

MediCine

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SARS-COV-2 VARIANTS: A Cause for Concern?

THE NIGHT SIDE OF LIFE

And navigating the
twilight zone in between
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THE AGONY AND THE ECSTASY

A medical student reflects
on her learning journey
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All in the Family

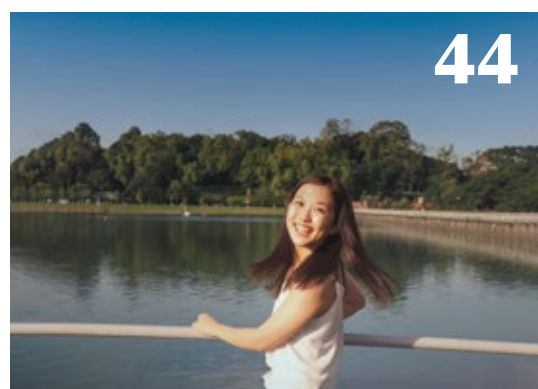
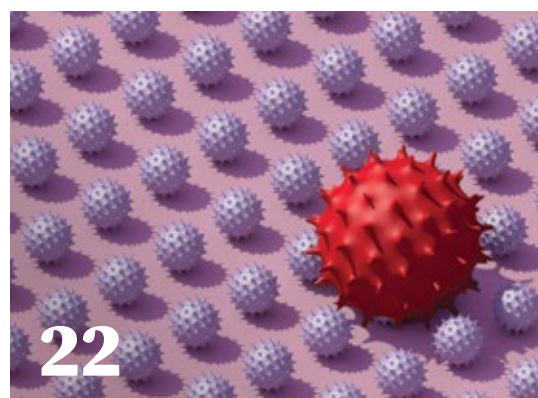
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MediCine

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NUS Yong Loo Lin
School of Medicine

Dean's Message

Dear Reader,

Two steps forward, one step back. That may be a reasonable summary of Singapore's efforts in dealing with the COVID-19 pandemic, as the health authorities constantly adjust plans to prevent infection rates from overwhelming the healthcare system and tanking the economy. That means we have had to alternate between near-normal living and very *new normal* conditions that included spending weeks sheltering at home, going out only for urgent and necessary errands.

Humans are an adaptable species and Singaporeans have always displayed quick reflexes whenever we have had to pivot to new ways of getting things done. Take the Medicine and Nursing Classes of 2026, already a semester into their first year of studies. While it has not been easy for everyone, they have generally adapted to new ways of learning, with virtual online lessons mandated by safe management measures.

Since February 2020, we have leveraged technology to overcome as much as practically possible the challenges posed by remote learning. Our educators and administrators have made use of webinar platforms to conduct interactive lectures and carry out collaborative learning cases. Zoom-based training is conducted with actual patients to let our students practise how to take history, physical examinations, together with real-time lab results and imaging for discussion of care plans.

“

The COVID-19 pandemic and the attendant difficulties and hindrances to our teaching notwithstanding, the challenge for the Yong Loo Lin School of Medicine endures—to educate and train generations of healthcare professionals who put the welfare of their patients first and foremost.”

Clinical exposure for our medical students has also been adapted to incorporate a mix of clinical training and campus-based learning. Training has resumed with precautions taken to protect our students, while still ensuring that they receive a holistic learning experience. Our students now stay in one hospital for their rotations, and ideally in one ward or a designated area whenever possible, and consecutive rotations would preferably take place in the same hospital.

The elective programmes organised by the School has also been one of the key highlights for many of our students. To replace the overseas programmes, we established six new pathway



programmes to develop and hone a broad range of skill sets among our students, such as problem-solving, innovation and entrepreneurship. Values and attitudes on the other hand, are shaped over time by life experiences.

Newly graduated Dr Tan Jun Xiang (Class of 2021) thus epitomises the kind of medical professional we delight in producing—grounded, humble, purposeful, patient-focused. I would like to think that the NUS medical school played a large part in infusing him with these values, though the truth probably lies in the life experiences that Dr Tan says he was exposed to as well as the longer route that he took on the way to medical school. Unlike most of his peers, he was a late bloomer who did not do very well for his PSLE, went to a neighbourhood school where he did well enough to enrol in a polytechnic, became a medical technologist and then developed a liking for medicine. He has not looked back since, telling The Straits Times (Aug 31, 2021) that “It’s a joy to go to work. The best part of being a doctor is seeing your patients recover. They come in pain or they cannot walk, you treat their problem and you see that they are recovering and they are able to walk out of the hospital.”

The COVID-19 pandemic and the attendant difficulties and hindrances to our teaching notwithstanding, the challenge for the Yong Loo Lin School of Medicine endures—to educate and train generations of healthcare professionals who put the welfare of their patients first and foremost.

Yours sincerely,
Yap Seng

New NUS Medicine Students Receive Warm Welcome

With COVID-19 still in our midst, the annual orientation programme, Medicamp 2021, shifted online and took place over four days in July 2021.



Photo: Meddy setting off from NUS Medicine to deliver Welcome Packs to the students.

Divided into mini-orientation groups, the incoming batch of NUS Medicine students were introduced to one another in a cosy setting, as they exchanged perspectives and aspirations about starting their journey in the medical school. In addition to sharing sessions, the online camp pitted the teams against one another at mass games and inter-group games. These included “Teachers’ Pet”, where students had to carry out a set of tasks over Zoom without the ‘teacher’ noticing, Haxball, an online multiplayer soccer game, as well as online charades.

“

“I am sure all of us will be able to make close friends and forge lasting memories in the next five years.”

Mike Sun, Phase I student

The organising committee also introduced a special edition of the Minecraft world, which was creatively conceptualised and constructed from scratch through a version made available to NUS students, within just a month. In the Minecraft world, games included “Finders Keepers”, where teams had to find as many enchanted books as they could, “Maze Runner”, where each team had to find landmarks within a maze and escape together, and “Medriokart”, where teams competed to finish a kart race within the shortest time. In addition to these games, all the players also had to work within their teams to create the most impressive Minecraft world with building blocks, and present their works during the finale of the camp.

