

MEDICAL DIGEST



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Medical Digest is a quarterly publication of Tan Tock Seng Hospital written by healthcare providers for healthcare providers, as a service to the medical community.

CONTENTS

TTSH RESEARCH NEWS

AN OCCUPATIONAL THERAPIST'S TAKE ON THE COVID-19 PANDEMIC

RISING ABOVE CHALLENGES - DELIVERING PHYSIOTHERAPY CARE DURING A PANDEMIC

COVID-19 AND THE IMPACT ON ALLIED HEALTH PROFESSIONALS - A DIETITIAN'S PERSPECTIVE

A REFLECTION ON SUPPORTING MIGRANT WORKERS DURING THE COVID-19 PANDEMIC

PATHOLOGY IN TIMES OF COVID-19

SPEECH AND LANGUAGE THERAPY IN THE TIME OF COVID-19: A PERSONAL REFLECTION

RADIOLOGY QUIZ & ECG QUIZ

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In this COVID-19 pandemic, we have seen many changes to our lives and lifestyles. I'd like to make a daring prediction of how the World will be different after this convulsive event.

In our lifetime, we have seen outbreaks of HIV, influenzas, MERS, SARS, Nipah, and Zika; we have seen Israel-Palestine conflicts, the Vietnam war, 9/11, the tsunami of 2004, assassinations, rise and fall of despots, breakdown of civil society, proliferation of weapons, over-exploitation of natural resources, mistrust of science, betrayal of the public by political and business leaders, and ascendancy of intolerance (enough for a new Billy Joel song). Through all these, those who have not fallen have simply trudged along.

Human beings have basically not changed. What has changed is that we have figured out new ways to do old things, or start doing some of the things that should have been done a long time ago, reluctantly. Instead of curbing materialism, we now buy unnecessary things online. Instead of eating more healthily, we now have fast food delivered fast to our door. Instead of minimizing unnecessary discussions, we now spend hours in sometimes simultaneous online meetings. Instead of using the computer to plan our day and perform mundane tasks, we are now stressed continually because of the blurring of the boundaries between work and rest, sleep and wakefulness.

My prediction? Soon, COVID-19 will be forgotten. Planes will fly again. Vigilance will lapse. We will latch on to the new problem of the moment. If that problem is medical, *Medical Digest* will surely have something to say about it! We wish you the very best for 2021.

Dr Leong Khai Pang
EDITOR
Medical Digest



RESEARCH EXCERPTS

TTSH RESEARCH NEWS

Every year, TTSH clinicians publish about 300 scientific papers. In this section, we selected a few reports and asked one of the authors of each to summarise and discuss the clinical relevance of their research.

AWAKE PRONE POSITIONING FOR NON-INTUBATED OXYGEN DEPENDENT COVID-19 PNEUMONIA PATIENTS



Ng Z, Tay WC, Ho CHB. Eur Respir J 2020; 56: 2001198 [https://doi.org/10.1183/13993003.01198-2020].

Prone positioning has been shown to improve oxygenation of intubated patients. Proposed physiological mechanisms underlying this improved gaseous exchange include amelioration of the ventral-dorsal transpulmonary pressure difference, reduced dorsal lung compression, improved lung perfusion, and increased functional residual capacity. Several meta-analyses have demonstrated that prone positioning, commonly employed in intensive care units (ICUs) for patients with acute respiratory distress syndrome (ARDS) to prevent ventilator-induced lung injury, reduces mortality rates. Although there is sparse literature on prone positioning of non-intubated patients, the current COVID-19 pandemic has boosted its use, with clinicians widely adopting this strategy in spontaneously breathing, non-intubated patients with COVID-19 pneumonia. Thus, the authors sought to investigate the effects of prone positioning on COVID-19 patients' oxygenation and outcomes.

This was a prospective case series of 10 patients with COVID-19 pneumonia requiring oxygen (O₂) supplementation who were admitted to the National Centre for Infectious Diseases (NCID) in March 2020. Patients were initiated on the prone positioning protocol in a general ward setting where they adopted the prone position for a cumulative total of 5 hours per day (five 1-hour sessions daily, with each session spaced 3 hours apart during waking hours). Once the patient had been weaned to room air for at least 24 hours, the protocol was terminated.

All patients tolerated the protocol. Protocol initiation occurred on Day 11 (median) from illness onset, with patients undergoing the protocol for a cumulative median of 21 hours. Nine patients were successfully weaned off supplemental O₂ after a median of 8 days. Three patients were transferred to the ICU for increasing O₂ requirements – One was subsequently intubated and died from severe ARDS, while the remaining 2 did not require intubation and were continued on the protocol, successfully weaning off supplemental O₂ thereafter. The intubation rate with prone positioning in this study was much lower than that observed in NCID's data for the 1st 100 patients admitted with COVID-19 pneumonia (10 % vs. 60 %). Although some patients experienced mild side-effects (musculoskeletal discomfort, nausea, vomiting), most reported symptomatic improvement.

IMPORTANCE IN CLINICAL PRACTICE

Prone positioning is a low-risk, logistically feasible intervention which can be implemented in non-intubated, cooperative patients to improve their oxygenation. It has the potential to reduce ICU workload burden, and benefit patients with COVID-19 pneumonia by diminishing or averting the need for ICU admission.

This summary was prepared by the editorial team of Medical Digest.



ASSOCIATION OF HIGHER BODY MASS INDEX (BMI) WITH SEVERE CORONAVIRUS DISEASE 2019 (COVID-19) IN YOUNGER PATIENTS

Ong SWX, Young BE, Leo Y, Lye DC. Clin Infect Dis. 2020; 71 (16): 2300 – 2302.

IMPORTANCE IN CLINICAL PRACTICE

Obesity is a significant risk factor for the development of severe COVID-19 in patients under the age of 60. Risk stratification using BMI should be considered in the course of COVID-19 treatment in order to avoid undertriaging this at-risk group of patients who are more susceptible to poor clinical outcomes.

Obesity, a traditional risk factor for chronic diseases, has recently been associated with a greater risk of infectious diseases. Possible mechanisms underlying this relationship include impaired cellular immune responses such as upregulated cytotoxic CD8+ T-cells, downregulated suppressive T-regulatory cells, decreased memory CD8+ T-cell production of IFN- γ (key cytokine involved in influenza clearance), and decreased memory B cells (responsible for antibody production). Body mass index (BMI) has previously been shown to be an independent risk factor for both influenza (e.g. Influenza H1N1) and non-influenza respiratory viruses (e.g. coronaviruses, rhinovirus), with underweight and obese individuals at increased risk of developing severe disease and complications compared to normal-weight individuals. However, there is limited data on the influence of BMI in the current coronavirus disease 2019 (COVID-19) pandemic caused by the SARS-CoV-2 coronavirus. Thus, the authors investigated the relationship between BMI and disease severity in COVID-19 patients in Singapore.

This was a retrospective observational study of 182 patients with COVID-19 (confirmed by polymerase chain reaction assay) admitted to the National Centre for Infectious Diseases (NCID). Demographics and clinical data (baseline investigations, comorbidities and clinical outcomes) were retrieved from patients' electronic medical records. Outcomes of interest were hypoxia requiring supplemental oxygen (O₂), intensive care unit (ICU) admission, mechanical ventilation, and mortality.

Ninety-one patients who were missing BMI data were excluded from the study. In the study population (N = 91), 51 (56 %) patients had BMI < 25 kg/m² while 40 (44 %) had BMI \geq 25 kg/m²; the latter consisted of 29 patients with BMI 25 – 30 kg/m² (overweight), 7 with BMI 30 – 35 kg/m² (obese) and 4 with BMI > 35 kg/m² (morbidly obese). Although there were no significant differences in clinical characteristics or outcomes between patients with BMI \geq 25 kg/m² and those with BMI < 25 kg/m², sub-group analysis of patients < 60 years old revealed a 6x increased likelihood of pneumonia on admission chest radiography requiring low-flow supplemental O₂ (OR 6.32, 95 % CI 1.23 – 32.34; p = 0.022) and a 16 % increased odds of mechanical ventilation (OR 1.16, 95 % CI 1.00 – 1.34; p = 0.049) in patients with BMI \geq 25 kg/m². Additionally, BMI \geq 25 kg/m² was associated with higher serum lactate dehydrogenase (p = 0.011) levels, which has been linked to severe COVID-19 in other studies.

This summary was prepared by the editorial team of Medical Digest.



CONTEMPORARY

NOVEL CORONAVIRUS IN TAN TOCK SENG HOSPITAL AND EVERYWHERE ELSE, MAY TO DECEMBER 2020

Noam Chomsky amalgamates information in the press, academic publications and books and brings his intelligence to bear to produce scintillating insight and critique of American politics, culture and foreign policy. Your writer tried to do the same for the coronavirus pandemic but with brain power several notches lower, the reader probably shouldn't expect analysis of the same quality.

In the Mar-June 2020 issue, we talked about COVID-19 and its impact on TTSH and the world from January to April. In this article, we cover the events from May to December.

TAN TOCK SENG HOSPITAL

On 1 June, TTSH's CEO Dr Eugene Soh sent an internal email to the hospital staff: "On 2 January, we started COVID-19 screening at our Emergency Department (ED), which marked the start of our hospital's response to an emerging threat ahead of the rest of Singapore. On 23 January, Singapore saw its first case of COVID-19 at Singapore General Hospital. Our National Centre for Infectious Diseases (NCID) reported the second case of COVID-19 the very next day. With increasing attendances, our ED colleagues opened the Screening Centre at NCID on 29 January to cater to 100 more seats for screening. Barely two months later, we expanded our screening capacity to 265 seats by optimising our spaces and workflows and outfitting our Screening Centre with an external tentaged area. At our peak, we were able to cater to up to 496 patients at any one time. The highest daily attendance recorded at our Screening Centre was 520 on 23 March."

He lauded the work by the Department of Laboratory Medicine (DLM), which supports the entire TTSH campus (including NCID) as well as Community Care Facilities, Polyclinics and Intermediate & Long Term Care (ILTC) partners. From 1 June, 2,000 PCR tests were performed daily. Serology testing was introduced on 27 May.

Mr Yong Keng Kwang, TTSH's Chief Nurse, remembers events in May: "As we gradually expanded our capacities to manage more COVID-19 cases, we were thankful that the government imposed the 'circuit breaker' in early April, as we believed it would contain the rate of infections in the country over time. However, our hearts sank slightly when a case was discovered in the Lee Ah Mooi (LAM) Nursing Home (NH). By early May, 16 cases had been managed at TTSH-NCID. We feared for the worst when these elderly residents were infected, but were eventually glad that the number of infections did not escalate beyond these 16 cases."

Dr Shawn Vasoo, Clinical Director, National Centre for Infectious Diseases and Head, Infectious Disease Research Laboratory, recalled the events on the first of May, "We re-visit CDCI (Communicable Disease Centre 1, the old buildings along Moulmein Road) which has been reopened (never thought this would happen) as a step-down/holding facility for COVID-19 patients or COVID-19 naïve patients needing conveyance. Zones/

demarcated areas need to be set up. Bed sheets in the wards, unlike the yester-years where CDCI was a functional unit were from well-wishers/donors and mostly colourful with printed animals on them. Which made it all a bit surreal."

Mr Yong continued, "During Circuit Breaker, healthcare institutions were among the numerous organisations whose employees were still working at their workplaces in large numbers. We were aware that healthcare workers could start a new cluster of infections if we were not strict with our precautions in terms of safe distancing, personal protection equipment and health monitoring. Hence, we continually reinforce these measures while acknowledging the inconvenience and extra efforts needed to uphold them. Hence even when there were infections discovered inevitably among several of our staff, we knew that the precautionary measures had worked effectively as their individual infections had not resulted in any further cluster in each of their work unit/department."

"BY EARLY MAY, 16 CASES HAD BEEN MANAGED AT TTSH-NCID. WE FEARED FOR THE WORST WHEN THESE ELDERLY RESIDENTS WERE INFECTED, BUT WERE EVENTUALLY GLAD THAT THE NUMBER OF INFECTIONS DID NOT ESCALATE BEYOND THESE 16 CASES."

In mid-May, TTSH was busy treating COVID patients. Dr Vasoo: "Increasing recognition that COVID-19 is a prothrombotic state and together with haematology and ICU physicians we discuss and explore the use of thromboelastography to help delineate such patients. A COVID-19 "bleeding and clotting" study group is eventually established by the Clinical Board to give consultative advice and study this issue in depth. As for 12 May, we have treated 2 patients at NCID and 2 at NTGGH with convalescent plasma, another national programme established by jointly by NCID-TTSH and HSA, as a salvage therapeutic for severe COVID-19 patients."

On 29 Jun, Madam Yap Lay Hong, 102, is announced as Singapore's oldest COVID survivor. Though discharged from TTSH on 1 May, she only saw her son on 26 Jun because of the entry into phase two of the reopening.

Mr Yong continues his narration about the Hospital's work: "We had closed all our extended COVID-19 capacities in main building (TTSH) and Renci by early June, but continued to run 2 wards at CDC 1 for migrant-worker patients who encountered delays in returning to their dormitories. We gradually started to re-deploy staff back to BAU (business as usual) areas since June, as the number of new COVID-19 cases remain relatively stable, while the demand for BAU services (especially ED attendances) rose by about 5% weekly since mid-July. The hospital had to grapple with a new norm to balance and provide for the service needs of both COVID-19 and BAU areas, even as other restructured hospitals 'wind-down' their COVID-19 facilities."

Dr Vasoo said, "A stock take on the number of beds in service we had on campus on COVID Ops on this day was 788 beds! NCID 280 beds + CDC2 64 beds + CDC1 192 beds (rampable to 394) + ICU 50 beds = 788 beds. NCID is rampable to 586 beds (including ICU) intrinsically. But right siting of fairly well patients awaiting discharge or conveyance (instead of a full admission) was aided by beds in CDC1 which opened again and served an important "escape valve". Contrary to the popular song "The Lion Sleeps Tonight" - Or Sai so to speak - awoke again. CDC1 opened 4/5/2020 and closed 14/8/2020. It served us 102 days."

The overall success in controlling the outbreak in Singapore meant that TTSH could de-escalate. Dr Vasoo said, "By 23 June, the situation has improved, NCID is down to 330 beds in service and 45% BOR on this day. By 15 July, Ward 83 in CDC 2 is returned to BAU work, from being a ward to evaluate COVID-19 suspects (Enhanced pneumonia surveillance - EPS), signalling a gradual transition to more normality and ramping down of cases."

Mr Yong said, "TTSH-NCID were the first to enter this fight against COVID-19, and are destined to be the last warrior to leave this battlefield."

