providing a hassle-free experience for patients.

The hospital has been designed with patients' comfort in mind. Since its opening, the building has garnered numerous awards for its green and energy efficient design. Patients can enjoy comfortable accommodation in different categories of wards with views of greenery and naturally cool air from improved ventilation. KTPH also provides a wide range of outpatient specialist services.

YISHUN COMMUNITY HOSPITAL

2 YISHUN CENTRAL 2
SINGAPORE 768024
TEL: 6807 8800
www.yishuncommunityhospital.com.sg

Yishun Community Hospital (YCH) is a 224-bed hospital which provides intermediate care for recuperating patients who do not require the intensive services of an acute-care hospital. Opened in November 2016, YCH provides a range of services from rehabilitation and sub-acute care to geriatric, dementia and palliative care services, to help support the growing ageing population in Singapore.

WOODLANDS HEALTH

CORPORATE OFFICE
9 MAXWELL ROAD
MND COMPLEX ANNEX A
#03-01A
SINGAPORE 069112
TEL: 6681 5999
www.whc.sg

Woodlands Health (WH) provides care for the north-western population in Singapore. We will operate a purpose-built integrated Campus set to open progressively from 2023. The campus will include a fully integrated acute and community hospital, specialist outpatient clinics, intermediate and long-term care facilities and green healing spaces. We will offer a comprehensive range of acute, sub-acute, rehabilitative and transitional care services, working closely with partners to deliver seamless care within and beyond our Campus.

Since 2016, WH has started serving and empowering residents in their health journey through our community nursing posts and outreach efforts. In September 2020, WH introduced the GPFirst Programme in the North and opened the first community-based Urgent Care Centre at Kampung Admiralty, making urgent care more accessible to residents living nearby.

NATIONAL SKIN CENTRE

1 MANDALAY ROAD
SINGAPORE 308205
TEL: 6253 4455
www.nsc.com.sg

The National Skin Centre (NSC) is an outpatient specialist dermatological centre with a team of dermatologists who have the experience and expertise to treat a wide variety of skin conditions. The Centre also aims to facilitate subspecialisation and be the national focus for the treatment, research, and training on all aspects of skin diseases.

With a comprehensive range of subspecialty services, and serving about 80 per cent of dermatology outpatients in Singapore, NSC is firmly established as a reputable dermatology centre in Singapore and the region. NSC also collaborates with the Agency for Science, Technology and Research (A*STAR) and Nanyang Technological University (NTU) to operate the Skin Research Institute of Singapore (SRIS), which focuses on conducting high impact, inter-disciplinary skin research designed to translate into improved health outcomes and quality of life.



NATIONAL HEALTHCARE GROUP POLYCLINICS

HEADQUARTERS
3 FUSIONPOLIS LINK #05-10
NEXUS@ONE-NORTH (SOUTH LOBBY)
SINGAPORE 138543
CONTACT CENTRE: 6355 3000
www.nhgp.com.sg

National Healthcare Group Polyclinics (NHGP) forms the primary healthcare arm of NHG. Its six polyclinics serve a significant proportion of the population in the central and northern parts of Singapore.

NHGP provides a comprehensive range of health services for the family, functioning as a one-stop health centre providing treatment for acute medical conditions, management of chronic diseases, women & child health services, and dental care. The focus of NHGP's care is on health promotion and disease prevention, early and accurate diagnosis, disease management through physician-led team-based care, as well as enhancing the capability of Family Medicine through research and teaching.

Through the Family Medicine Academy and the NHG Family Medicine Residency Programme, NHGP plays an integral role in the delivery of Primary Care training at medical undergraduate and post-graduate levels. With the Primary Care Academy, NHGP provides training to caregivers and other primary care counterparts in the community sector.