“Despite the COVID-19 restrictions and medium through which the camp was conducted, we managed to make the most out of the camp and definitely got to know one another better through the games and sharing,” shared one of the Phase I students.

The incoming students also had the opportunity to role-play during the Simulations (SIMS) segment, where they experienced the steps and interactions they would have to manage as junior doctors in the years to come.

“While the pandemic has changed the face of how orientation was traditionally conducted, our organising committee has tirelessly worked through many changes to ensure that the new students would have an enjoyable experience. We hope that the students have built good rapport with one another through the camp, as we believe having a close



Top:
New students at NUS Medicine were introduced to one another at MedCamp 2021.

Bottom (in circles):
The students posed for a shot with Meddy upon receiving their Welcome Packs.

community is very important to follow us through the five years of medical school,” reflected Phase II students, Charmaine Chua and Timothy Ng, who were the directors of MedCamp 2021.

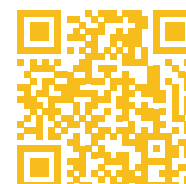
Instead of the Welcome Dinner which used to be the first event to formally induct new students into the medical fraternity, the School came up with COVID-19-safe ways of welcome, before the semester began in August 2021. Spearheaded by the Events Core Team, the School prepared close to 300 surprise Welcome Packs for them. These packs were delivered to their homes, with Meddy, the School mascot, accompanying the delivery team to some locations.

The Welcome Packs, comprising white coats pinned with name tags, class ties and scarves (for male and female students respectively), messages from the Dean and House Master Mentors, Meddy plushies, official School masks and Vanda NUS Medicine hand sanitisers, were put together in boxes bearing the crests of the Houses to which the students are assigned. Each pack was also individualised, with the student’s name printed on the spine of the box.



Grateful for the gesture, the students penned notes of appreciation to the team in helping them establish a sense of belonging to the School despite the lack of in-person events to mark the start of their semester. “I am sure all of us will be able to make close friends and forge lasting memories in the next five years,” said Phase I student, Mike Sun.

Scan to see the preparation and delivery of Welcome Packs here:



Multidisciplinary Student Teams Present Healthcare Solutions at Medical Grand Challenge 2021

The fifth edition of the Medical Grand Challenge (MGC) organised by NUS Medicine took place online on 21 August 2021. The innovative solutions of 16 teams were assessed by a panel of judges, who represented a variety of industries such as information technology, healthcare and research.



The teams brought their proposals to life and had them assessed by the judges for impact on healthcare, innovation, business strategy, marketing and commercialisation.

Team Rebee+, which developed a new lower-back pain physiotherapy programme featuring a wearable sensor and application technology for remote monitoring of patients under physiotherapy for musculoskeletal issues, swept the top prize in the Open Category.

Team Exo-brace brought back top honours in the Nascent Category with a brace that provides knee osteoarthritis

patients the stability and mechanical support to ambulate early after total knee replacement surgery.

Runner up in the Open Category, BioTrack, came up with a wearable 12-Lead ECG monitor that automatically takes measurements and sends them to a cloud server with AI-assisted diagnostic algorithms. Doctors are able to review these for undesirable conditions identified by the Artificial Intelligence (AI) system. Runner up in the Nascent Category was Project Dialight, which worked on easy-to-use solutions that would empower the patients to treat their diabetic foot ulcers at home. The goal of the project is to prevent infection, the

progression of infection to later stages, and to promote wound healing.

Team ParuKu devised a chatbot application aimed at the preliminary detection of respiratory diseases, winning the hearts of the audience and clinching the People's Choice award. Taking third place in the Open Category and winning the Social Responsibility award was Team Screenable, who worked with tech mentor Dr Andrew Wu of Mesh Bio, to improve the DARA®, a predictive analytics and clinical workflow automation solution that automatically structures health data streams and synthesises actionable insights for doctors and patients.

The MGC aims to inculcate a spirit of inquiry and hone problem-solving instincts among NUS Medicine undergraduates, while encouraging creativity and entrepreneurship. The multidisciplinary nature of the competition also seeks to foster collaborative teamwork among students from different faculties and backgrounds. Over the past year, these students have gone through interdisciplinary boot camps to develop and refine their proposed solutions and prototypes, designed to address a number of existing healthcare problems.

Students from various NUS faculties such as Medicine, Arts, Pharmacy, Business, Computing, Engineering, Science and Law—and their counterparts from Nanyang Technological University (NTU), Yale-NUS, Singapore Management University (SMU) and Singapore Polytechnic (SP), together with international student competitors from America, Australia, England, Indonesia, Malaysia, and Vietnam—presented their innovative solutions to unmet healthcare challenges that the teams identified.

Competing in two categories, 11 teams in the Nascent Category proposed solutions to a clinical problem or unmet healthcare need they had identified and tackled from scratch. Meanwhile, the Open Category saw five teams working on projects initiated by industry experts who guided them as “Tech Mentors”; or improved on ideas offered in previous competitions. The Open Category also saw international teams competing.



The MGC is more than a competition for students to assess each other’s strengths and talents, or to beef up their portfolios. We hope to nurture curious leaders who will be able to navigate the complexities and ambiguities of an ever-shifting global environment.”

Prof Chong Yap Seng, Dean, NUS Medicine



Left:

A prototype of Exo-brace, that provides knee osteoarthritis patients the stability and mechanical support to ambulate early after total knee replacement surgery.

Right:

A prototype of Rebee+, a wearable sensor and application technology that remotely monitors patients under physiotherapy.



Dr Tan See Leng, Minister for Manpower and an alumnus of NUS Medicine, graced the event as Guest-of-Honour. In his speech, Dr Tan said, “The diversity of participants across countries and professional expertise epitomises the spirit of the MGC to promote cultural diversity, inclusion, equity, and interdisciplinary collaboration. Not only will this accelerate our efforts to identify systemic and care gaps, but it will also allow us to co-create transformative and sustainable solutions using real world evidence.”