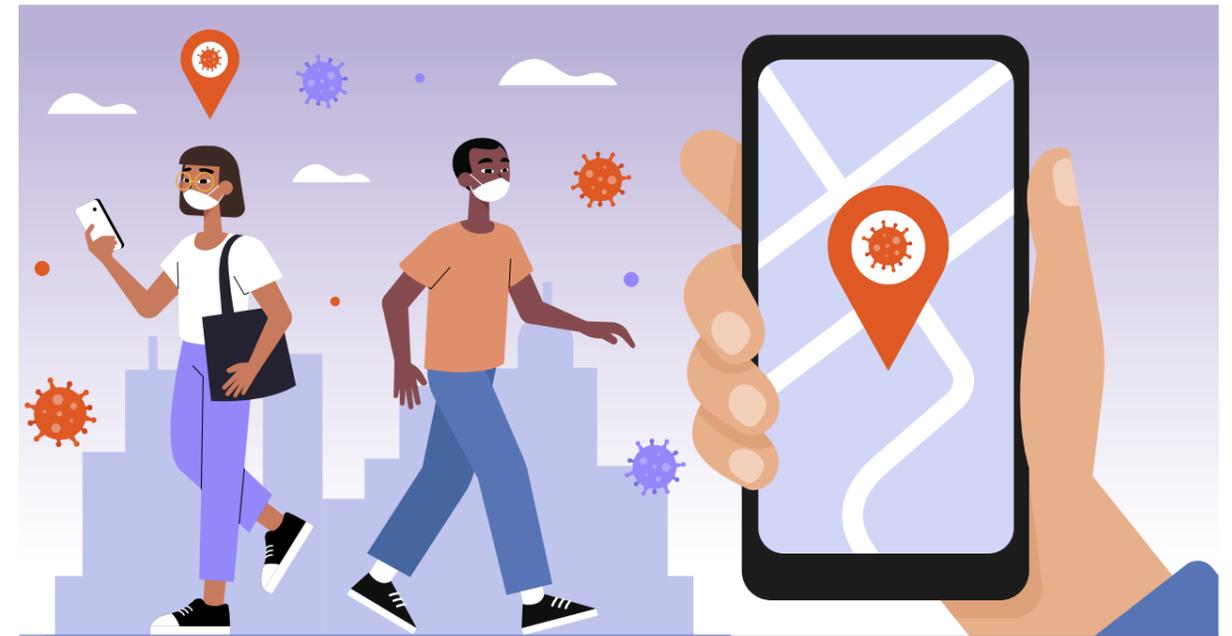
SINGAPORE

On 1 May 2020, there were 932 new cases in Singapore, with a total of 17,101. On 2 May, Singapore reports 447 new COVID-19 cases and one death. On 3 May, Singapore reported 657 new cases. On 4 May, Singapore reported 573 new cases of COVID-19, with the total reaching 18,778. There are now 18 deaths. Mr Gan Kim Yong announced in Parliament that as of Apr 26, there were 66 cases of confirmed COVID-19 infection among healthcare workers and support staff. 46 of these healthcare workers had direct contact with patients. On 5 May, 632 cases of COVID-19 infection in Singapore, the vast majority of whom are Work Permit holders residing in foreign worker dormitories. Nine cases are Singaporeans or Permanent Residents. The total number reached 19,410. On 6 May, 788 cases of COVID-19 infection in Singapore, the vast majority of whom are Work Permit holders residing in foreign worker dormitories. 11 cases are Singaporeans/ Permanent Residents. On 9 May, a 53-year-old Indian national was brought to CGH in cardiac arrest. He was found to have died of coronary infarction. He was the fourth COVID patient to have died of heart disease; these patients were not added to the official list of COVID deaths.

"TTSH-NCID WERE THE FIRST TO ENTER THIS FIGHT AGAINST COVID-19, AND ARE DESTINED TO BE THE LAST WARRIOR TO LEAVE THIS BATTLEFIELD."

On 2 June, a 41-year-old man (case 11714) died suddenly from pulmonary embolism after discharge from hospital on 17 May. On 6 Jun, there were 344 new cases, with the total number now 37,527. On 8 Jun, there were 386 new cases, including two who were asymptomatic picked up at Public Health Preparedness Clinics. On 9 Jun, the average number of new COVID-19 cases in the community increased from 4 to 8 in the week after the circuit breaker period. On 13 Jun, the Singapore F1 race scheduled to be held in September was cancelled. The number of cases exceeded 40,000. There were 347 new cases, bringing the total in the country to 40,197. On 25 June, Salma Khalik highlighted the low COVID-19 mortality rate in Singapore, attributing it to the bulk of the infected being young and healthy, and the capacity in the hospitals. The article included a table (up to date as of 24 June 6.45 pm) showing the mortality rate in Singapore as 0.1%, compared with 14.5% in Italy, 14% in UK, 9.6% in Spain, 8.5% in Sweden, 5.6% in China, 5.3% in Japan, 5.3% in Indonesia, 5.1% in USA, 3.2% in India, 2.2% in South Korea, 1.8% in Thailand, 1.4% in Malaysia and 0.5% in Hong Kong.

The South China Morning Post reported that Singapore's contact tracing app TraceTogether was inspired by a prize-winning program kTrace developed by two students Rohan Suri and Claire Scoggins in 2014 (in the 10 June edition). Singapore's GovTech contacted Rohan Suri, now a student at Stanford, and he provided ideas and experience, though he did not directly work on TraceTogether. On 29 Jun, BBC reported that Singapore was distributing the TraceTogether tokens, firstly to vulnerable older people. These devices have unique QR codes, have batteries that last 9 months, and have no internet or cellular capabilities so they cannot be accessed remotely. Singapore company PCI produced the devices, having won S\$6 million tender for 300,000 sets. By 14 September, Singapore has started distributing the TraceTogether token, aiming to reach 70% penetration in conjunction with



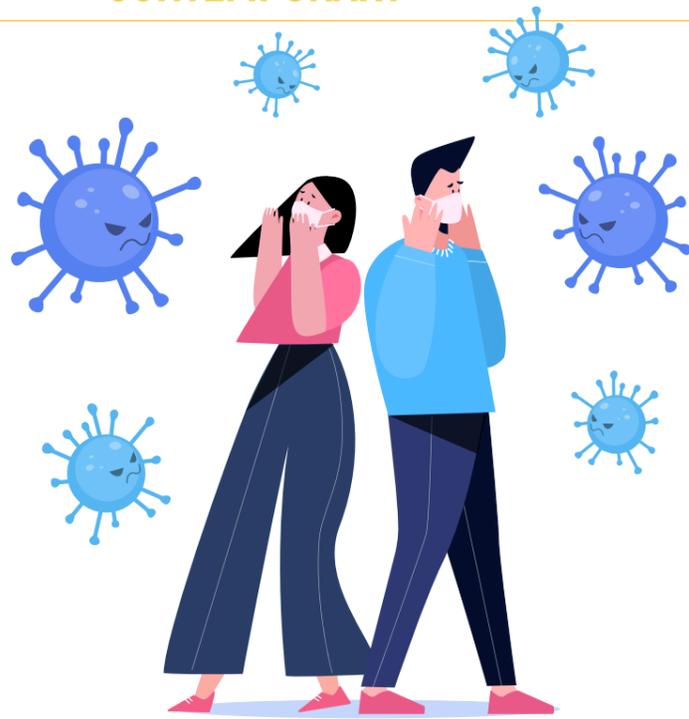
BY 14 SEPTEMBER, SINGAPORE HAS STARTED DISTRIBUTING THE TRACETOGETHER TOKEN, AIMING TO REACH 70% PENETRATION IN CONJUNCTION WITH THE TRACETOGETHER HANDPHONE APP. THE FIRST BATCH OF THE TOKEN HAS ALREADY BEEN GIVEN OUT TO 10,000 SELECTED SENIORS FROM LATE JUNE.

the TraceTogether handphone app. The first batch of the token has already been given out to 10,000 selected seniors from late June.

On 14 July a 62-year-old Singapore died on 14 July from COVID, the 27th person to do so. He is Case 17,168 and was diagnosed on 30 April. SGH started to operate a new facility with 50 isolation rooms on 15 July. The Ward@ Bowyer took 7 weeks to build. By 13 July, Singapore has tested one million swabs from 520,000 people. The rate is calculated to be 177,000 swabs per million population, the third highest in the world after Denmark and UK. In the period 6-13 July, 143,000 swabs were analysed (Straits Times 16 July). Regional screening centres have been opened in the Old Police Academy, The Float @ Marina Bay, Bukit Gombak Sports Hall and Bishan Sports in June. A fifth centre is planned at 7 Bedok North Street 2, the previous Sepak Takraw Sports Hall. On 20 July, TODAY reported that MOM and MOH apologised on 19 July for the 3-week delay in informing a person of a positive COVID-19 test result. The person was tested on 22 June, but was informed that he was positive only on 13 July. Unfortunately, even by 15 July, he was still staying with 11 other roommates. The initial person was asymptomatic, but 7 of his roommates were found to have past infection and 3 had recent infection. On 25 July, there were 513 new cases in Singapore, including

two from the community, taking the total to 49,888. The MOH said, "This last batch of workers came from dormitories with a relatively high prevalence of COVID 19, and will be subject to a final test before they complete their isolation periods. We therefore expect the daily case counts to be high for the coming two weeks, before tapering down thereafter." On 26 July, with 481 new cases today (5 from the community and 4 imported), there are 50,369 infected people altogether in Singapore. On 31 July, there were 396 new cases. Three were imported and three from the community. There were 183 cases in hospital, none in intensive care and 5,551 in community facilities. Since the outbreak started, there have been 699 imported cases, 2,179 community cases and 49,327 dormitory cases, giving a total of 52,205.

There was a lapse in TTSH's laboratory leading to a Jurong West Secondary School student being labelled as COVID-positive erroneously (Straits Times 15 July). After admission to NUH, two further tests were negative, which prompted a retest of the original specimen. The positive specimen actually came from a migrant worker. TTSH apologised for the error: "We are sorry for the mistake and sincerely regret the inconvenience caused to our patients and her school. We audited our laboratory testing for COVID-19 for that period and no other mislabelling was discovered. We have also put in



that would continue in the dormitories even after the outbreak comes under control within dormitories.” On 23 April, a worker from India was found dead at a stair landing at Khoo Teck Puat Hospital. In May, a Bangladeshi worker was found dead in a factory-converted dormitory in Kranji Crescent. On 24 July, an Indian worker was found dead at Sungei Tengah Lodge. There is a photograph purportedly showing a working who slit his throat at a Sungei Kadut dormitory on 2 Aug. The snapshot on 31 August is that there have been 56,812 people who have been infected with COVID-19 in Singapore, slightly below 1% of the population of 5.7 million. 2,240 are locally transmitted cases, 903 imported and 53,669 contracted in the dormitories. Twenty-seven have died, 78 still treated in general ward, none in ICU. 2,292 have been discharged from hospital.

On 25 September, there were 11 new cases of COVID-19, of which nine were migrant workers and two were imports who arrived in Singapore on 13 Sep.

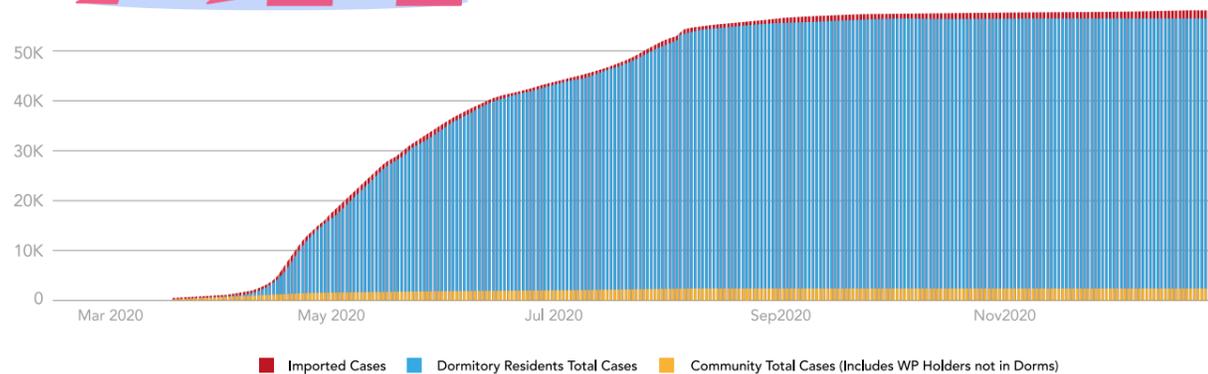


Figure 1. Total number of cases in Singapore to November 2020. Adapted from the Ministry of Health's coronavirus website <https://covid19.moh.gov.sg/>

place additional checks to prevent such an incident from occurring again.”

On 5 August, there were 908 new cases in Singapore, inclusive of 4 imported from India and one from the community, apparently unlinked to known clusters. The MOH spokesman said, “They are among the final batch of workers being cleared and they come from dormitories who were tested during their isolation or quarantine period even though they are asymptomatic. Hence we expect the daily case counts to be high for the coming days, before tapering thereafter as the inter-agency task force completes the dormitory clearance.” The tally stands at 54,254 cases in toto, with 6,458 under observation, 1 in critical condition and 27 deaths. On 6 August, TODAY also reported Singapore's multi-ministry task force acknowledged that there have been a spate of suicides and attempted suicides at the foreign worker dormitories. Professor Kenneth Mak said, “I do not pretend that the work is completed or that we have a very comprehensive system of support. But the task force is committed to making sure that the mental health needs of the migrant workers are looked into, supported – not just now, but that there is a sustainable framework

On 3 October, there were six new cases, four imported, one from the community and one from workers' dormitory. On the next day, there were 12 new cases, six imported. Two came from the community and four from workers' dormitory. Ten were asymptomatic. On 8 October, 8 Oct, there were nine new cases, five imported and four from dormitories. On 12 October, a 64-year-old man (case 57,960) passed away this day from complications of COVID-19 infection. He was diagnosed on 4 Oct and is the first fatality in almost three months. There were 4 new cases in Singapore (two imported and two locally transmitted), the lowest number since 4 Mar when there were 2 cases. There are 57,880 cases altogether.

On 3 November, only one new imported case reported in Singapore. As of 30 November, there have been 58,218 cases in Singapore, with 29 deaths (figure 1). On 26 November, a 32-year-old man was the first patient who contracted COVID in the community for 16 days. On this day, there were 58,195 cases in total, with 43 in hospital and one in intensive case. There have been 28 deaths.

An 83-year-old man who reported ill with diarrhoea while on a cruise to nowhere on board the Quantum

of the Sea was tested positive for COVID, according to onboard protocol, using the ship's PCR equipment. The ship was forced to return to Singapore on 9 Dec. Passengers started to disembark at 7.30 pm and all were required to undergo a rapid antigen test at Marina Bay Cruise Centre. The ship left on 7 Dec and was due to return on 10 Dec. Unexpectedly, the original sample and a further one tested at the NPHL were negative. The next Quantum of the Sea cruise on 10 Dec was cancelled.

of the hotel were likely to have been previously infected with COVID out of 571 tested. On 27 Dec, it was reported that another 23-year-old Malaysian woman, who stayed at Mandarin Orchard until 20 Dec, could be linked.