INSTITUTE OF MENTAL HEALTH

BUANGKOK GREEN MEDICAL PARK
10 BUANGKOK VIEW
SINGAPORE 539747
TEL: 6389 2000
www.imh.com.sg

The Institute of Mental Health (IMH) is a 2,000-bed acute tertiary psychiatric hospital. Set amidst 23 hectares of serene surroundings, IMH offers a multidisciplinary and comprehensive range of psychiatric, rehabilitative, and counselling services in both hospital and community-based settings to meet the needs of children and adolescents, adults, and the elderly. Besides providing patient-centred clinical services, IMH trains the current and next generation of clinicians, nurses, and allied health professionals in psychiatry and conducts research related to mental health.



ADMIRALTY MEDICAL CENTRE
676 WOODLANDS DRIVE 71 #03-01
KAMPUNG ADMIRALTY SINGAPORE 730676
TEL: 6807 8000
www.admiraltymedicalcentre.com.sg

Admiralty Medical Centre (AdMC) is a one-stop medical centre for outpatient clinic consultation, day surgery, rehabilitation and diagnostic services, as well as community health outreach activities. It provides selected specialist outpatient services, day surgery procedures and endoscopies for patients. The medical and surgical services are run by clinical departments from Khoo Teck Puat Hospital. AdMC aims to provide hassle-free, holistic specialist care in a convenient community setting in collaboration with other healthcare partners.



INSTITUTE OF GERIATRICS AND ACTIVE AGEING
CENTRE FOR GERIATRIC MEDICINE
TEL: 6359 6332
www.iga.com.sg

The Institute of Geriatrics and Active Ageing (IGA) was established to be at the forefront of Tan Tock Seng Hospital's expansion of research and training initiatives to serve our rapidly ageing population.

Through rigorous translational research and innovation relevant to the needs of older persons, IGA aims to influence geriatric care and practice, propagate evidence-based knowledge through education and learning, and advance the health and quality of life of older persons.



NATIONAL HEALTHCARE GROUP DIAGNOSTICS
3 FUSIONPOLIS LINK #05-08
NEXUS@ONE-NORTH (SOUTH TOWER)
SINGAPORE 138543
CALL CENTRE: 6275 6443 (6-ASK-NHGD)
www.diagnostics.nhg.com.sg

National Healthcare Group Diagnostics (NHGD) is a business division of NHG, providing quality laboratory and imaging services at the primary healthcare level. Via its extensive network of over 20 imaging centres, laboratories and a fleet of mobile service vehicles, NHGD provides one-stop imaging and laboratory services that are accessible, cost-effective, timely, seamless, and accurate. In its continuous quest for quality excellence, NHGD received international accreditation such as ISO 15189 for medical testing and medical imaging.

Urgent Care Centre @ Admiralty

URGENT CARE CENTRE @ ADMIRALTY
676 WOODLANDS DRIVE 71 #01-01
KAMPUNG ADMIRALTY SINGAPORE 730676
TEL: 6363 3000
www.whc.sg/feelingunwell/urgent-care

The Urgent Care Centre at Kampung Admiralty (UCC @ Admiralty) provides consultations for urgent but not life-threatening acute medical conditions requiring intermediate level of care, and treatments such as application of splint or cast for simple fractures and dislocations, stitching for cuts and wounds, and administration of intravenous fluid. Located in the community, the UCC makes urgent care more accessible to residents living nearby, without them having to visit the hospital emergency department (ED). The UCC @ Admiralty is an initiative by Woodlands Health in partnership with Khoo Teck Puat Hospital.



NHG PHARMACY
3 FUSIONPOLIS LINK #05-07
NEXUS@ONE-NORTH (SOUTH LOBBY)
SINGAPORE 138543
TEL: 6340 2300
www.pharmacy.nhg.com.sg

National Healthcare Group Pharmacy (NHGPh), a business unit of NHG, provides a wide range of pharmacy services to meet the needs of the community. Our pharmacies offer trusted services to help the community use their medication in a safe, effective, and responsible manner. As the leading provider of pharmacy services in the long-term care sector, we actively address the needs of the senior community and their caregivers. Our team of pharmacists provides clinical pharmacy services to help customers achieve the best results for their prescribed therapy by working with other members of the healthcare team. Customers can seek advice on medication and purchase quality and affordable healthcare essentials from our retail branches and online store.