“The MGC is more than a competition for students to assess each other’s strengths and talents, or to beef up their portfolios. The multidisciplinary nature of this challenge nudges our students to consider solutions from various dimensions and perspectives, and view problems they identify in a much larger context, instead of seeing global problems in conventional silos. We hope to nurture curious leaders who will be able to navigate the complexities and ambiguities of an ever-shifting global environment,” said Prof Chong Yap Seng, Dean of NUS Medicine.

Commencement Prize Winners for Classes of 2020 and 2021



Dr Chen Weihua, Elijah (Class of 2020),
Winner of Chua Toh Hua Memorial
Gold Medal



Dr Low Su Jun, Blaise (Class of 2021),
Winner of Chua Toh Hua Memorial
Gold Medal



Dr Lavenniah Annadoray (Class of 2021),
Winner of Wang Gungwu Medal
and Prize for Best PhD Thesis
in the Natural Sciences

The Chua Toh Hua Memorial Gold Medal is a university-level award that is given to PhD graduates with the most outstanding research work done in Life Sciences. Established in 1998 by Professor and Mrs Chua Nam Hai in memory of Prof Chua's late grandfather, Mr Chua Toh Hua, the medal was awarded to two students this year—NUS Medicine PhD students Dr Chen Weihua, Elijah (Class of 2020) and Dr Low Su Jun, Blaise (Class of 2021). Dr Chen graduated under the supervision of Professor Nicholas R. J. Gascoigne from the Department of Microbiology and Immunology, while Dr Low graduated under the supervision of Dr Teo Kee Keong, Adrian from the Department of Biochemistry and Professor Tai E Shyong from the Department of Medicine. Their theses are titled, “Identification of Cdc7 as A New Regulator of T Cell Activation” and “Investigating the Effects of A Novel HNF1A Mutation in Maturity Onset

Diabetes of The Young 3 (MODY3)” respectively.

In addition, NUS Medicine PhD student Dr Lavenniah Annadoray (Class of 2021) was awarded the Wang Gungwu Medal and Prize, in the category of “Best PhD thesis in the Natural Sciences”. Established in 2005 by Professor Wang Gungwu, the award comprises a medal and cash prize of S\$5,000, and recognises the global impact of the candidates’ theses, impact factor of publications, as well as the essential impact and quality of employment as a result of their graduate training and research.

Dr Lavenniah graduated with a PhD under the main supervision of Professor Roger Foo, Director of the Cardiovascular Disease Translational Research Programme, with her thesis titled “Synthetic Circular miRNA Sponges as A Novel miRNA Interference Technology”.



It has been a rare achievement where three of our PhD students won university-level awards over a short span of two consecutive years. On behalf of the School, I would like to congratulate these students on their well-deserved success!”

Associate Professor Kevin Tan, Vice-Dean of Graduate Studies, NUS Medicine



Helping New Mums Fight the Blues

BY DR SHEFALY SHOREY, ASSISTANT PROFESSOR,
NUS ALICE LEE CENTRE FOR NURSING STUDIES, NUS MEDICINE

Elizabeth Quek is one of the rare women who has given four weeks of her maternity leave to her husband. In Singapore, partners can claim up to four weeks in what is known as shared parental leave.



Despite having a supportive husband who was willing to shoulder quite a bit of the demands of caring for a baby, the couple began having arguments when it was time for both parents to get back to work.

“I had to become the default caregiver. But I would say, ‘Why aren't you taking care of her? I need to work’. And he would be like, ‘I have so much work to do too’. So that’s where we ended up getting into arguments,” said Elizabeth on Channel News Asia’s Heart of the Matter podcast.

Elizabeth began feeling upset, overwhelmed and found it hard to cope. Like her, Sara (not her real name), one of my research participants, found the period after her childbirth to be a rough ride.

She felt overwhelmed with breastfeeding and was constantly reminded by her family members that she should breastfeed for at least six months after her daughter’s birth.

She started feeling anxious and developed a nagging fear of going back to work. She was especially concerned about how she would cope with breastfeeding while working.

She would cry every night from the lack of rest and giving in to the demands of her newborn. She started blaming herself for not being a good mum and started to have feelings of guilt about not enjoying motherhood.

Both Sara’s and Elizabeth’s stories are common—in fact, they epitomise the experience of hundreds of women I have met in my research work.



20%
reduced risk of developing postpartum depression in those who received peer support over the phone in the first three months after giving birth



1 IN 10
mothers are affected by postpartum depression

The transition to motherhood is a stressful period for new mothers—with women being extremely vulnerable to biological, emotional, and familial changes.

For working women, motherhood may present additional stressors of juggling with parenting roles and employee roles.

Though the research around employment status and postpartum depression is inconclusive, my own study of 138 women, of whom 43% were working mothers, indicated that a majority of them felt overwhelmed by newborn care tasks and work-related demands.

Nationally, postpartum depression affects one in 10 mothers, and it can be hard to diagnose as women do not seek timely help. Many women often have no idea they have early signs of depression, nor does anyone in their family and close social circle.

This is something Elizabeth mentioned in the podcast. “My friends didn't really talk about their experience and how difficult it was to be a mother until, I started opening up about my journey. Then they responded. So my hypothesis is that mothers normalise the stress they go through—that mothers have to be sacrificial and you just endure it.”

Even among women who recognise they are feeling emotionally down, getting timely help and treatment is rare. Those affected often feel reluctant to seek help due to the social stigma around mental health, especially during what is supposed to be one of the most joyous times of their lives—motherhood.

These women who do not get help tend to dismiss their symptoms as “normal feelings” and keep to themselves. But the problem, if untreated, can become so deep that it can lead to devastating consequences, including suicide.

Screening is useful but missed opportunities remain

In Singapore, pre and postnatal check-ups are an essential part of the system. If doctors detect signs of depression they can request for more support for these mothers.

That's a good step but depending on screening alone is not enough. There are mothers who default on their hospital visits. And even among those who do not, many brush away concerns.

Sara was one such mum. Despite feeling overwhelmed, she did not seek help as she was concerned about being judged to have fallen short as a mother.