THE WORLD

On 3 May, China announced only 3 new cases, all imported. There had been 82,880 cases in China, with 4,633 deaths. For the first time, New Zealand had no new cases. In an easing of the nine-week national lockdown, Italians will be free to stroll and visit relatives from 4 May. On 8 May, the western world celebrated VE Day with little fanfare. On 9 May, Seoul closed bars and nightclubs again after a 29-year-old man started a cluster of 17 new cases. He visited five clubs and bars in Itaewon in the weekend of 2 May. Social distancing rules were relaxed only after 5 May. The Washington Post (12 May) reported that these are gay bars and clubs and the local LGBT community feared repercussions. On 12 May, the White House mandates masks for staff but not for the President. Dr Anthony Fauci warned the country that premature reopening of businesses risks new outbreaks. On 18 May, Washington Post reports that people in Georgia, USA, were returning to the shops and restaurants as the state re-opened. The same edition also warns of disagreement between the White House and the Centers for Disease Control and Prevention. White House trade advisor Peter Navarro criticised the CDC over the production of a flawed test kit. President Xi of China defended his country's handling of the pandemic and said that a review of the events is needed, after the pandemic and by WHO. On 20 May, Japan lifted the state of emergency. On 29 May, President Trump alleged that the Chinese government covered up the virus outbreak and instigated a global pandemic. He also announced that, “We will today be terminating our relationship” with WHO.

On 9 Jun, Washington Post reports that New York has re-opened from 8

Jun, 100 days after the first COVID case was confirmed. This was the first of a 4-phase reopening plan. On 16 Jun, the South China Morning Post reported that the Xinfadi food wholesale market in Beijing is believed to be the source of a new outbreak that has affected 106 people. Dr Wu Zunyou, chief epidemiologist with the Chinese Centre for Disease Control and Prevention, believed that the outbreak was detected on time and it is likely that it has been contained. On 25 Jun, Straits Times sounded a warning that new cases were appearing around the world. It cited high daily numbers in California, Arizona, Texas and Florida, Tokyo saw 55 new cases the previous day (highest in the past 1.5 months), New Delhi hit a new single-day record and infected passengers flew into Hong Kong from Manila and Kuala Lumpur. USA was seeing daily new highs. On 27 Jun, Florida recorded 9,585 new cases (a record for a second day), Arizona 3,591 cases (a record high equal to that on 23 Jun), Nevada 1,099 cases (double the previous record), South Carolina 1,604 cases (a record) and Georgia 1,990 (also a record). Meanwhile, BBC reported that the death toll from COVID-19 has passed 500,000. South Korea reported 42 new cases of which 27 were linked to a major church in Seoul. On 29 Jun, The Straits Times reported that there was now 10 million cases in the world.

On 2 July, the Washington Post reported that the USA was straining to cope with the large number of tests as the disease surges in the Sun Belt (the southern states). The LA Times report a resurgence of COVID-19 deaths in California, with a record 149 on 8 Jul followed by 137 on 9 Jul. Orange County mask policy perhaps reflected the confusion in many countries. Dr Nichole Quick, the county's chief health officer, resigned on 8 Jun after being threatened for making public mask-wearing mandatory. The requirement was removed on 11 Jun. However, on 18 Jun, the governor Gavin Newsom mandated state-wide mask wearing. On 16 July, the Straits Times reported that Tokyo raised its COVID-19 alert

ON 16 DECEMBER, BBC REPORTED THAT 152,000 OUT OF 323,000 OR 47% OF FOREIGN WORKERS IN SINGAPORE'S TESTED POSITIVE FOR THE VIRUS. IT PICKED UP A REPORT IN THE MOH'S WEB SITE DATED 14 DEC. THIS NUMBER COMBINES THOSE DETECTED BY PCR (54,500) AND BY SEROLOGY (98,000).

On 16 December, BBC reported that 152,000 out of 323,000 or 47% of foreign workers in Singapore's tested positive for the virus. It picked up a report in the MOH's web site dated 14 Dec. This number combines those detected by PCR (54,500) and by serology (98,000). The latter figure was only released on 14 Dec. Outside of these workers, 3,815 people contracted the virus.

Thirteen people serving stay-home notice in Mandarin Orchard were tested positive for COVID-19, with the virus showing genetic similarity in all. These 13 stayed in the hotel in the period 22 Oct to 11 Nov. There were three others who tested positive but these are thought to be imported cases separate from the group. ST reported that three staff members

to level 4, the highest tier. There were 165 new cases in the capital on 15 Jul. On 18 July, BBC reported that Chinese officials declared a 'wartime state' in Urumqi, Xinjiang after a resurgence of new cases. Flights in and out were cancelled and subway services stopped. Rui Baoling, director of the disease control and prevention, said that the main cluster was in the Tianshan district of Urumqi but the 'situation is generally controllable'. On 19 July, BBC reported that Hong Kong Chief Executive Carrie Lam said that there were 100 new cases in the territory, the situation was 'really critical' and there was 'no sign' that it was coming under control. Hong Kong shut Disneyland one month after reopening. Bars, gyms, club were closed and sit-in dining was not allowed after 6 pm. Hong Kong recorded 73 new cases on 20 July, 66 being local transmissions. Civil servants were again required to work from home and school reopening delayed until mid-August (Straits Times 21 July). The newspaper also reported that Malaysian was still considering whether wearing face mask in public should be made compulsory. On 25 July, South Korea reported 113 new cases (Channel News Asia), the largest single-day number in almost four months. On 27 July, BBC reported that the Trump administration's national security adviser, Robert O'Brien, 54, tested positive for COVID-19. The Washington Post printed the White House statement: "He has mild symptoms and has been self-isolating and working from a secure location off site. This is no risk of exposure to the President or the Vice President. The work of the National Security Council continues uninterrupted." On the same day, TODAY reported that South Korean authorities notified New Zealand that a passenger from that country tested positive for COVID-19. The traveller left New Zealand on 21 July, transited in Singapore, before arriving in Korea on 22 July. New Zealand said that the South Korean authorities told her that they suspect that the person was infected in Singapore. On 28 July, BBC reported that Lothar Wieler, head of the Robert Koch Institute, said that he was 'very concerned' by rising infection in Germany. There were 3,611 new cases in the past week. Mr Wieler was worried that people had become 'negligent' and he told people to wear masks, respect social distancing and practice good hygiene. He said, "We don't know yet if this is the beginning of a second wave but of course it could be. But I am optimistic that if we follow the hygiene rules we can prevent it, it's up to us." In the same day, Germany issued travel warning for three regions in Spain, Aragon, Catalonia and Navarra. On 30 July, BBC reported that indigenous populations that are less well served in terms of medical staff and equipment are at greatest risk from COVID-19, which threatens to wipe out communities and populations. For examples, 1/2,300 indigenous Americans have died, compared to 1/3,600 white Americans, and the Navajo Nation surpassed New York state in COVID-19 infection rate in May 2020.

As of 8 pm of 4 August, US has 4,742,191 cases of COVID-19 infection and 153,655 deaths. On 10 August,

James Gallagher of the BBC assessed the current status of coronavirus in the world. He wrote that it took 67 days to reach the first 100,000 cases, 11 days for the second 100,000, four days to the third and now, just a few hours. Dr Margaret Harris of WHO told him, "We're still in the midst of an accelerating, intense and very serious pandemic. It's there in every community in the world." On 12 August, the Washington Post reported that Facebook and Instagram removed 7 million posts for COVID-19 misinformation from April to June 2020. Worldwide number of cases exceeded 20 million. The Washington Post had been critical of the FDA and the CDC. In an opinion piece on 26 August, it criticised the FDA for not standing up for itself and authorising the use of convalescent plasma to treat COVID infection when the evidence is insufficient. The FDA had to back-pedal. On the next day, the Washington Post reported that the CDC's sudden and unexpected announcement advising doctors not to test asymptomatic people even if they have been exposed raised alarm. The newspaper said that this leads to confusion, and that 40% who are tested return positive, indicating that they could be infectious.

ON 10 AUGUST, JAMES GALLAGHER OF THE BBC ASSESSED THE CURRENT STATUS OF CORONAVIRUS IN THE WORLD. HE WROTE THAT IT TOOK 67 DAYS TO REACH THE FIRST 100,000 CASES, 11 DAYS FOR THE SECOND 100,000, FOUR DAYS TO THE THIRD AND NOW, JUST A FEW HOURS. DR MARGARET HARRIS OF WHO TOLD HIM, "WE'RE STILL IN THE MIDST OF AN ACCELERATING, INTENSE AND VERY SERIOUS PANDEMIC. IT'S THERE IN EVERY COMMUNITY IN THE WORLD."

The WHO reported a record single-day increase of 307,930 on 13 September. On 15 September, the Straits Times reported that European countries are still seeing rising number of cases. In UK, the 'R' number is estimated to be 1.7. Dr Mark Walport was quoted, "I think one would have to say that we are on the edge of losing control." Austria is seeing a second wave with daily new cases nearing 1,000. France reported 10,561 new cases on 12 Sep, the highest daily number. The Czech Republic also saw a record single-day number of 1,541 on 13 Sep. Spain and Portugal were also seeing surges in numbers.

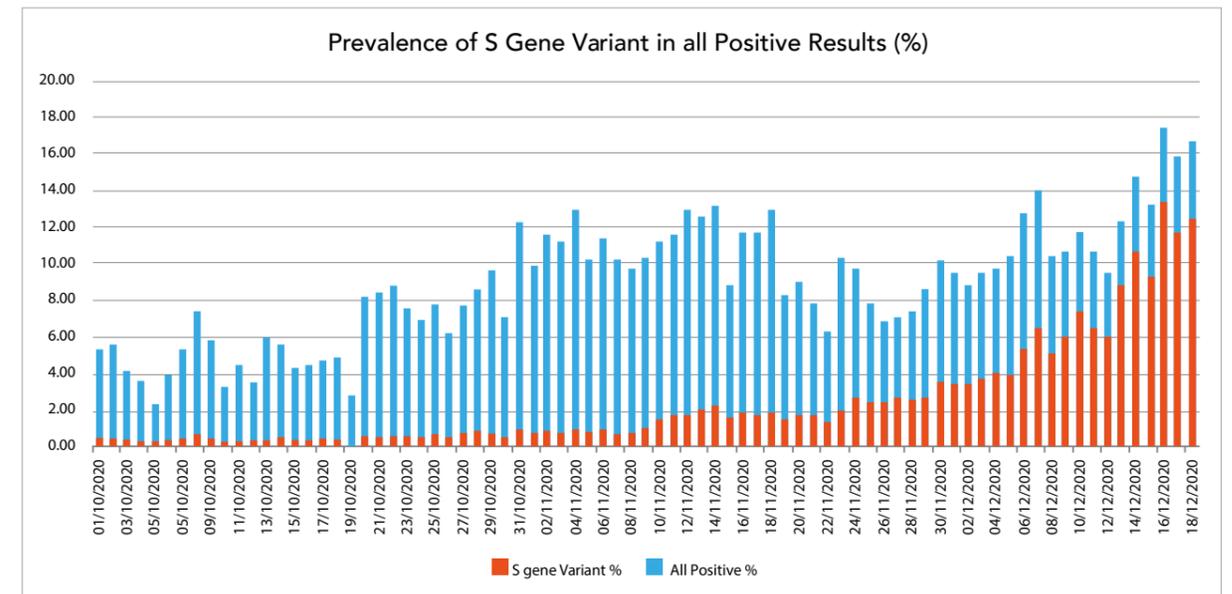


Figure 2. The new strain of SARS-CoV-2 is gradually replacing the usual one in UK over the past few months. Modified from <https://www.bbc.com/news/health-55388846>

Image Source: <https://www.fpri.org/article/2020/03/covid-19-crisis-political-and-economic-aftereffects/>

On 2 October, in an unbelievable turn of event, President Trump announced that he and his wife were infected with the virus. The US presidential election was only a month away. Among the treatments he received was an antibody cocktail made by Regeneron. It was reported on 9 October that the antibodies from three of five recovered COVID patients from Singapore were used in the development of the cocktail. President Trump was discharged from hospital on 5 October. On 5 October, the BBC reported that Mike Ryan, the executive director of WHO's Health Emergencies Programme, announced at an internal leaders' meeting in Geneva that 10% of people may have contracted the coronavirus. The official figure is 35 million, but WHO puts it nearer to 800 million. Dr Tedros Adhanom Ghebreyesus said, "Although all countries have been affected by this virus, we must remember that this is an uneven pandemic. Ten countries account for 70% of all reported cases and deaths and just three countries account for half." The three countries he referred to are USA, India and Brazil. Bars are shut in Paris, France. Madrid is facing another lockdown. On 23 October, BBC reported that President Macron of France saying that he predicts that his country will be fighting the virus at least until the middle of

2021. On this day there were 40,000 new cases and 298 deaths in France. On 26 October, BBC reported that Melbourne will exit lockdown from 28 Oct. The city had been closed since early July. Victoria state was the epicentre of the country's second wave, with 90% of 905 deaths in Australia. On 26 November, it was reported that asymptomatic infected people are driving the surge in Seoul. There were 569 new cases this day, of 525 were local transmissions, a number not seen since 6 March. On 4 November, UK went into lockdown again because of the rising number of infections. Coronavirus cases in the USA increased by 120,276 on 5 November. There have been 100,000 new cases every day for the past week. Twenty out of 50 states reported record one-day increases. Greece announced on 14 Nov that primary schools, kindergartens and day care centres will be closed as coronavirus deaths increased. There were 72,510 cases in total and 1,035 deaths. The Greek nationwide lockdown will continue until 30 November. In France, the total number of infections crossed 2 million and the death toll passed 44,000. It remained in lockdown. In Germany, people were told to prepare for another four to five months of lockdown. Mr Frank Ulrich Montgomery, the German chairman

of the World Medical Association, said, "My forecast is that we will have to talk about further restrictions rather than any easing." By 10.26 pm on 30 November 2020, the Johns Hopkins Coronavirus Research Center has registered 62,862,137 cases globally, with the ten most affected countries being USA (13,389,786 cases), India (9,431,691), Brazil (6,314,740), Russia (2,275,936), France (2,270,573), Spain (1,628,208), United Kingdom (1,621,313), Italy (1,585,178), Argentina (1,418,807) and Colombia (1,308,376). There have been 1,461,571 deaths globally. On 21 December, ST carried a report from Reuters that British Health Secretary Matt Hancock suggesting that the new coronavirus strain – VUI-202012/01 - was 'out of control' (figure 2). A lockdown came into force on 20 Dec in London and south-east England to stop the spread of this virus. In a dramatic showdown, thousands of lorries and trucks were prevented from entering France on Christmas eve as part of a 40-nation ban of entry of UK travellers to limit the spread of the new strain. By the end of 2020, there has been 83,554,605 infections in the world with US accounting for 19,974,884, India for 10,286,709, Brazil 7,675,973, Russia 3,153,960, France 2,677,666, UK 2,496,231, Turkey 2,208,652, Italy

2,107,166, Spain 1,928,265, and Germany 1,760,715. There have been 1,820,512 deaths. By end 2020, in many parts of the world, the battle with COVID rages on.

THE VIRUS AND PUBLIC HEALTH

On 23 May, it was reported that hydroxychloroquine, promoted by President Trump, has been shown to be harmful in a 96,000-patient study published in the Lancet.¹ However, this paper, found to contain unreliable data, was vilified and retracted. On 13 June, The Straits Times carried a warning written by Drs Mikael Hartman and Lee Chuen Neng about the rush to publish COVID-19 research, sometimes compromising the peer review process.