DIRECTORY



NHG COLLEGE
3 FUSIONOPOLIS LINK #03-08
NEXUS@ONE-NORTH (SOUTH LOBBY)
SINGAPORE 138543
www.college.nhg.com.sg

NHG College plays an instrumental role in facilitating continuous learning and development of our workforce, as well as driving leadership development in NHG. NHG College taps into our internal expertise, and collaborates with renowned institutions and industry partners to build collective capabilities of NHG leaders, educators, healthcare professionals, and staff, to improve the health of our patients and the community.



NHG EYE INSTITUTE
TEL: 6357 8000

NHG Eye Institute (NHGEI) synergises clinical expertise and services across all ophthalmology departments in NHG (Tan Tock Seng Hospital, Khoo Teck Puat Hospital and Woodlands Health) to provide the breadth and depth of eye care to our patients. Coordinated sub-specialty complex care, award-winning clinical research and innovation, and a rigorous culture of quality improvement, training and mentorship are our hallmarks. Together with NHG Polyclinics, we have developed an extended network of primary eye care units in the community, and we co-anchor the Singapore Integrated Diabetic Retinopathy Programme with Singapore National Eye Centre.



NHG HEART INSTITUTE

Established on 1 June 2019, the NHG Heart Institute encompasses the cardiology departments of Tan Tock Seng Hospital, Khoo Teck Puat Hospital and Woodlands Health. It seeks to strengthen the practice of cardiology across NHG through good clinical and administrative governance, consistency in standards of care, and harmonisation of manpower to facilitate right-siting of services and provide evidence-based care. It also serves as a platform for collaboration and coordination for clinical practice, research, education, training, and population health. NHG Heart Institute will partner providers in Primary Care to deliver seamless care and transition for our patients in the community.

USEFUL LINKS & HELPLINES

MENTAL HEALTH

- IMH Mental Health Helpline: 6389 2222
- Samaritans of Singapore (SOS) Hotline: 1800 221 4444
- Singapore Association for Mental Health (SAMH) Helpline: 1800 283 7019
- National CARE Hotline: 1800 202 6868
- Silver Ribbon (Singapore): 6386 1928
- Community Health Assessment Team (CHAT): 6493 6500 / 6501
- Community Wellness Clinics (CWCs)
 - Geylang Polyclinic, 21 Geylang East Central, Singapore 389707
 - Queenstown Polyclinic, 580 Stirling Road, Level 4, Singapore 148958

CAREGIVER SUPPORT

- For caregivers to persons with mental illness:
Caregiver Alliance: 6460 4400 or visit www.cal.org.sg
- For caregivers to the elderly:
The Seniors Helpline: 1800 555 5555
- Singapore Silver Line: 1800 650 6060
- Alzheimers' Disease Association Singapore
Helpline: 6377 0700 or visit www.alz.org.sg
- Caregiving Welfare Association:
6466 7957 / 7996 or visit www.cwa.org.sg
- Touch Caregivers Support:
6804 6555 or visit www.caregivers.org.sg
- Agency For Integrated Care (AIC):
1800 650 6060 or visit www.AIC.sg
- Tsao Foundation: 6593 9500 or visit www.tsaofoundation.org
- Sage Counselling Centre: 6354 1191 or visit www.sagecc.org.sg

HOSPICE & PALLIATIVE CARE

- Singapore Hospice Council:
6538 2231 or visit singaporehospice.org.sg
- Dover Park Hospice: 6500 7272 or visit www.doverpark.org.sg
- HCA Hospice Care: 6251 2561 or visit www.hca.org.sg



TOGETHER, STRONGER TO COMBAT COVID-19