In my research, I have discovered that it is important to bring mental health awareness and interventions to new mothers who need them, instead of expecting them to seek it on their own. As a mother myself, I can understand that the focus is seldom on self-care as the entire world revolves around the new baby.

We are working on a large-scale peer-support programme in which trained peer volunteer mothers, who have experienced and recovered from postpartum depression, are matched to at-risk mothers. They come alongside the new mothers to offer a listening ear and encouragement as and when needed.

We matched Sara to one such experienced mother who had struggled to breastfeed her baby for two weeks. When Sara learnt that the baby grew up nonetheless to become a healthy teenager, she mustered the courage to tell her husband she wanted to stop breastfeeding.

He was supportive and communicated their decision to their extended family members. Sara managed to feel better as she had more time for herself, and her husband started to help with the feeding after work. In Sara's own words, "Life became normal."

My study showed that those who received peer support over the phone in the first three months after giving birth, had a 20% reduced risk of developing postpartum depression.

A non-judgmental listening ear and a friend to talk to provide emotional comfort, reassurance and reduced negative feelings and loneliness at a vulnerable time for new mothers, who fear being viewed as incapable.

Fathers play a critical role

This type of support can complement other sources of aid. Fathers play a crucial role in the well-being of the new mothers. They can take care of other household responsibilities like preparing meals and bathing the baby.

Fathers should keep in mind that merely listening to their wives' needs without trying to solve all their problems can be beneficial. Encouragement that also acknowledges their wives' efforts go a long way.

They also play a vital role in ensuring that family members do not write off the mother's symptoms, or confuse her with outdated advice.

Interestingly, research has shown that partners of depressed new mothers are at higher risk of developing postpartum depression themselves. A local study of 200 fathers conducted between 2016 and 2018 found that

the early postpartum period is a stressful time for dads. The study revealed that at the six-month mark, at least one father was reported to be at risk of depression.

One way to avoid falling into this trap would be to set aside time to be together so that fathers and mothers can support each other, especially when mothers go back to work.

Easing back to work

One of the toughest transitions for mothers is getting back to work while their babies are still very needy. This can exacerbate feelings of inadequacy. Many in my research group feel they have to live up to expectations of being a good mother and a committed employee.

But these can be unrealistic, because every family is different and workplaces can vary greatly in their demands. New mothers need to learn how to enjoy their motherhood at their own pace and be clear about what they can and cannot do.

I tell new mothers that it is fine to ask for flexible work arrangements and even lighter responsibilities for the first few months at work to re-acustom themselves to their jobs after spending time away. New moms can also consider taking half days instead of a long period of maternity leave.

Sara has found her footing and is a much happier working mother now. For her, speaking to someone who walked the same path before made a big difference and this should be an important lifeline for all mothers because they shouldn't have to travel this road alone.

Dr Shefaly Shorey has done extensive work in the areas of family and women's health, with a special interest in perinatal health.

This article was first published in Channel News Asia, 3 July 2021, and has been edited for MediCine.



Together But Still Apart

Older adults living with families are socially isolated, with men who live alone more susceptible.

Social disconnection—a lack of social, emotional and physical engagement with other people—results in isolation and loneliness. Risk factors such as the shrinking of family sizes, lack of family support and declining health have made it hard for older adults to keep up with social and economic activities and maintain social connections, resulting in social disconnection and isolation. The social distancing measures brought about by the ongoing COVID-19 pandemic have exacerbated social isolation, especially among the elderly.

A study of 16,943 older people by Professor Koh Woon Puay, from the Healthy Longevity Translational Research Programme at NUS Medicine and Associate Professor Feng Qiushi of the NUS Faculty of Arts and Social Sciences found that among socially disconnected older adults in Singapore, 78.8% are living with family, compared to 14.4% who are living alone.

The research team also studied the factors associated with social isolation in this cohort of senior citizens, who form what is known as the Singapore Chinese Health Study, to examine similar effects among those living alone and those living with their families. The salient findings were:

- Regardless of living arrangements, factors such as low education levels, cognitive impairment, fair or poor self-rated health, depression, and limitations with daily living activities were independently associated with social disconnection.
- Among those living alone, men were twice as likely to experience social disconnection compared to women.



Interventions that encourage individual and personal productivity, such as paid work, volunteerism and learning new skills should be promoted among older adults to create opportunities for social interaction and maintenance of cognitive functions.”

Prof Koh Woon Puay, Healthy Longevity Translational Research Programme, NUS Medicine



Among socially disconnected older adults in Singapore

78.8% are living with family, compared to **14.4%** who are living alone



1. Low education levels, cognitive impairment, fair or poor self-rated health, depression and limitations with daily living activities are independently associated with social disconnection

2. Men living alone are twice as likely to experience social disconnection compared to women

Interventions

From these findings, Prof Koh recommended targeting community interventions at elderly men living alone, and extending the scope of these interventions to help older adults who are in poor health and living with their families. Despite efforts that the Singapore Government has invested in the area of eldercare which have helped most older people stay socially connected, social alienation is increasingly present due to demographic trends of population ageing and solo-living. Additional efforts are needed to help vulnerable individuals, especially older men.

Prof Koh said, “Interventions that encourage individual and personal productivity, such as paid work, volunteerism and learning new skills should be promoted among older adults to create opportunities for social interaction and maintenance of cognitive functions.”

A study to see how we age

In addition to social isolation, older adults face increased risk of chronic age-related diseases, as well as gradual loss of bodily functions and independence in activities of daily living. Prof

Koh and Assoc Prof Feng are now collaborating with other scientists within NUS and other research institutions to establish the “SG70 Towards Healthy Longevity” cohort study, to examine the effects of biological, lifestyle and socioeconomic factors that prevent people from ageing healthily and productively. The cohort study will recruit 3,000 participants, from the ages of 65 to 75 years old, and belonging to the three major ethnic groups in Singapore. This age group has been identified as belonging to a vulnerable period where the average Singaporean may transition from good health to poor health. The team will study this ageing process in the SG70 participants for the next 10 to 15 years.