On 27 May, Washington Post reported on the development of remdesivir. It started as an ‘also-ran’ drug for Gilead Sciences, until a scientist in the company Robert Jordan persuaded his superiors to let him develop it. Three government agencies provided an estimated \$70 million of public fund for research, ironically not insisting on patent rights. It balanced this by reasoning that drug companies will not invest millions on a drug that is taken only for a short time by the few people infected by a rare virus without government support. The significant report on the efficacy of the drug in shortening illness and reducing mortality was published on 22 May and more fully on 8 October.²

On 2 July, the Washington Post published a piece on post-mortem findings of COVID-19 patients. The surprise was the paucity of inflammation in the brain and heart, though these organs often show dysfunction in patients. However, there were multiple thromboses in the brains leading to hypoxia even in early disease. One of the earliest autopsies was conducted by Dr Richard Vander Heide, who ‘... remembers cutting the lung and discovering what were probably hundreds or thousands of microclots.’

In July, an important paper demonstrating the efficacy of dexamethasone was published in the New England

Journal of Medicine. It was shown that the IV or oral dexamethasone 6 mg daily for up to 10 days reduced mortality in severely ill patients but had little effect in those not requiring mechanical ventilation.³

On 24 July, CNA reports the press release by MP Biomedicals Asia Pacific and A*STAR of a jointly developed test kit for SARS-CoV-2 antibodies. The test, which uses ‘proprietary synthetic viral proteins’, takes 15 minutes to detect IgG and IgM antibodies against the virus. On 6 August, TODAY carried a report by Susan Hazel and Anne-Lise Chaber of the School of Animal and Veterinary Science, University of Adelaide, who are working with France’s National Veterinary School of Alfort, to train dogs to sniff out Sar-CoV-2 in the sweat of COVID-19 patients. The dogs have been unerringly successful in detecting infected patients. Dogs have been trained for this purpose in the United Arab Emirates, Chile, Argentina, Brazil and Belgium.

On 26 August, the Washington Post told the story of a meeting in Boston in late Feb 2020 organised by drug company Biogen for its executives that resulted in the virus spreading to the Boston suburbs, Indiana, North Carolina, Slovakia, Australia and Singapore. Scientists could track this particular virus because of the mutation C2416T. The virus from 28 conference attendees who contracted the disease had the organism sequenced show this mutation. This strain of the virus infected hundreds of people in the Boston area and other parts of the world. This variant is found in one-third of the sequenced viruses in Massachusetts and 3% in the USA.

The iPhone can already facilitate contact tracing without downloading any new app, through the new iOS 13.7. It can keep a log of other phones detected with Bluetooth for 14 days (BBC 2 September). On 2 September, a metaanalysis published in JAMA by the WHO Rapid Evidence Appraisal for COVID-19 Therapies (REACT) Working Group, showed that 28-day all-cause mortality was lower in patients who received corticosteroids (odds ratio 0.66) compared with those who received usual care or placebo. WHO changed its recommendations based on this.

VACCINES

On 12 May, The Washington Post cited concerns that the richer nations may hoard vaccines for their own citizens especially when it could take years before sufficient number of doses can be made. Gavin Yamey, director of the Center for Policy Impact in Global Health at Duke University, was quoted; “Rich countries monopolize the vaccine, poor countries were left behind. They got the vaccine later, and they got less of it. Unless we make the vaccine globally available, we are not going to be able to end the pandemic, because ... an outbreak anywhere is an outbreak everywhere.”

On 12 August, Washington Post profiled Dr Peter Marks, a top official at FDA who will decide which coronavirus vaccine will be given to tens of millions of Americans. The newspaper described the political pressure that he faces as the administration is hoping for a vaccine to be available in November, in time for the election. In June, Dr Marks laid down a rule that any vaccine must be 50% more effective than a placebo before it can be approved, emergency or otherwise. He said that eradicating the virus probably requires a vaccine to be 70% effective with 70% take-up rate by the population. On 14 August, Dr Fauci said that the US was preparing a strain of coronavirus for vaccine human trials, if the need came about. In current trials in which volunteers are exposed to the virus through social interactions, he said that

to tell if a vaccine is 60% effective, 150-160 people in a 30,000-person study need to catch the infection (Washington Post 15 August).

On 14 September, Senior Minister Tharman Shanmugaratnam said at the Singapore Summit, “So, don’t think of vaccines as a silver bullet. It requires a whole set of tools – quick and cheap testing, social distancing, people wearing a mask because it is the responsible thing to do, and the social protocols that have to become the norm in every civilised society.” In the same meeting, the Straits Times reported that Ms Mazumdar-Shaw, executive chairman of Indian pharmaceutical giant Biocon, said that countries should not hoard vaccines for their own people when they become available, a practice branded as ‘vaccine nationalism’. On 25 September, New York Times reported that there were 27 COVID-19 vaccines in phase 1 studies, 14 in phase 2, 11 in phase 3, 5 with limited approvals, and none fully approved. On 20 November, WHO’s special envoy for COVID-19 David Nabarro said that vaccination should not be made mandatory or it may deter people from taking it.

On 12 November, the Singapore MOH announced the establishment of a vaccine advisory committee chaired by Associate Professor Benjamin Ong, senior adviser to the director of medical services.

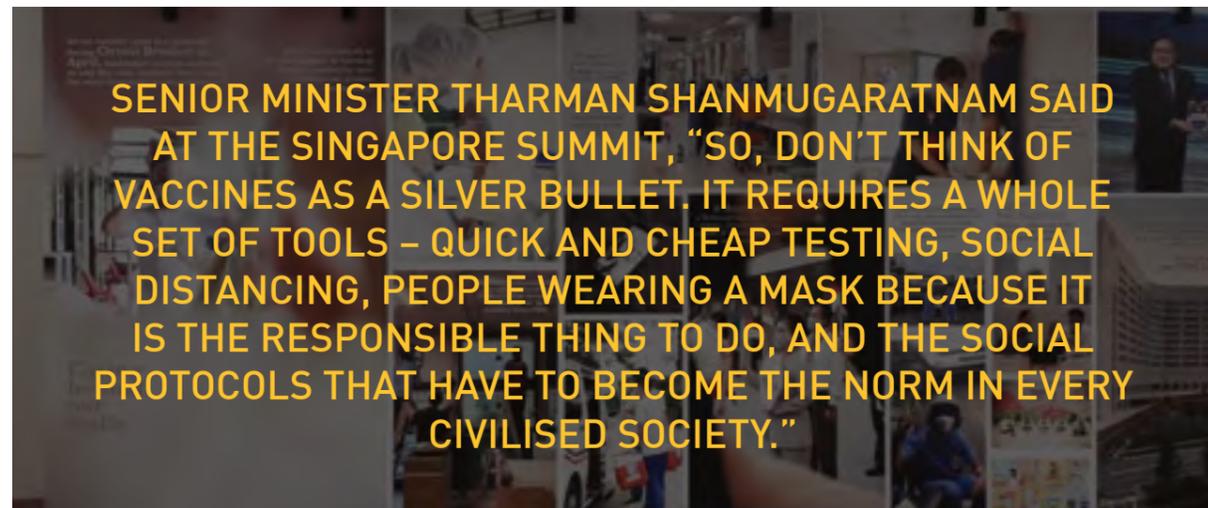
PFIZER-BIONTECH

On 16 November, Financial Times carried an article about the husband-and-wife team that set up BioNTech in 2002, Dr Ugur Sahin and Dr Ozlem Tureci. Both were born to Turkish parents who migrated to Germany. The vaccine they designed, BNT162b2, and tested by Pfizer, proved that mRNA technology works. mRNA vaccine did not require any viral carriers and is relatively easy to manufacture. Unfortunately, the vaccine has to be kept at -75°C during transport.

The Pfizer-BioNTech and Moderna vaccines makes use of synthetic mRNA technology, which could be traced to the work of Dr Katalin Kariko, who had been working on mRNA for thirty years.⁴ Funding bodies and colleagues had not been sympathetic with her work. In 1995, she was demoted after six years on the faculty at the University of Pennsylvania. Dr Kariko struggled for grants and she made less money than many lab technicians (Washington Post 7 December). She was challenged by a colleague Dr Drew Weissman to create an HIV vaccine. Exogenous DNA and RNA engage the toll-like receptors (TLR) and activate the immune system. An unmodified mRNA injected into the body will be destroyed before it enters the cell. It took ten years of work before they found the solution to overcome this immunity. They discovered that incorporating

nucleosides such as m5C, m5U, s2U, m6A, Ψ, or 2’-O-methyl-U into RNA reduced TLR activation.⁵ This fact was not widely known but was not overlooked by two people who were later to found Moderna (which is a contraction of ‘modified’ and ‘RNA’) and BioNTech (short for Biopharmaceutical New Technologies): Derrick Rossi and Ugur Sahin, respectively. Dr Kariko eventually joined BioNTech.

From 20 candidates, the company whittled the number to four, then to one. On 2 July, it was reported that the vaccine showed promise in that it produced a more robust immune response than did the actual infection. The vaccine provokes Th1 and Th2 responses.⁶ Pfizer planned to have 100 million doses of the vaccine available by the end of 2020 and 1.2 billion in 2021. On 7 September, Pfizer announced that it is expanding the patient number for its trial from 30,000 to 44,000. On 8 November, the vaccine was reported to show 95% efficacy, based on the first 94 cases of COVID among the clinical trial subjects, with further results on 170 cases. Eight came from the group that received the vaccine and 162 from the group that received placebo. Pfizer chairman and CEO Albert Bourla released this statement: “The first set of results from our phase 3 Covid-19 vaccine trial provides the initial evidence of our vaccine’s ability to prevent Covid-19.” With the announcement of the successful trial, BioNTech was



SENIOR MINISTER THARMAN SHANMUGARATNAM SAID AT THE SINGAPORE SUMMIT, “SO, DON’T THINK OF VACCINES AS A SILVER BULLET. IT REQUIRES A WHOLE SET OF TOOLS – QUICK AND CHEAP TESTING, SOCIAL DISTANCING, PEOPLE WEARING A MASK BECAUSE IT IS THE RESPONSIBLE THING TO DO, AND THE SOCIAL PROTOCOLS THAT HAVE TO BECOME THE NORM IN EVERY CIVILISED SOCIETY.”

suddenly worth 30 billion euros, purportedly more than what Deutsche Bank is worth.

Pfizer asked for Emergency Use Authorization (EUA) of its vaccine from the US FDA on 20 November. FDA insists that companies can apply for an EUA only when half the trial participants have been followed for two months after the last dose. A News article in Nature discussed the possible problems with such approval before the full results of the trials are published. The long-term efficacy and safety of the vaccines remain unknown as they have been studied for only a few months. Volunteers in the placebo arm will want to cross over to the other arm, possibly weakening the study because the comparator group becomes smaller. The article quoted Prof Ooi Eng

Eong of Singapore's Duke-NUS Medical School, "Any vaccine approved, even if only for emergency use, will change the landscape of how vaccines get into the market."⁷ This vaccine was approved by the UK on 2 December, the first country in the world. New York Times reported that this puts a lot of pressure on US regulators. British and European regulators look at the companies' analysis of the trial data, while US agencies insist on examining the data themselves. US approved the vaccine on 11 December.

Singapore approved the Pfizer-BioNTech vaccine on 14 December. Accordingly, 40 doctors in NCID received the vaccine on 30 December. The first person in Singapore to be vaccinated is Senior Staff Nurse Sarah Lim.

MODERNA

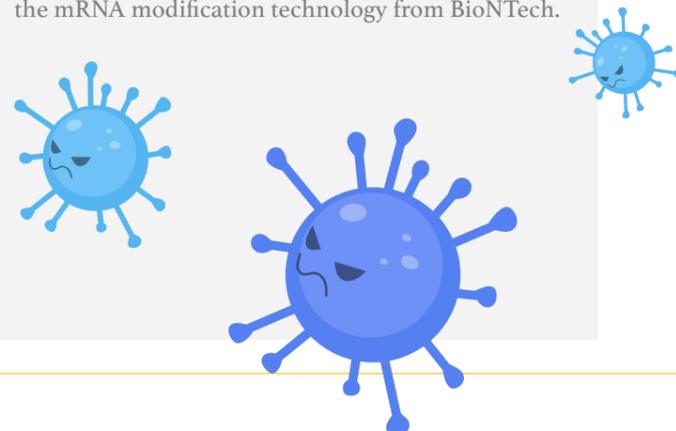
The Moderna vaccine came from the Vaccine Research Center of NIH, created by Fauci in 1997. The Washington Post (7 Dec) told the story. Dr Barney Graham, deputy director of the Center, initially studied the structure of the prefusion glycoprotein of respiratory syncytial virus for vaccine targeting. Once the protein has engaged with its cellular receptor, its shape changes, so the vaccine must target the original molecule.⁸ Later, when a postdoctoral fellow returned from Saudi Arabia with a disease that was thought to be MERS (the illness was later found to be caused by HKU1, a much less dangerous virus), his team decided to work on the spike protein of HKU1 as a means of understanding MERS. They found that the coronavirus spike protein was shaped like a thumbtack but changed to a rod after it has fused with cells. They developed a stable form of that thumbtack-shaped protein.^{9,10} Graham brought his old team together again for the COVID-19 vaccine. He had also been working with Moderna on a Nipah virus vaccine, so this company was a natural partner for him.

On 19 May, Moderna announced that their COVID-19 vaccine, called mRNA-1273, is effective in stimulating antibody production in the first 8 volunteers in a phase one trial (only this number has been tested for antibody in the 45-person study). On 16 July, Moderna announced that it was about to launch a vaccine trial on 27 July, recruiting 30,000 participants in the USA with a two-year follow-up. The first volunteer for the clinical trial for the vaccine developed by Moderna and NIH received the injection at 6.45 am on 27 July (Washington Post 28 July). The CEO of Moderna Stéphane Bancel said, "I believe it is a historic day: the first Phase 3 COVID-19 vaccine being run in the U.S.

It's a historic day for science, as well. This is the first Phase 3 of a messenger RNA medicine in the world." Dr Fauci said that it would be possible to tell if the vaccine was effective by November or December, if not earlier. On 8 August, TODAY carried a Reuters reporting quoting Dr Fauci saying that the coronavirus vaccine could end up being effective only 50-60% of the time in a Brown University webinar. He said, "We don't know yet what the efficacy might be. We don't know if it will be 50% or 60%, I'd like it to be 75% or more. But the chances of it being 98% effective is not great, which means you must never abandon the public health approach." He also said that Moderna's vaccine trial could show definitive data only in November of December. On 16 November, Moderna announced the first data about its vaccine. Out of 196 cases of COVID that developed among the trial volunteers, " came from the active arm and 185 from the placebo arm. Moderna sought EUA for its vaccine on 30 November from the US and European regulators.

US approved the vaccine on 18 December. It is no surprise that Fauci chose to be injected with this vaccine on 22 December.

Therefore, BioNTech borrowed the spike protein stabilisation knowledge from NIH, and the NIH used the mRNA modification technology from BioNTech.