The eventual aim of the SG70 cohort study is to gather scientific evidence that will form the basis for intervention studies in the near future that may slow, halt or reverse the ageing process, in order to help people age more healthily, avoid age-related diseases and maintain a good quality of life in their twilight years.

The Night Side of Life

*BY DR NOREEN CHAN, HEAD & SENIOR CONSULTANT,
DIVISION OF PALLIATIVE CARE, NATIONAL
UNIVERSITY CANCER INSTITUTE, SINGAPORE*



Recently, a colleague was hospitalised for breathlessness, a quite unexpected development for someone who runs 80km a week and used to high-altitude trekking. He messaged me to apologise that he would not be at work for a while, then followed with a reassuring “Not cancer...so I don’t need you yet”.

When he was back home recuperating, we exchanged messages and he shared that among the many changes forced on him, aside from unpleasant breathlessness was the unwelcome reality that he had become... a patient.

The irony of it. We, healthcare workers, who every day see people whose lives are upended by a devastating diagnosis. Somehow we convince ourselves we can carry on like this, always, that it will not happen to us. And even if it did, our work experience will stand us in good stead. And while we like to think we know what the journey entails—and why not, it is our bread and butter, our daily work—the truth is, we will probably never know what it is really like for our patients and families. Until it happens to us.

Dr Christopher Cheng, CEO of Sengkang General Hospital and clinical associate professor at NUS Medicine, in the prologue of his book (*I Thought I Knew: A Professor Turned Patient*) wrote: “I have been a doctor for more than 37 years, and a urologist focused on prostate cancer since completing my fellowship at the Mayo Clinic in 1991... You will forgive me for saying, I thought I knew. That was until I became a patient myself, lying on a cold operating

table on Saturday morning in December 2017.

... At the end, you may say—this guy still doesn’t really know. But having tasted my own medicine, I think I now know a little more about what it means to be told you have cancer, how it feels to be really sick and helpless, and finally what it means to be truly alive after going through hell. It is my hope that everyone who reads this story will understand the fragility of life, the importance of not taking it for granted, and not wasting the second chance. Through sharing my experience, I hope you will come to this realisation without having to go through being diagnosed with cancer yourself.”

Having listened to patients and families’ stories, I am reminded of Susan Sontag’s analogy (from *Illness as Metaphor*): “Illness is the night side of life, a more onerous citizenship. Everyone who is born holds dual citizenship, in the kingdom of the well and in the kingdom of the sick. Although we all prefer to use the good passport, sooner or later each of us is obliged, at least for a spell, to identify ourselves as citizens of that other place.”

But for the patients I see, they are stuck in that foreign land: their illness is not going away, they will not get better, in fact they are going to die from it. For a few, the change of status from vague symptoms to a diagnosis of cancer, to incurable cancer, to terminal disease, happens so quickly—a matter of weeks in some cases—that they are still grappling with the rapid turn of events, and have not had the time nor space to process everything that has happened.

When reality does sink in, that this is how it is going to be, it will never be like it was, people respond in a variety of ways, but primarily, we grieve. It might sound strange but it is completely normal—grief is a response to loss, and what is happening here is the loss of one’s health, identity and social role (as the caregiver, breadwinner etc.), loss of dreams and the future ...and one must go through this valley of darkness, to mourn and grieve, before moving on to a different future, to transformation and even growth.



Illness is the night side of life, a more onerous citizenship. Everyone who is born holds dual citizenship, in the kingdom of the well and in the kingdom of the sick. Although we all prefer to use the good passport, sooner or later each of us is obliged, at least for a spell, to identify ourselves as citizens of that other place.”

Much of this tends to go unnoticed by the average healthcare professional. It is not that we are unkind but there does seem to be this blind spot where psychosocial and spiritual distress is concerned. Or perhaps we are too busy, or uncomfortable with venturing beyond the “measurables” like blood pressure, temperature or pain scores.

Our healthcare system is designed for treating diseases, not so much for looking after people. We teach healthcare students how the body works,

how it can break down, what can be done to “fix” it, but hardly anything about the human experience of health and sickness, of living and dying. It is quite common for me to see patients with reams of information on their diseases, lists of problems, stacks of numbers and images, but precious little about the PERSON in the patient. Who they are, how they live, what they are thinking and feeling about all of this. Yet it is the person who suffers, sometimes silently and unsupported.

We live in an age of medical miracles, where artificial intelligence and technology are transforming medicine and healthcare faster than any time in history. But let us not forget that care is a partnership, not a commodity, and every patient is a person in need. We should not underestimate the power of kindness and compassion, the listening ear, the gentle touch, the quiet voice asking “how are you?” that connects and comforts like nothing else can.

And always remember, one day “they” will be “us”.

“

We teach healthcare students how the body works, how it can break down, what can be done to ‘fix’ it, but hardly anything about the human experience of health and sickness, of living and dying.”



And Navigating the Twilight Zone In Between

BY YUEN YI CHING, SENIOR PHARMACIST (CLINICAL), NATIONAL UNIVERSITY HOSPITAL

I used to believe in hard work, now I am not so sure. I used to have specific targets to meet personally, financially, now I am not so sure. I used to believe that keeping myself very fit will keep me healthy for years to come, now I am not so sure. I used to believe in black and white, now I am not so sure. *Think again...*

As a pharmacist, I learnt about tuberculosis, or TB, in a textbook, in guidelines, in review articles and in pharmacopeia. I learnt about the disease, the evidence, the drugs, the interactions and the side effects. I thought I knew them quite well, till I got TB myself. Oh think again! How wrong and naive was I? I knew very little and I have much to learn.

As a patient, I learnt about uncertainties, unknowns, frustrations, fear and pain. I am so used to problem solving on a daily basis, but when the role was reversed, where I was the problem to be figured out, the fear was intense although I was calm on the outside.

As a pharmacist, I was not prepared to be a patient. I did not want to be sick as I have not been sick for nine years. Being sick was not an option for me as I should be helping the sick. *Think again...*

As a patient, I went through investigations. A pleural tap was

my first ever medical procedure, during which a needle was inserted to remove fluid from the space between lining of the lung and the wall of the chest. I had no issue with the medical resident doing the procedure for me as they need practice too. Unfortunately, he failed twice, the procedure was taken over by his supervisor, and my ribs got a few extra pokes. The experience must have been nerve-wracking for him as he knew me from before. I was seeing stars by the end of the procedure due either to pain or the amount of local anaesthetic used.

Those TB medications that I checked as a pharmacist before dispensing them to patients—those capsules and tablets are in front of me, in medicine cups. For my consumption. The side effects flashed by, the dosing verified. I am now the patient.

As a person, I am blessed that I was so well looked after. I received incredible care throughout, almost immediate investigations and reviews by my wonderful colleagues and friends. I have nothing but gratitude for everyone who helped me through this journey.

As a person, I learnt to walk again, to breathe and to slow down. Sometimes, the bravest thing to do is just putting one foot in front of another, or just catching my breath after a coughing fit. Slow down,

breathe; appreciate it because we take breathing for granted until something literally takes your breath away.

“

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Asian Clinical Research Network Established to Tackle Drug-resistant Infections in the Region

The Wellcome Trust has provided a grant of S\$2.5 million to NUS to establish the Asian Clinical Research Network (ACRN) to conduct antimicrobial clinical research to develop the most effective ways to treat and prevent life-threatening drug-resistant infections.

This is the first clinical trial network established in Asia focusing on drug-resistant infections. Other similar networks have been set up in Europe, the United States and Australia, and collaborating with these networks is a key long-term goal.

The NUS Saw Swee Hock School of Public Health will be hosting the network and the School will work closely with local partners, namely—NUS Yong Loo Lin School of Medicine, Duke-NUS Medical School, Lee Kong Chian School of Medicine at Nanyang

Technological University as well as the National Centre for Infectious Diseases—to carry out clinical trials related to drug-resistant infections. Each institution has committed S\$500,000 towards establishing and supporting the work of the ACRN, bringing the total funding for this network to S\$5 million. The Singapore Clinical Research Institute will also be involved in implementing this network.

Professor Paul Tambyah from NUS Medicine has been the site principal investigator for a number of clinical trials of antimicrobial agents used to treat drug resistant infections, which include most recently, the successfully concluded MERINO trial. He said, “I am looking forward to more collaborative high-quality clinical research studies to answer the important questions in dealing with antimicrobial resistant pathogens.”



Global public health challenge

Antimicrobial resistance occurs when microbes become resistant to the medications used to treat the infections they cause. These drug-resistant infections are a global health issue that could be exacerbated by responses to the COVID-19 pandemic. In fact, the World Health Organization (WHO) has declared antimicrobial resistance one of the top 10 global public health threats facing humanity.

Currently, at least 700,000 people die each year due to drug-resistant infections. According to a report released by the United Nations in 2019, drug-resistant infections could cause 10 million deaths each year by 2050, and by 2030, antimicrobial resistance could force up to 24 million people into extreme poverty. Experts predict that by 2050, nearly half of the deaths caused by drug-resistant infections could occur in Asia and many of these epicentres of antimicrobial resistance in Asia have poor public health infrastructure to combat this problem.

Urgent action is therefore needed to address this issue and reduce the number of deaths each year, especially in Asia. Establishing the ACRN will help to improve and strengthen clinical research capabilities in the region, to successfully and efficiently deliver interventions for drug-resistant infections. Importantly, the network will improve access to clinically relevant and vulnerable populations, ensuring that treatments reach those most in need.



Antimicrobial resistance could force
24 MILLION
people into extreme poverty by 2030



Drug-resistant infections could cause
10 MILLION
deaths each year by 2050

Asia-based clinical trial network to improve treatment and supply of new drugs

Associate Professor Hsu Li Yang, an infectious disease expert and Vice-Dean (Global Health) at NUS Saw Swee Hock School of Public Health, explained, “The current model of clinical research in antimicrobial resistance is to fund individual clinical trials on an ad-hoc basis, with each trial requiring significant investment in research infrastructure and skills development in addition to the trial-specific costs. This model is inefficient scientifically, developmentally and financially. Such trials are also typically not conducted in low- and middle-income countries, where there is the greatest need.”

He added, “A clinical research network based in Asia will significantly increase the quality and efficiency of clinical trials in the region, resulting in an improved understanding of drug-resistant infections, improved treatment of those infections and an increase

in the supply of new drugs to fight antimicrobial resistance. The joint funding will also spur research collaboration and capacity building both in Singapore and the region to jointly develop solutions to the issue of antimicrobial resistance.”

Dr Tim Jinks, Head of the Drug Resistant Infections Priority Programme at Wellcome highlighted the importance of this new initiative. “New antibiotics and improved ways of treating people are necessary to save lives and stop the spread of drug-resistant infections. We are thrilled to launch this important clinical research network with NUS and partners. This multi-institutional and international collaboration will strengthen and build research capabilities in Asia and support world-class science. I look forward to seeing the network deliver results that will be important to the health of people in the region and around the world.”



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Assoc Prof Hsu Li Yang, Vice-Dean (Global Health), NUS Saw Swee Hock School of Public Health

¹ <https://www.myvmc.com/news/common-antibiotic-slays-superbug/>.

² <https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance>.

³ <https://www.who.int/news/item/29-04-2019-new-report-calls-for-urgent-action-to-avert-antimicrobial-resistance-crisis>.

⁴ <https://asia.nikkei.com/NAR/Articles/Drug-resistance-threatens-Asia-s-health-and-economy>.

Yong Loo Lin School of Medicine and Lien Foundation Establish Early Childhood Centre with \$30 Million Gift

The Centre for Holistic Initiatives for Learning and Development (CHILD), established with a generous gift of S\$30 million from the Lien Foundation, will provide a multidisciplinary approach to translating critical research to intervention, and improving the health and developmental outcomes of children in Singapore and beyond.