OXFORD-ASTRAZENECA

BBC told the story of the AstraZeneca vaccine on 14 December. As soon as the genetic sequence was released on 11 January, Professor Teresa Lambe of Oxford University's Jenner Institute spent the next 48 hours designing a new vaccine on her laptop. Soon afterwards, Prof Andrew Pollard, director of the Oxford Vaccine Group, contacted Prof Sarah Gilbert, head of the Jenner Institute, to join forces to develop and test the new vaccine. The Oxford group had already constructed vaccines with the Chimpanzee Adenovirus Oxford One (ChAdOx1), so it was not a stretch to insert the SARS-CoV-2 sequence into this vector. The first two volunteers were Elisa Granato, microbiologist, and Edward O'Neill, cancer researcher. A few days later, social media announced that Elisa Granato died, which turned out to be untrue.

On 7 September, AstraZeneca suspended its COVID vaccine trial when one participant developed a serious adverse event. On 12 September, AstraZeneca announced that it was resuming the clinical trial in Britain for its vaccine, after halting it for six days. The study is still suspended in other countries (New York Times). On 21 October, CNA reported that AstraZeneca's vaccine trial is ready to resume this

coming week. The US arm of trial had been on hold since 6 September while it had resumed in UK, Brazil, India and South Africa. Six weeks later the trial finally restarted in the US.

On 28 November, Reuters reported that AstraZeneca intended to conduct another global trial according to CEO Pascal Soriot. The company had reported that patients who received half the dosage in the first of a two-injection program (about 3,000 volunteers) were 90% protected than those who received the intended dosage (62%, in 9000 volunteers). The problem arose this way: to manufacture the vaccine in quantity, Oxford commissioned a company in Italy. This manufacturer used a different method than the Oxford group to measure the viral concentration in the vaccine. The Oxford group, using their determination method, found that the vaccine was double strength, so they decided, with the regulator's consent, to administer half the dose. But it did seem that this dose was too low because it did not cause the usual side effects such as soreness or fever. The paper was published on 8 December.¹¹

UK was the first country in the world to approve this vaccine on 30 December 2020.

JOHNSON & JOHNSON

The Johnson and Johnson also uses a viral vector, adenovirus 26. The Phase 3 ENSEMBLE trial is a randomized, double-blind, placebo-controlled clinical trial to test the safety and efficacy of a single dose of a vaccine versus placebo in up to 60,000 adults. On 12 May, The Washington Post reported that Johnson and Johnson is raising production in a biotechnology plant near Interstate 95 in Baltimore to manufacture a billion dose of vaccine. The study started in September and aims to recruit 60,000

volunteers in total but was suspended on 13 October when one patient fell ill. The trial resumed eleven days later. Reuters reported that Johnson & Johnson (9 December) plans to reduce enrolment for the trial to 40,000 volunteers as the rate of COVID-19 infections was higher than expected and could produce sufficient data. The advantages of the Johnson & Johnson vaccine are that it can be stored in normal refrigerator temperature, it has a single-dose regime and it is cheaper than the Pfizer and Moderna competitors.

SINOPHARM

China began inoculating people with the Sinopharm trial vaccine since 22 July under 'urgent-use' protocols (Washington Post 25 August). On 25 September, TODAY reported that China expects to have produced 600 million doses of COVID vaccine by the end of 2020. Mr Wu Yuanbin of the Ministry of Science and Technology said in a press conference that eleven Chinese vaccines are being trialed with four in phase 3 studies (two by China National Biotec Group, a subsidiary of Sinopharm, one by Sinovac and one by CanSino Biologics and the Chinese military). He said that 59 vaccines are under research in China. Mr Zheng Zhongwei said that the safety

of the vaccines has been established but not yet the efficacy. On 31 December, the National Medical Products Administration approved the vaccine developed by Sinopharm, for general use (as opposed to emergency use). The BBC reported that deputy commissioner of the Administration Chen Shifei said, "After a series of strict reviews, verification, test data analysis in accordance with the Law and procedures, it is concluded that the known and potential benefits of Sinopharm's new inactivated coronavirus vaccine are bigger than the known and potential risks, and it fully meets the pre-set requirements of conditional marketing standards." The vaccine is said to be 79.3% effective.

SPUTNIK V

On 10 August, Russian President Vladimir Putin claimed that his country has approved world's first coronavirus vaccine developed by the Gamaleya Institute in Moscow and one of his daughters has taken a dose. Information on the phase 1 and 2 trial results of Sputnik V, as the vaccine is named, will only be published at end-August. The vaccine apparently uses adenovirus to deliver the gene of the spike protein. Following the Pfizer announcement in November, Russia also reported that the Sputnik V vaccine against is more than 90% effective. On 5 December, BBC reported that Russia is starting an inoculation program with its Sputnik V vaccine.

Thousands of people have already registered to receive the vaccine this weekend. Moscow Mayor Sergei Sobyenin announced the program earlier in the week and said that the vaccine has been offered to school staff, health service workers and social workers. An online system allows Moscow residents aged 18-06 in these professions to register for free vaccination at 70 city sites, operating from 8 am to 8 pm local time. Reuters also reported that Indian pharmaceutical company Hetero will produce more than 100 million doses of Sputnik vaccine per year. The Russian sovereign RDIF was behind the agreement. RDIF Head Kirill Dmitriev said that there was capacity to produce more than a billion doses starting 2021.

CONCLUSION

We are again learning that health, politics and the economy are intertwined. Vaccines have shown remarkable efficacy but the rollout for global delivery will take more than a year. It is amazing that Pfizer and Moderna placed their bets on unproven mRNA technology to take on the biggest global health problem in modern times. Surely, the power to make cells produce any given protein at a specific time will

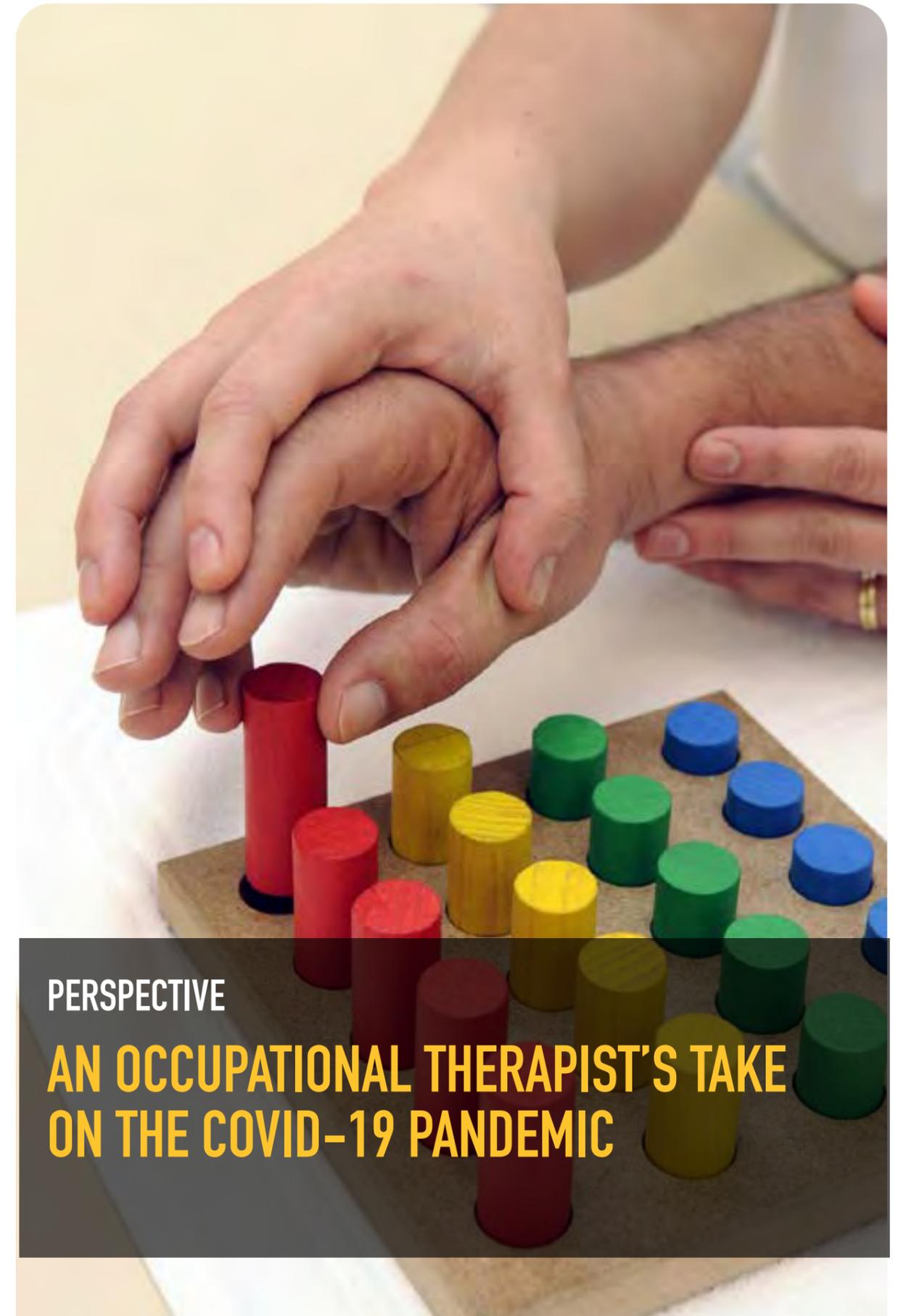
profoundly change Medicine. Reliance on science, prompt governmental action and responsible citizenry are important in the control of infectious disease. People in authority have enormous influence on how the fight is fought; they take reputational (politicians, heads of health agencies), economic (the vaccine companies) and societal risks (the lives and livelihood of people) as they decide how to tackle the pandemic.

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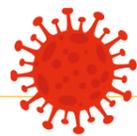


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PERSPECTIVE

AN OCCUPATIONAL THERAPIST'S TAKE ON THE COVID-19 PANDEMIC



Sun Tzu once said in his Art of War: “Know the enemy and know yourself; in a hundred battles you will never be in peril.”

Thus far, humanity’s fight in the COVID-19 war has seemed to be more defensive than offensive. Our enemy appears to know us more than we know it. Just as we thought our experience from SARS and extensive preparation over the years could give us a better chance of winning the war, this illusive enemy went into stealth mode and threw a curve ball that caught even health experts from all over the world by surprise.

We, mankind, embrace fair competition. We design all sporting competitions with rules that ensure the best player wins. Even in first encounters between two sides that have never met before, be it boxing or tennis, the better side can afford to lose the first round/game while learning to understand the opponent better, be agile to adjust and adapt, and make a strong comeback leveraging on his/her experience and mastery. But the struggle against COVID-19 is not a fair and friendly match. We must, therefore, be extremely mindful not to risk losing any lives and livelihood while we adjust and adapt to the new (never) normal.

What did this mean for occupational therapy services in Tan Tock Seng Hospital? It meant that we had to translate in-person best practices into new remote formats, while wondering what optimal practice is.

Our unique occupational focus can be pivotal to identifying new and creative solutions in response to this unprecedented and challenging situation. For hand occupational therapy, the aim in this situation was to get something quickly and effectively to meet the needs of our patients while at the same time staying safe, ourselves and patients alike. Ironically, a therapist’s hand is an indispensable tool to treat the patient’s hand, yet hand is one of the most likely mediums for the spread of COVID-19 through the common touch points.

The highly contagious spread of COVID-19 is postulated to be through droplet spread, and the WHO recommends airborne, droplet and contact precautions. Hence, personal protective equipment (PPE) with gowns, gloves, N95 masks, face shields or goggles and, surgical caps or hoods, are recommended for prolonged close contact in hospitals¹ (Figure 1). Apart from discomfort and heat, verbal communication was difficult and there is reduced tactile sensitivity, increased difficulty of fine hand movements and, impaired visibility due to deposition of water vapour on the face shield or eye goggles. With a hot water bath left uncovered during the process of splinting, the face shield or eye goggles constantly fogs up, blocking direct line of vision. At the end of the session, one can feel the strain in the eye socket from prolong compensation with peripheral vision. There is a sense of breathlessness trying to work the intricate splinting process under the PPE.



Figure 1. Janis Yeo (left), author of this article, and Dr Dawn Chia (right), Consultant in TTSH’s Department of Hand & Reconstructive Microsurgery, in full PPE with modified occupational therapy tools outside the COVID-19 isolation room at the National Centre for Infectious Disease (NCID) in April 2020 when new cases started crossing the 1,000 mark daily.

OUR UNIQUE OCCUPATIONAL FOCUS CAN BE PIVOTAL TO IDENTIFYING NEW AND CREATIVE SOLUTIONS IN RESPONSE TO THIS UNPRECEDENTED AND CHALLENGING SITUATION. FOR HAND OCCUPATIONAL THERAPY, THE AIM IN THIS SITUATION WAS TO GET SOMETHING QUICKLY AND EFFECTIVELY TO MEET THE NEEDS OF OUR PATIENTS WHILE AT THE SAME TIME STAYING SAFE, OURSELVES AND PATIENTS ALIKE.



The usual thermoplastic splint fabrication using a splinting pan with regulated heating mechanism is no longer applicable in this situation. We had to think of new remote strategies while achieving the same outcomes – (i) Ensuring that the water temperature is optimal without causing burns to the patient; (ii) ensuring that basin that is half filled with hot water to avoid spills and burns during the process of transportation via the hand; and, (iii) minimising surface contamination for the next user by using a plastic sheet to protect the basin². At the end of the process, we wanted to ensure the safety of the subsequent user, while trying to minimize the number of items for decontamination. This meant that a substantial amount of items had to be discarded. Famous naturalist David Attenborough once said “Surely we have a responsibility

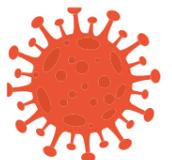
to care for our planet. The future of humanity and indeed all life on earth, now depends on us.” While necessary, I do feel a sense of guilt that I am contributing to environmental pollution.

Occupational therapists are experts at helping people find new ways of doing things in challenging times. Our profession is very well placed to be part of the problem-solving that is now needed to find new and safe ways of working while the COVID-19 pandemic continues. There are times when it is difficult to keep this thought afloat as you dwell on the prospects of a loss from the normal social support network at work, and experience separation from affective links because of the restrictions on social contacts. We do resort to our own social support network when dealing with this emergency. It gets tough, needing to work with new

protocols that change frequently; this adds on to the stress of the loss of normal social support. I find comfort knowing that I am not alone, and there are many healthcare workers out there battling the same, if not worse, situation. I find comfort having government support, management support and outpouring public support.

After almost a year of fighting in this COVID-19 war, we are getting to know our enemy better, and the balance has started to tip. Humanity has now taken a more offensive front, with researchers concocting vaccines which will inoculate and save billions. With everyone’s continued cooperation in donning masks and social distancing, hopefully the COVID-19 strife can draw to a close in due time.

OCCUPATIONAL THERAPISTS ARE EXPERTS AT HELPING PEOPLE FIND NEW WAYS OF DOING THINGS IN CHALLENGING TIMES. OUR PROFESSION IS VERY WELL PLACED TO BE PART OF THE PROBLEM-SOLVING THAT IS NOW NEEDED TO FIND NEW AND SAFE WAYS OF WORKING WHILE THE COVID-19 PANDEMIC CONTINUES.