The first of its kind in Asia, CHILD will build on an unmatched reservoir

of clinical data on mothers and children in Singapore, provided by a much-cited research study—the GUSTO¹ (Growing Up in Singapore Towards healthy Outcomes) cohort. The GUSTO study is a major collaborative research effort involving the National University Health System, KK Women's and Children's Hospital, and A*STAR's Singapore Institute for Clinical Sciences, as well as international researchers in New Zealand, the United Kingdom, and other countries.

CHILD is an inclusive, multi-collaborative effort, whose founding partners include NUS Medicine, Lien Foundation, Centre for Evidence and Implementation (CEI), and A*STAR's Singapore Institute for Clinical Sciences (SICS). It aims to work with multiple partners in the local early childhood and family services space.

The work of CHILD supports the Research, Innovation and Enterprise (RIE) 2025 plans on 'human health and potential' which aims to realise the full potential of every child through improving prenatal and early childhood development, and learning outcomes in schools. It also ties in well with the mission of Singapore's Child and Maternal Health and Well-being Task Force to help women prepare for motherhood, and help children attain good health and well-being from their early years.

Its key propositions include:



A multidisciplinary approach bringing together professionals from a variety of disciplines, cutting across social, health and education boundaries and incorporating health, sociology, psychology, artificial intelligence, and data analytics.



Helping to build capability and capacity at all levels and spheres within the early childhood space, involving its network of partners and collaborators comprising scientists, researchers, community partners, policymakers, teachers, therapists, and other professionals.



Closing the gap between the evidence for what works to give children the best start to life and the effective implementation of this in policymaking and service delivery.



Innovative, novel screening tools – develop and implement research-validated 'made-in Singapore' early screening tools as part of early detection, and to accurately and reliably identify children at risk of developmental concerns and stratify them according to risks. An example of this is the Whole Child Assessment (WCA)² developed by GUSTO researchers to assess school readiness.



Developing targeted intervention programmes tailored according to the risk profile of children screened, instead of a common one-size-fits-all approach. Examples of this include the EASEL (Enhancing and Screening Early Development to Better Children's Lives) Trial which screens preschool children and also provides appropriate interventions to improve early childhood educators' everyday practices in the classroom and their delivery of these practices for children with different needs. Another example is the Appetite Toolbox which aims to cultivate healthy eating behaviours early in life, and provide children and caregivers with tools designed to enhance self-regulated eating skills during preschool.



Breadth of focus – Based on GUSTO, as well as the latest evidence and data in the childhood development space, the focus is from conception to the primary school years.

“The work of CHILD will promote efforts to maximise the developmental potential of children, with a focus on their emotional, cognitive, and social well-being, from conception to primary school years. The centre’s emphasis is in line with Singapore’s national drive to boost the health and well-being of mothers and their children and ensure a good start to life for all children in Singapore,” said Professor Chong Yap Seng, Dean of NUS Medicine, and Executive Director, SICS, A*STAR.

“In a time of rapid social and technological change, we believe the convergence of disciplines and collaborative talents will inspire and propel new ways of uplifting the early childhood ecosystem,” said Mr Lee Poh Wah, CEO, Lien Foundation.

“We see CHILD as an investment in the future and it represents a commitment to support the national ambition of maximising human potential and enhancing the health and well-being of the next generation. We look forward to co-creating solutions with forward-thinking partners to ultimately achieve better outcomes for our young,” said Mr Lee.

In gathering and synthesising the latest evidence and data across disciplines from Singapore and in the region, which will be used to guide and inform social policies and programmes and to accelerate the process from research and evidence to policy and intervention, CHILD aims to engage and bring together key stakeholders in the local early childhood and family services space comprising government institutions such as the Health Promotion Board, social



service agencies, preschools and other institutions, as well as international partners.

“Findings from recent studies present clear evidence that high amounts of passive viewing screen time in early childhood are associated with numerous developmental and behavioural issues, including language delays, social communication deficits, and attention deficit hyperactivity disorder (ADHD) traits. This is a worrying trend and a key public health concern that we can, and ought to address, especially in this digital age where increased digital media use in infants and toddlers is ubiquitous,” said Professor Lee Yung Seng, Co-Director of CHILD and Head of Paediatrics at NUS Medicine.

“Based on current evidence, CHILD would recommend no passive screen time for children below 18 months and not more than one hour per day of unsupervised, passive screen viewing for children between 18 and 36 months of age,” added Assistant Professor Evelyn

Law from the Department of Paediatrics at NUS Medicine and Principal Investigator, Translational Neuroscience Programme, SICS, A*STAR.

“Children are the future of our society. For long-term benefit across generations and to ensure optimal outcomes for the children, we urgently need to start focusing on women’s maternal mental health and well-being before pregnancy through to after birth. By amalgamating and integrating the research efforts in early childhood development, from preconception to pregnancy to the child’s infancy and early growing up years, the Centre is uniquely poised to accelerate this paradigm shift in our understanding of brain development and function in young children,” said Prof Chong Yap Seng.

Scan to find out more about CHILD here:



CHILD Evidence Briefs

CHILD has produced two 'Evidence Insights' on maternal mental health and the impact of digital media use on children's brain development.

a) Maternal mental health affects brain development in children

Research from GUSTO, which aims to understand how conditions in pregnancy and early childhood influence the health and development of women and children, has shown that nearly 40% of mothers in Singapore displayed depressive symptoms during pregnancy. Even at mild to moderate levels, this distress experienced by the mothers may affect the cognitive and emotional development and function of the child, and may go on to have an adverse impact on their school readiness, academic performance and even mental health^{3,4}. The impairment of these functions places the child at a lifelong disadvantage⁵.

Importantly, the S-PRESTO (Singapore Preconception Study of long-Term maternal and child Outcomes) study found that

women's maternal mental health issues may begin before conception, and remain problematic during their pregnancies, and even after delivery.