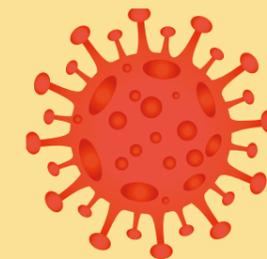


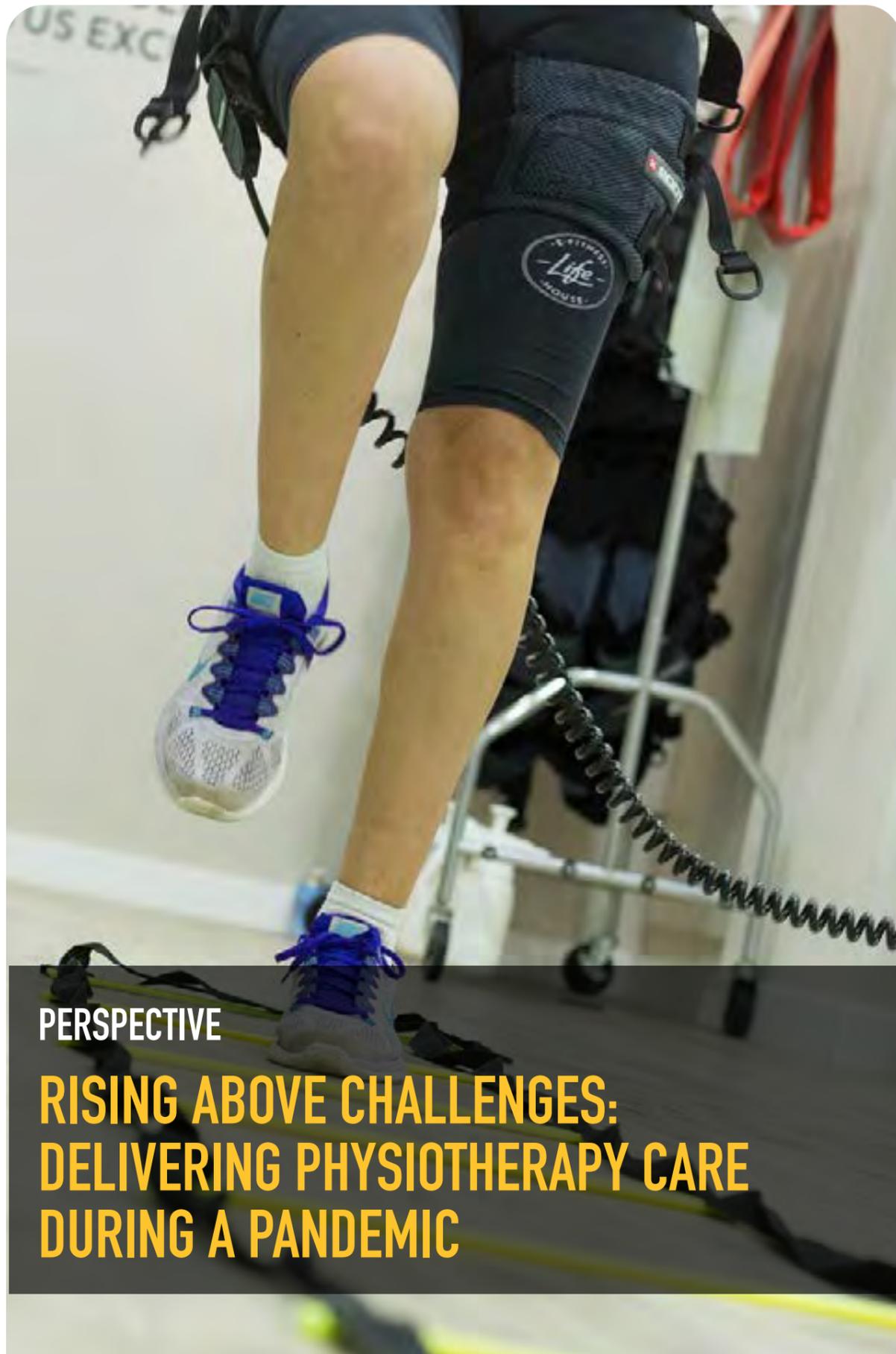
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PERSPECTIVE

RISING ABOVE CHALLENGES: DELIVERING PHYSIOTHERAPY CARE DURING A PANDEMIC

COVID-19 is the event of the century. The pandemic has altered the lives of all of us, bringing huge changes to our way of living and setting new norms to the way we do things. Many industries were heavily hit, and some even brought to a halt. Unfortunately, healthcare was also not spared.

During the Covid-19 pandemic, similar to other outpatient clinic services within Tan Tock Seng Hospital, our physiotherapy services at the outpatient clinic were greatly impacted. The announcement of Circuit Breaker and subsequent listing of allied health services as a non-essential healthcare service meant that many of our patients were unable to receive their physiotherapy services until further notice. There were many uncertainties and questions.



Figure 1. TTSH physiotherapists conducting tele-rehab sessions.

For our outpatient physiotherapy clinic services, we had to comply with the relevant stipulated rules and guidelines as part of safe management measures, and we could only see certain cases listed as essential cases face-to-face in the clinic. All other services were postponed until further notice. Many of the patients had questions - When will we be able to attend our outpatient physiotherapy appointments? Where do we go if we really need rehabilitation?

A large amount of patients were not able to receive timely physiotherapy care, and this potentially might result in delays in their recovery process. Despite their conditions being (normally) non-life threatening and unlikely to result in permanent disability or immediate hospitalization, postponement of care may mean their condition getting more chronic eventually.

As the famous American political figure, Eleanor Roosevelt, once said - *"You must do the thing you think you cannot do."*

Our team embarked on an unprecedented, daunting and exciting journey. We began exploring the use of technology and virtual health conferencing extensively to explore the delivery of physiotherapy sessions via tele-health. We poured into scholarly evidences of tele-health, and commenced coordinated efforts within the team to look into the feasibility and effectiveness of tele-health in existing literature.

We also looked into established tele-rehabilitation online resources, and began exploring and developing our own digitalized exercise programs and videos with the aim of using them to complement and facilitate our tele-rehab sessions. A tele-health task force was set up within the outpatient workgroup; several focus group sessions with our HOD were arranged to brainstorm on



what could and could not work. Based on a set of clinical needs and patient suitability criteria, we prioritised patients based on their conditions. We also cautiously looked into the safety aspects of tele-rehab and took extra care and precautions in setting safety measures to prevent any potential accidents or mishap. We conducted test-run sessions to ensure that everything could run smoothly and safely (Figure 1).

Once the core team was confident and prepared to conduct rehabilitation sessions via video-conferencing, we initiated the process of screening and listing patients for tele-rehab. Patients started to learn the use of video-conferencing with us. It was like Christopher Columbus, setting out on a maiden voyage, to experience and discover the "New World".

The journey was not smooth sailing. There were instances of stalled sessions due to unstable internet / Wi-Fi connections. At times, the beginning of these sessions had hiccups and pauses, as patients were also

unfamiliar with the set-up. Physical examination was also different, as we could only see patients on a 2-dimensional screen, rather than physically in clinic.

However, we were relieved that patients were able to receive timely care, and provided positive feedback to our tele-rehab service. Most patients quickly learnt the use of tele-conferencing, and were able to smoothen out the hiccups in no time. On our end, we also looked into improving network stability and processes to speed up the set-up phase with our patients. We continued to collect feedback and looked into continuous service improvements. Patients were generally satisfied and happy to receive tele-health physiotherapy sessions during Circuit Breaker as an alternative.

Quickly, months flew by. Circuit Breaker ended. Our outpatient

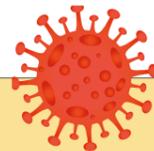
physiotherapy services also resumed. Patients were relieved that they were able to return to face-to-face visits. Many patients still preferred the traditional face-to-face contact, as compared to virtual rehabilitative sessions.

At present, the provision of tele-rehab service remains available after the therapist's review at the first physiotherapy consult. We endeavor to keep tele-rehab as a good alternative for peace times. Although no one would hope for another pandemic-scale interruption of our outpatient physiotherapy services, we will definitely keep the tele-rehab service for times of need.

Indeed, difficult times raise opportunities. In times like this, we stood up to the challenge bravely and strongly.

We saw, we met, and we conquered.

WE ALSO LOOKED INTO ESTABLISHED TELE-REHABILITATION ONLINE RESOURCES, AND BEGAN EXPLORING AND DEVELOPING OUR OWN DIGITALIZED EXERCISE PROGRAMS AND VIDEOS WITH THE AIM OF USING THEM TO COMPLEMENT AND FACILITATE OUR TELE-REHAB SESSIONS.



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PERSPECTIVE

COVID-19 AND THE IMPACT ON ALLIED HEALTH PROFESSIONALS — A DIETITIAN'S PERSPECTIVE

The COVID-19 pandemic stems from SARS-CoV-2, a coronavirus that can result in mild to severe respiratory illness and is highly contagious during its incubation period of up to 14 days¹. Due to its stealthy nature, governing bodies and public health officials across the globe have instituted various strategies to curb its spread, including lockdowns, crowd-control measures, mandatory wearing of personal protective equipment, travel restrictions, contact tracing and quarantine measures². This has resulted in major changes and disruptions to many aspects of daily living.

There is a large body of literature on COVID-19 and its impact on healthcare workers with ~ 5000 articles available on PubMed³. Most of these articles discussed or investigated the psychosocial impact on doctors and nurses, the safety and physical health of healthcare professionals, and innovations for better care of patients during this pandemic³. In contrast, similar literature sharing the experiences of allied health professionals are scarce, although there were two key publications by Coto et al⁴ and Matos et al⁵ featuring the experiences of allied health professionals and dietitians, respectively. Aside from the reported experiences of healthcare professionals, dietary impacts of COVID-19 are also of interest. Current literature carries reports on changing dietary patterns, and emergence of myths pertaining to dietary cures for COVID-19 during this pandemic⁶⁻⁸.

This article will discuss the experiences of dietitians in TTSH during the COVID-19 pandemic, and the observed changes in dietary practices, in contrast to existing reports where relevant.

ROLES OF DIETITIANS AND DIETETIC TECHNICIANS DURING THE COVID-19 PANDEMIC

Dietitians provide nutrition support to ensure adequate nutrition, which is an integral aspect for the management of COVID-19 patients to prevent malnutrition and maintain good immunity⁹. The indications for nutrition support can range from provision of therapeutic meals and dietary advice for specific medical conditions or poor appetite, to prescribing individualised enteral feeding regimens during critical care [9]. Additionally, dietitians also provide dietary counselling for the management of chronic diseases, which may be newly diagnosed in COVID-19 patients. Dietetic technicians assist to ensure patients' dietary preferences are considered and implemented in the outbreak wards.

Due to the lockdown imposed during the Circuit Breaker, there had been changes to individuals' dietary habits, which is well-documented in the literature⁶⁻⁸. Most of these were positive, including the increased consumption of healthier food choices, and decrease

in fast food consumption^{7,8}. There were other reports of individuals gaining weight during this period, predisposing them to chronic diseases such as diabetes and cardiovascular diseases⁶. These dietary shifts reinforced the important role of dietitians in educating the public on appropriate dietary choices during the pandemic (Figure 1) and personalising nutritional plans for individuals managing their chronic diseases. Fake news and misinformation about how different dietary measures can cure COVID-19 had also inundated the Internet, and this was perpetuated by the widespread usage of technology and social media during this period¹⁰. With the click of a few buttons, information can flow to individuals instantly and rapidly, making it more contagious than how the SARS-CoV-2 virus spreads. Several dietary-related myths for COVID-19 cure methods which had emerged include drinking water at boiling point to kill the virus, drinking water frequently to flush out the coronavirus, consumption of turmeric and curry to prevent COVID-19, and drinking bleach to fight the coronavirus.

These posed challenges to dietitians as people may be misled to negatively influence their health behaviours¹⁰. Such beliefs can impede the perception of risk by the public, and decrease the compliance to seeking formal medical help when needed¹⁰. Dietitians were tasked to proactively debunk such myths during patient consults by directing them to appropriate dietary guidance developed by professional bodies such as the World Health Organisation and the Dietetic Association of Australia^{11,12}.

NUTRITION CARE PROVISION DURING COVID-19: INNOVATIONS AND CHALLENGES

The COVID-19 pandemic saw the rise of the use of telehealth, a ubiquitous term which encompasses the remote assessment of patients via telecommunication such as using the phone or Internet, in the outpatient setting¹³. This mode of care delivery reduces physical contact and risk of potential COVID-19 transmission, while maintaining patients' access to appropriate healthcare in the event of lockdown or movement restriction. Likewise, providing nutrition support remotely safeguards the dietetic workforce from unnecessary risks of virus exposure.

Teleconsultation (via video conferencing or phone calls) was rapidly ramped up to allow dietitians and dietetic technicians to continue providing dietetic consultations with minimal disruption to patient care in both inpatient and outpatient settings. It enabled connection with direct care staff, allowing them to access vital information required in nutrition assessments where patients were uncommunicative. It also created access for direct communication with patients who were able to communicate. This channel of communication and engagement with patients is key in ensuring individualized nutrition plans are developed in collaboration with the patients. This is appreciated by patients as it allows them to remain engaged as much as possible, without compromising the personal connection that usually comes with face to face consultations.

For patients requiring inpatient care, the initial wave of COVID-19 cases requiring dietitian care were mostly from mechanically ventilated patients in the ICU. These cases were largely locally transmitted cases, with a few imported ones. These were manageable, and declined in numbers when effective strategies were implemented by the Singapore government, such as border control with travel restrictions, and the Circuit Breaker which curbed the community spread and importation of cases.

This was then followed by the wave of COVID-19 transmission among migrant workers living in dormitories. These patients were vastly different from those whom dietitians had seen from the initial wave of infection. The team faced challenges in meeting the nutritional needs of these patients who were mostly from Bangladesh and used to self-prepared home cuisines. The team had to consciously take into consideration culturally appropriate eating habits

and food choices. After discussions with various stakeholders, including gathering feedback from the patients themselves, nurses and the food service team, workflow was implemented to ensure that patients were given the appropriate portion sizes that they were used to for their meals. Additionally, the food service team kindly offered the option of additional curry in their meals, due to the workers' preference for larger amounts of gravy.

Language and communication barriers were another challenge when dealing with foreign workers from outbreak wards, especially when they were referred for chronic disease (e.g. diabetes, high cholesterol, and hypertension) management, which is prevalent among them. Besides Bangladesh or India, there were also some workers from Myanmar, Thailand and China. As the outbreak wards were out of bounds to dietitians, communication with these foreign workers was mainly done through the phone, which amplified the challenges. This led to dietitians creating alternatives such education resources for diabetes in Bengali and Tamil. To further promote healthy eating and self-empowerment of chronic disease management, there was a collaboration with a few foreign workers to produce a set of healthy cooking videos using recipes contributed by them. The production was subtitled in Bengali and Tamil to enhance their learning. The videos are publicly available via the TTSH Youtube Channel (access via: https://www.youtube.com/watch?v=UbOrSSAWiGc&list=PL-CkGc3Da6cQWdxgtJLSG1eMGETDhKs_4 and <https://www.youtube.com/watch?v=DpT3KOL12ho&list=PL-CkGc3Da6cQfC3g6VDNL5vsV4gS2oS1d>) to increase the reach of information to the community.

PSYCHOSOCIAL WELLBEING: PERCEPTIONS & INITIATIVES

It has been well-documented that psychosocial wellbeing in healthcare workers is greatly compromised during pandemics¹⁴⁻¹⁵. The stress is mostly due to fear of contracting the disease, possible unemployment, uncertainty for the future, and social isolation^{4-5,15}. A cross-sectional study in the United States involving allied health professionals reported that 86 % of participants experienced increased stress levels due to changes in their clinical activity, in addition to the fear of contracting COVID-19 during work (76 %), and fear of transmission of COVID-19 to families and friends (96 %)⁴. Matos et al reported decreased wellbeing scores in dietitians working in Brazil during the pandemic⁵.

It has been reported that these stressors, if not timely managed, can result in long-term psychological and mental impact in clinicians. There have been reports of emotional stress developing into post-traumatic stress disorder amongst front-line clinicians during the COVID-19 pandemic^{15,16}. In addition, burnout may develop and this may have detrimental consequences¹⁰. Burnout has been associated with anxiety and depression, and may compromise patient safety through



Figure 1. Infographic created on healthy dietary guidelines during the COVID-19 pandemic (posted on TTSH Facebook page).

impaired clinical judgment and decision-making¹⁶.

Echoing the findings of the above two papers, perceived decreased wellbeing was also not uncommon among dietitians in TTSH. Some dietitians and dietetic technicians in the department were deployed to the frontlines of the COVID-19 battle,



Figure 2. TTSH's dietitians and dietetic technicians in full protective gear, enthusiastic and ready for deployment to the frontline.

either to provide triaging services at the screening centre at NCID or to provide swabbing services in the long-term care facilities (Figure 2). Due to the close proximity to possible COVID-19 positive cases, the fear of contracting the virus



Figure 3. Although physically segregated into two different sub-teams, it was important to keep the morale up with small gestures (Disclaimer: photo taken before the implementation of safe distancing measures).

was very real. However, this was mitigated by the strong camaraderie they shared with the rest of the healthcare team, and also the appreciation showed by many of the patients and members of the public.

For dietitians working in non-outbreak wards, the chances of contracting COVID-19 from these patients were lower, but there was still a possibility. Furthermore, there had been news reports of healthcare workers contracting COVID-19. Though not proven to be nosocomial, this still led to some uncertainty and fear in some dietitians to a certain extent. The stringent measures that the hospital implemented to triage possible positive cases together, sufficient supply of personal protective equipment and, regular updates, helped allay these worries, and built trust and confidence within the team.

Another common stressor amongst healthcare workers is social isolation during this pandemic¹⁵. Due to social distancing measures in place, individuals were (and, still are) advised to keep a safe distance apart (Figure 3), have lunch individually, and avoid social mingling during and outside of working hours. Dietitians were not spared from these measures, resulting in decreased social interactions,

increased loneliness and overall decrease in morale and wellbeing, especially when support and morale were of utmost importance in fighting this pandemic.

Fortunately, many support measures have been implemented, either as hospital policies or as department initiatives, to mitigate the impact of stress and decreased psychosocial wellbeing amongst dietitians in the department. Social media, such as Telegram, is used for the timely dissemination of COVID-19-related measures in the hospital to provide individuals with clarity. It has been reported in the literature that the appropriate use of social media for information dissemination during the COVID-19 pandemic can help alleviate some stress and uncertainty amongst healthcare workers¹⁷. In Asian culture, food is always viewed as an entity that can unite people. As dietitians are often avid foodies, the department also implemented a monthly 'Woo-Hoo Wednesday' initiative to provide breakfast to staff as a morale booster. The unique feature about this initiative was that breakfast items chosen were purchased either from local businesses or from social enterprises to support them during this pandemic, which made the initiative more meaningful (Figure 4). Additionally, a welfare officer,



Figure 4. One of the goodies from 'Woo-Hoo Wednesday' - these cookies were created by a local bakery which employs individuals living with autism.

trained in basic counseling skills by the Department of Psychology, has been appointed in the department to disseminate information on self-care during the pandemic and offer emotional support for dietitians in need.

THE POSITIVES OF A PANDEMIC

A positive upshot that stemmed from the pandemic was more collaborations between clinicians, intra-professionally and inter-professionally. As our understanding of the medical management of COVID-19 continues to deepen and strengthen, there is also a need to understand how COVID-19 patients fare nutritionally. A group of dietitians from different institutions (such as TTSH, Ng Teng Fong Hospital, Khoo Teck Puat Hospital and National University Hospital) specialising in intensive care nutrition have come together to collate nutritional information and outcome measures of mechanically-ventilated COVID-19 patients; this will provide some insights on the nutritional status of these patients. It is hoped that this current collaboration will progress, resulting in possible future partnerships between healthcare institutions to work towards a common goal to achieve better patient care.

Dietitians are also involved in other collaborative efforts to achieve better care for COVID-19 patients. With the setting-up of the COVID-19 Rehabilitation Rounds, initiated by the Department of Rehabilitation Medicine Department and Department of Physiotherapy, dietitians are now part of the multi-disciplinary team comprising a rehabilitation physician, physiotherapist, occupational therapist, and speech therapist. The team meets weekly during medical rounds to discuss the rehabilitation management of selected COVID-19 patients; this has brought about greater understanding of different clinicians' perspectives on patient care, resulting in better and more holistic care for patients.

CONCLUSION

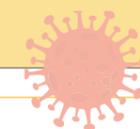
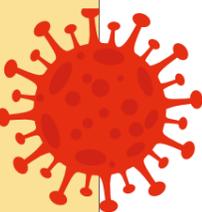
The COVID-19 pandemic has resulted in many disruptive changes. However, it also allowed us to step out of our routine work environments to create opportunities and innovations that can benefit our patients, the public and fellow healthcare professionals during this 'new normal'. Through our shared experiences, we have built confidence, and we will continue to support each other till the pandemic ends.

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PERSPECTIVE

A MEDICAL SOCIAL WORKER'S REFLECTION ON SUPPORTING MIGRANT WORKERS DURING THE COVID-19 PANDEMIC



Figure 1. The COVID-19 MSW team (from left to right): MSW Lee Qing Hui, Principal MSW Tan Tian Wui, Senior MSW Janet Lim, MSW Lim Shiao Wei, MSW Eugene Wong and MSW Junie Lim.

In May 2020, with a team of five other Medical Social Worker (MSW) colleagues (Figure 1), I stepped into the COVID-19 wards in the old Communicable Disease Centre (CDC) at Moulmein Road. Previously closed in December 2018 (Neo, 2018), the CDC has played an important role in this pandemic between May to August 2020. Due to the rapid rise in the number of COVID cases in the migrant worker dormitories, CDC was re-opened to cater to the need.

The migrant worker population forms nearly a million of Singapore's labour population (Ministry of Manpower Singapore, n.d.), working mainly in labour-intensive jobs in the construction, manufacturing, marine shipyard, process or service sectors as low or semi-skilled workers. Prior to COVID-19, it was the norm for 20 workers to share a dormitory room, and to commute from dorms to work sites in packed vans. At work, the workers interacted and spent long hours with other workers from different dormitories (Tan, 2020). As the rest of the nation started safe distancing measures, these conditions were ideal for the novel coronavirus to spread rapidly within the migrant worker community, putting the migrant workers at significantly higher risk of contracting the virus. Since the outbreak, migrant worker dormitories have been on a lockdown, work was halted and workers were sent for screening at the National Centre for Infectious Diseases (NCID). In early June 2020, batches of workers were started to be cleared to resume work (Baharudin, 2020).

There was an element of uncertainty when our team was going in to work with a population – migrant worker community - that we did not have significant experience with. In my limited years of practice, I had gotten used to working with familiar client groups, and grew into a comfort zone where I had resources at my fingertips. Working with the migrant workers has been like pressing a “reset” button, unlearning and relearning what we could offer them, as we explored what resources were available to them.

Fortunately, the migrant workers were open to our interventions and we were able to learn about their concerns. We observed that the workers had to deal with multiple stressors. At the initial onset of the outbreak, there was limited information in their mother tongues. This resulted in fear about their conditions, confusion about what is happening as they were moved from one isolation facility to another and, uncertainty on how long these restrictions would last. Our team also recognised the need for continuous psychosocial support to address the workers' anxiety and/or emotional distress; however, it was not readily available at all the isolation facilities due to different management groups. Hence, with the support of our department, the team conceptualized a series of group work activities to engage as many migrant workers as possible under the hospital's care.

Many of the migrant workers feared first and foremost whether their employers would still keep their jobs for

them, since they were not useful to their employers during their time of quarantine – prolonged, for some, as they were readmitted to the hospital several times due to persistent symptoms. To the migrant workers, their source of income is essential to them in providing for their families, and paying off their debts incurred via agent fees to even come to Singapore for work.

We also came across several migrant workers who found themselves incidentally diagnosed with chronic diseases such as Diabetes, when they underwent medical investigations for COVID-19. While treatment was available and possible during their time with us, it was the post-discharge access to medication and access to funding to purchase the medication that proved to be a challenge. This was further complicated by the fact that some of the migrant workers temporarily lost their income as there was no work to be done during the lockdown of the workers' dormitories and work sites. While we did manage to work out treatment arrangements with the support of our Endocrinologists, our partners at HealthServe, and the migrant workers' employers, the process showed us that access to subsidized and affordable healthcare for our migrant workers is extremely limited, due to their non-resident status in Singapore. Even where non-subsidized healthcare is available through private clinics, the workers might not be able to afford

their medication due to income instability and generally low wages.

The migrant workers were neither hostile nor resentful toward their employers and the authorities, despite the overcrowded living arrangement that contributed to their medical condition, and the limited information provided to them. In fact, they were grateful for the medical attention and assistance rendered to them. We were humbled by their responses as one could easily externalise the problems.

The lack of membership of the receiving country is among the five significant arguments against equality for migrant workers characterised by The International Labour Organization (International Labour Conference, 2014). While the Infectious Diseases Act (IDA) (SSO, 2020) in Singapore takes care of treatment and treatment fees for all residents in Singapore (barring some exception cases), the COVID-19 pandemic uncovered other underlying issues that our migrant workers had less power or lacked access to resources to address, due to their non-citizenship status, such as job insecurity, and medical insurance for other health conditions not covered by the IDA.

In our interactions with the migrant workers, we became more cognisant that the management of the virus and outbreak itself has taken center-stage during this pandemic. We can

see that Singapore has been flexible in learning and adjusting to new measures to minimize infections and contain the COVID-19 outbreak since the virus hit our shores. Singapore's response to the COVID-19 pandemic has been strategic and systemic, and has been suggested to take the form of a learning-driven approach (Abdullah & Kim, 2020). In the three phases of responses against COVID-19 (Abdullah & Kim, 2020), we see the government learning from our own experience from the SARS pandemic in 2003, and the responses of other neighbouring countries, culminating in the Circuit Breaker on 3 April 2020. In late April, adjustments were made to extend the Circuit Breaker to June 2020, and migrant workers were placed on Stay Home Notice in their dormitories following the surge in infections among migrant workers.

In the spirit of learning, perhaps we could also learn to shift some of the focus onto the individuals afflicted with the virus, and the "suitcase" of isolation, confusion, helplessness, and anxiety, that comes along with the diagnosis, especially in a crisis such as a pandemic. That is not to say that we do not practice patient-centered care, or do not provide a humanistic approach, but it is food for thought on how we may be able to advocate for the system to accommodate patients' psychosocial needs, regardless of their citizenship status, and/ or financial circumstances.

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PERSPECTIVE

PATHOLOGY IN TIMES OF COVID-19

Amidst the mad flurry of activities occurring in the outpatient and inpatient areas during the earlier days of the COVID-19 pandemic, TTSH's Histopathology lab, despite not being patient fronting, was not spared from the effects of the pandemic. Principal Medical Technologist, Ms. Shairiann Ishak, who was with the lab when SARS hit Singapore, shares her COVID-19 pandemic experience with Dr Tang Yee Lin, who is a consultant in the Department of Pathology, TTSH.

Q: How was the laboratory affected by the pandemic?

“Although we were not directly affected (since we are not patient-fronting), the bulk of our work is oncology-related, hence it is time-sensitive. We still received cases, and the reduction in workload was only approximately 20 %. One of our technical staff from our molecular section was deployed to the Microbiology lab to help out with the COVID-19 diagnostic tests.”

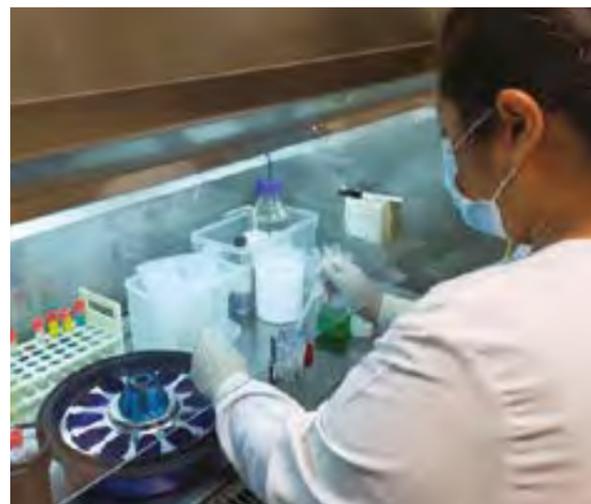


Figure 1. Ms Shairiann handling specimens in the biosafety cabinet.

Q: What were the major changes in the workflow processes in the lab?

“In terms of specimens, cytology cases from all suspected COVID-19 patients had to be placed in formalin prior to being sent to the lab, and were left for 24 hours prior to handling. All specimens had to be handled in a biosafety cabinet (Figure 1). Histology specimens were kept longer in formalin as well to ensure that pathogens (if any)

would be deactivated. However, the on-site assistance for fine needle aspiration and frozen section services were not offered for any suspected or confirmed COVID-19 cases. Extra precautions, such as disinfecting glass slides prior to being redistributed, were also taken.

Throughout this period, regular briefings (via Zoom) were held to keep our staff informed on the changes in protocols and to help support and manage expectations.”

Q: What challenges did you face during this period, and how were you able to overcome them?

“As mentioned, our work is time and location-sensitive. Although there were talks of segregating the department, the lack of working space, dedicated equipment and facilities, and the bio-safety requirements made it very challenging. The department mitigated that by instructing everyone to wear masks in the lab at all times (even before the hospital-wide mask policy was introduced), and restricted co-mingling between personnel in the lab. This allowed the lab to function with full capacity throughout this period. Being adaptable and being able to make clear decisions was important, due to the rapidly changing environment. Thankfully, our staff were very compliant. It helped that communication provided by the hospital leaders was clear and timely, which assisted in reassuring staff and providing the necessary directions.”

Q: How different was this from SARS?

“SARS felt scarier due to the high mortality rate, and it was the first pandemic we had experienced as a nation. There were many unknowns and, during that period, all clinical services were suspended, in contrast to now. We are definitely better prepared now than we were in the previous pandemic.”

Q: Were there any lessons learnt during this period, and what does the future of pathology look like?

“COVID-19 enabled us to rethink and relook into our various work processes and layout of the lab. Expansion of the physical lab, and a move towards digital pathology, are currently being planned; this would allow for more seamless transitions in the future. Our staff are definitely more prepared now having been through this major episode.”



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PERSPECTIVE

SPEECH AND LANGUAGE THERAPY IN THE TIME OF COVID-19: A PERSONAL REFLECTION

of patients who have opted to continue with their follow up via telepractice (Figure 4). Anecdotally, these patients have shared that this mode of delivery saves them time and provides convenience. This likely rings true for patients with mobility difficulties which would make it more challenging for caregivers to bring them into the outpatient clinic. As a clinician, it is also pleasant to be able to review patients in a more comfortable environment compared to the usually sterile clinic room.

LIMITATIONS

However, that is not to say that telepractice comes without its own set of challenges. The most

glaring challenge which I have faced in providing language therapy via telepractice comes with technological issues such as poor internet connectivity, which results in a delay in responses.

There are also differences in digital literacy, and access to these technologies, which directly impacts one's ability to reap benefits from these technological advances (Beaunoyer, Dupere & Guitton, 2020). Perhaps, as the uptake of telepractice continues to grow, further exploration could be undertaken to understand and ensure how to better support and educate those who are less equipped with these technologies.

CONCLUSION

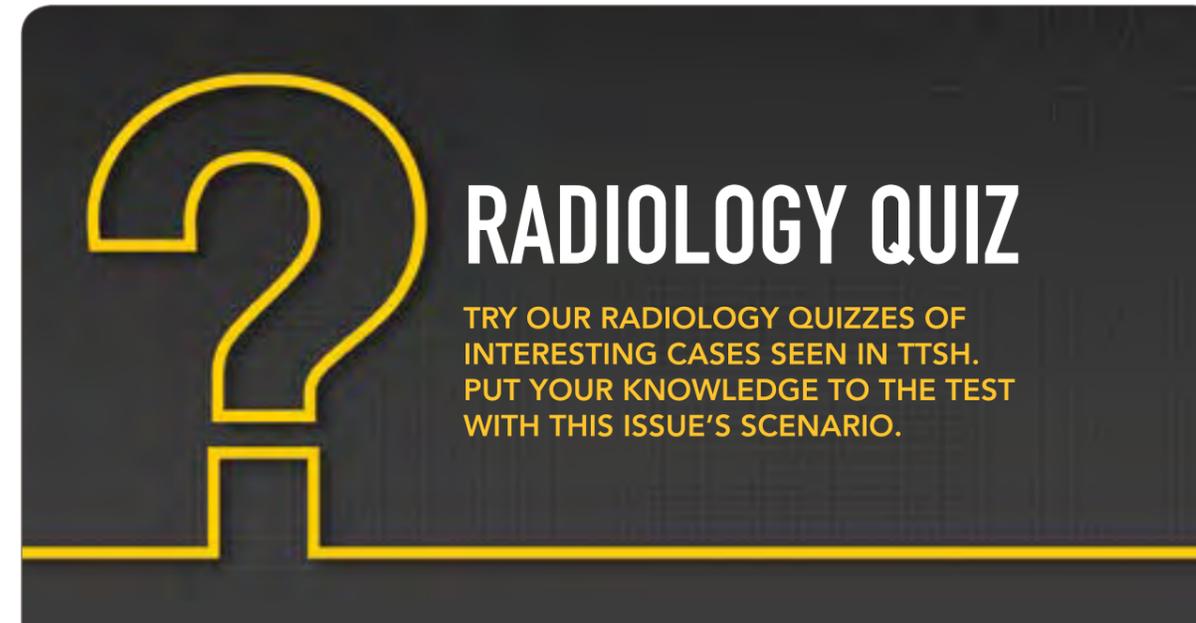
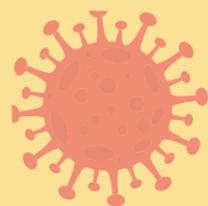
As the year 2020 comes to an end, it is remarkable to witness how much has changed yet remained similar. While our practices may have changed with social distancing rules, it is heartening to note that many of us have maintained our usual practice of collaboration, and ensuring timely care is provided. Perhaps, most striking to me would be how this has pushed us as therapists to reconsider the ways in which we practice, and ensure continuity of care for our patients. And in the midst of doing so, we may have pushed to the fore, an alternative means of providing therapy and improving the quality of care for our patients with both swallowing and communication impairments.

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TRY OUR RADIOLOGY QUIZZES OF INTERESTING CASES SEEN IN TTSH. PUT YOUR KNOWLEDGE TO THE TEST WITH THIS ISSUE'S SCENARIO.

A 36-year-old Chinese woman with no known medical history presented with fever, cough, sputum production, sore throat and diarrhea on the sixth day of illness in early 2020. On arrival at the Emergency Department (ED), the fever had resolved (36.9 °C) and the measured oxygen saturation was 99 % on breathing room air.

INVESTIGATIONS

The investigations included haemoglobin 12.9 g/dL (reference range 11.8 to 14.6), total white count 7.3 x 10⁹/L (4.9 to 9.6), platelet 314 x 10⁹/L (150 to 360), neutrophil 3.64 x 10⁹/L, lymphocyte 3.09 x 10⁹/L (1.1 to 3.1), and lactate dehydrogenase 386 u/l (270 to 550).

The chest radiography (CXR) was performed on day 8 of symptom onset (figure 1).

Computed tomography (CT) was performed the following day for her abdominal symptoms (figure 2).

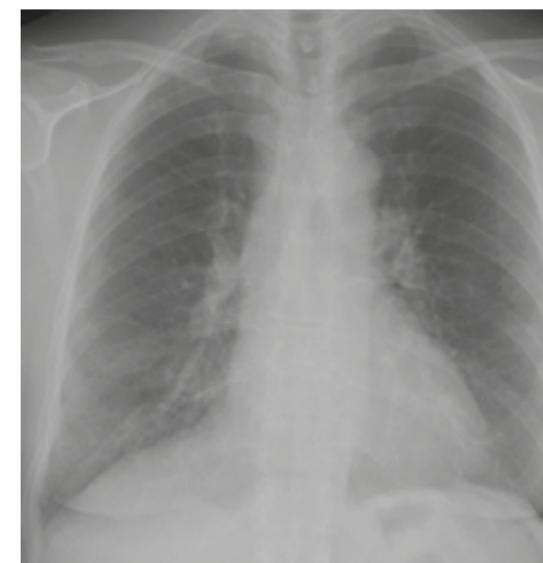


Figure 1. CXR of a young woman with fever and cough on Day 8 of symptom onset.



Figure 2. CT on Day 9 of symptom onset.

QUESTIONS

- 1) What are the findings in this patient's CXR (Figure 1)?
- 2) What are the findings in this patient's CT (Figure 2)?
- 3) What are the differential diagnoses for this patient's condition?

ANSWERS

- 1) CXR shows bilateral multifocal ground glass opacities predominantly affecting the lower zones. The term 'ground glass' is used as the hazy opacity does not obscure blood vessels in the affected regions. No pleural effusion is detected.
- 2) CT performed the next day shows patchy "ground glass" opacities affecting the lower lobes, worse on the right. As seen on the CXR, the opacities do not obscure blood vessels and the term 'ground glass' is used. There is good correlation between the findings seen on CXR and CT.
- 3) Bilateral multifocal ground glass opacities have a broad list of differentials. The most common causes are infective causes such as viral pneumonia and alveolar edema seen in congestive cardiac failure. Less common causes of multifocal ground glass opacities are interstitial pneumonia, pneumonitis, lung fibrosis, and neoplasms, to name a few. The presenting complaint of fever and upper respiratory tract symptoms suggests these lung findings are most likely due to an infection. In an immunocompetent individual, viral pneumonia due to coronavirus infection is the main concern. If the patient is known to be immune-compromised, considerations include opportunistic infections such as pneumocystis pneumonia (PCP) and cytomegalovirus (CMV) pneumonia.

Swab tests were positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and the patient was diagnosed with coronavirus disease 2019 (COVID-19). She was isolated and discharged from hospital after she recovered. Throughout her admission, she did not require oxygen or intensive care unit (ICU) admission.

DISCUSSION

Coronavirus disease 2019 (COVID-19) is a new disease entity discovered in the central Chinese city of Wuhan in mid-December 2019. This new virus represents the 3rd virus of the coronaviridae family to cause potentially fatal lower respiratory tract infection in the immunocompetent adult population.

More than half (63.3%) of the radiographs of COVID-19 positive patients in Singapore are normal on arrival. This is in part due to the practice of aggressive contact tracing and screening in Singapore. When positive, the most common pattern of opacity is ground glass (55.0%), followed by consolidation (42.5%). Most were multifocal bilateral (60.0%), followed by unifocal (32.5%) and multifocal unilateral (7.5%). The median time from the start of symptom onset to the most severe CXR was 9 days.

Chest radiography is the predominant imaging modality used in Singapore. It is cheaper, lower radiation dose (70 times less than conventional CT thorax) and most importantly mobile. The ability to perform CXR by the patient's bedside means the patient does not need to be taken out of isolation, therefore minimizing the risk of nosocomial spread of COVID-19 in the hospital. Chest radiography has poor sensitivity (more than half of initial CXR were normal!) and poor specificity (many differentials). The main role of CXR is to determine severity of disease and monitor disease progression. Using the COVID-19 Radiographic Score (CRS), we found that findings on CXR correlated well with known laboratory markers of severity as well as clinically severe COVID-19 disease, defined as the need for oxygen or mechanical ventilation.

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A 60-year-old gentleman with poorly controlled diabetes mellitus, advanced chronic kidney disease and ischemic heart disease presented to the Emergency Department (ED) with a 3-day history of upper respiratory tract infection (URTI) symptoms, loss of appetite and poor oral intake. On examination, the patient is hemodynamically stable, with a blood pressure of 138/71 mmHg, heart rate of about 110 beats/min, and saturating at 97% on room air. A resting 12 lead electrocardiogram (ECG) performed in the ED is shown in Figure 1:

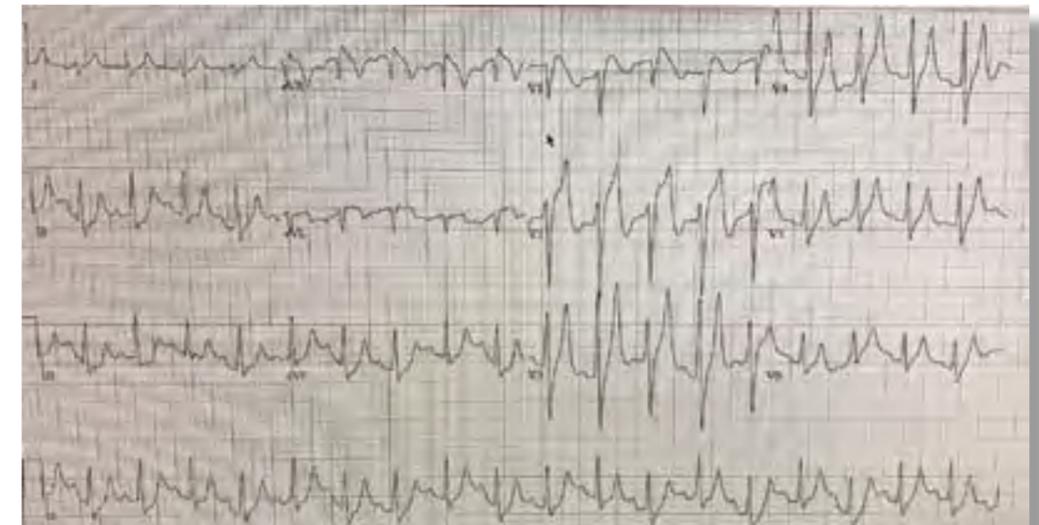


Figure 1. Resting 12 lead ECG in the ED.

QUESTIONS

- 1) Describe the findings seen on the ECG.
- 2) What is the next best investigation and management?

ANSWERS

- 1) The ECG shows sinus tachycardia, with a heart rate of about 114 beats/min. There are tall, tented T waves most clearly seen in leads V2-6, suggestive of hyperkalemia.
- 2) Serum potassium levels. Hyperkalemia treatment (see Discussion).

DISCUSSION

This ECG shows widespread peaked T waves which represent the typical changes seen in early hyperkalaemia (usually serum potassium 5.5 – 6.5 mmol/L). Specifically, these T waves are tall, narrow, symmetrical, and peaked with a prominent or sharp apex.

As the potassium level increases, other classical ECG changes occur, including broadening and flattening of the P wave, QRS widening, and ultimately, a sine wave pattern (serum potassium > 8 mmol/L). Left untreated, this can progress to heart block, asystole, and lethal ventricular arrhythmia. Immediate treatment includes potassium removal (e.g. Resonium), cellular shifting (e.g. insulin/dextrose) and cardiac membrane stabilisation (e.g. intravenous calcium).

In this patient, the serum potassium was found to be 6.9 mmol/L, with evidence of acute kidney injury. The patient's hyperkalaemia was refractory to medical therapy, and he was eventually referred for urgent haemodialysis.

The managing physician for this patient was initially concerned about acute coronary syndrome (ACS) in view of the ST changes, particularly in leads V1-V2. In

this setting, the prominent T waves may well represent hyperacute T waves seen in early ACS. However, there are subtle differences between the T waves in ACS and those seen in hyperkalaemia. Hyperacute T waves tend to be asymmetrical and broad based. There may also be associated reciprocal ST segment depression in other leads. Importantly, ST segment elevation limited to the right precordial leads (i.e. V1-V3, as seen in this case) can be an associated feature in hyperkalaemia and may be misinterpreted as myocardial infarction. Finally, as the name implies, hyperacute T waves in ACS are often short lived, with quick progression to classical ST segment elevation. When in doubt, serial ECGs should be performed every 15 minutes to assess for interval changes.

In summary, prominent T waves can be seen in life threatening conditions such as hyperkalaemia and ACS. It is important for clinicians to interpret ECG abnormalities in the context of the clinical presentation. The reader is encouraged to refer to the references for more pictorial examples of prominent T waves, and to understand how to differentiate the causes based on T wave morphology.

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IN SUMMARY, PROMINENT T WAVES CAN BE SEEN IN LIFE THREATENING CONDITIONS SUCH AS HYPERKALAEMIA AND ACS. IT IS IMPORTANT FOR CLINICIANS TO INTERPRET ECG ABNORMALITIES IN THE CONTEXT OF THE CLINICAL PRESENTATION.

ERRATUM

The article entitled 'HYPERTENSION – WHAT'S NEW IN ITS MANAGEMENT' published in the January – June 2020 issue of Medical Digest listed Adj. A/Prof Pankaj Kumar Handa, Senior Consultant Physician (Internal Medicine, Vascular Medicine & Hypertension), Tan Tock Seng Hospital, as the sole author. Ms Sagarika Handa, Medical Student in Deakin University, Geelong, Australia, co-authored the article. We apologise for the omission.