"These are significant findings that underscore the need for proactive intervention to take place as early as preconception, during pregnancy, and early postnatal period. This will ensure the optimal development of executive functions⁶ in the early years of their children and reduce the risks of lifelong downstream disadvantages. Interventions need to focus on both the mother and infant, with parental needs being supported even before the child is born," explained Associate Professor Robyn Mildon, Co-Director of CHILD and Founding Executive Director of CEI.

b) Adverse impact of passive screen time on children's cognitive and socio-emotional development

The early childhood years also present a crucial period to shape a child's cognitive development. In a study led by A/Prof Evelyn Law, which drew findings from GUSTO, it was found that locally, almost all infants and toddlers under two years of age are exposed to approximately two hours of digital media a day via electronic screen-based devices. High levels of passive viewing screen time during these early years may have adverse consequences for cognitive development in later childhood, including poorer eating behaviour, poor sleep, attention difficulties, near-sightedness, as well as developmental delays.



Scan to read full briefs here:



¹ GUSTO is a landmark study which has gathered valuable data in the past decade about how conditions in pregnancy and early childhood influenced maternal mental health and child neurodevelopment. More information on GUSTO is available at: <http://www.gusto.sg/>.

² The Whole Child Assessment (WCA) is a screening approach to identify children with learning difficulties before they enter primary school.

³ Glover V. Maternal depression, anxiety and stress during pregnancy and child outcome; what needs to be done. *Best Practice & Research Clinical Obstetrics & Gynaecology*. 2014; 28 (1): 25-35.

⁴ Law EC, Aishworiya R, Cai S, et al. Income disparity in school readiness and the mediating role of perinatal maternal mental health: a longitudinal birth cohort study. *Epidemiology and Psychiatric Sciences*. 2021; 30: e6.

⁵ Moffitt TE, Arseneault L, Belsky D, et al. A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences of the United States of America*. 2011; 108 (7): 2693-2698.

⁶ "Executive functions" are absolutely central to acquiring knowledge and solving problems, and are therefore critically important in school, work, and other aspects of daily life. They include the ability to consciously control behaviour; flexible thinking that forms the basis for planning and problem solving; the ability to regulate attention and process information; the self-regulation of emotional states; goal setting, planning and organisation.



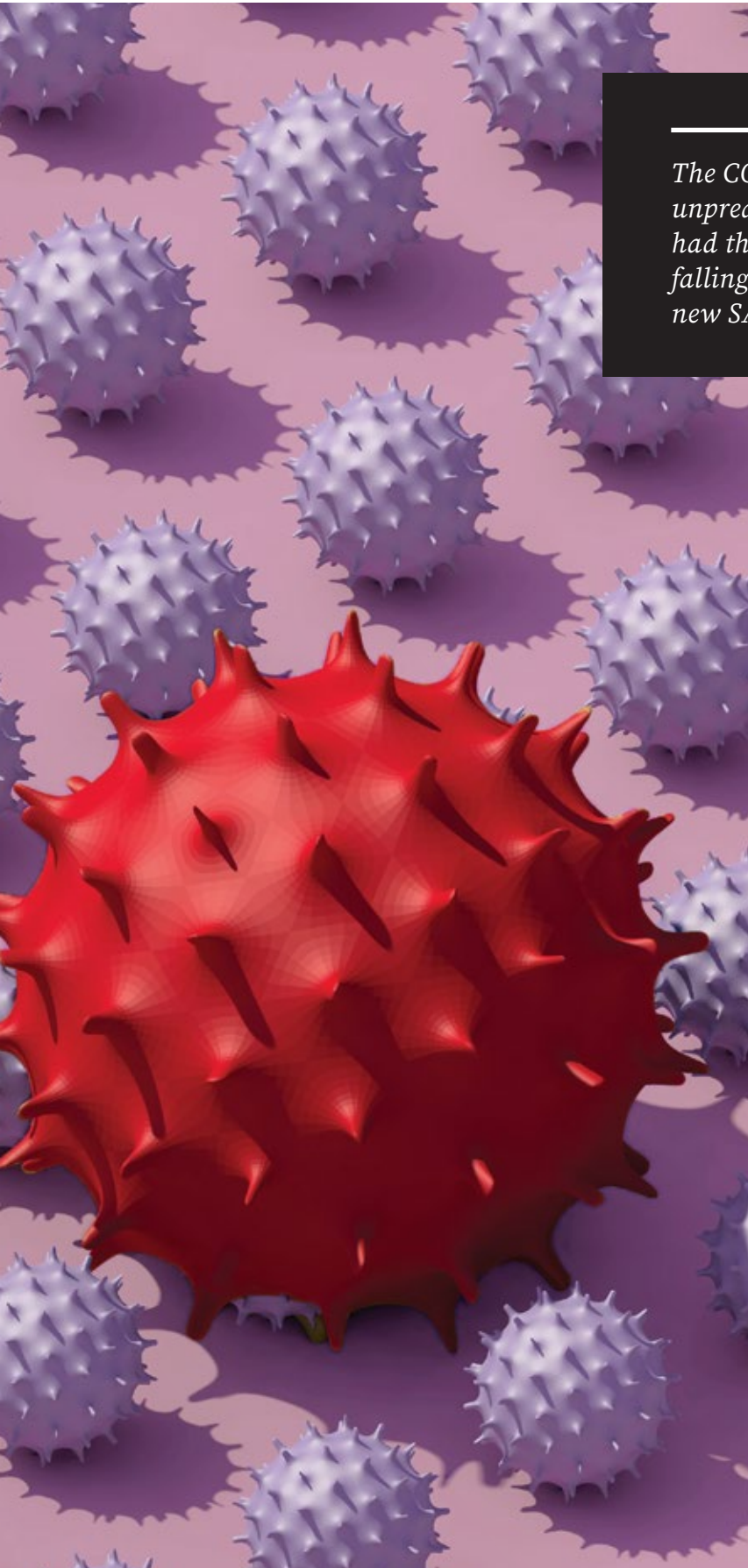
SARS-CoV-2

Variants:

A Cause for

Concern?

BY DR KHOR ING WEI, STAFF WRITER



The COVID-19 pandemic has been nothing if unpredictable. Just as it looked like Singapore had the situation under control, with cases falling and more people getting vaccinated, new SARS-CoV-2 variants started to emerge.

Some of these variants, such as the Delta, appear to be more contagious than the “original” virus. To understand the potential impact of these variants, we need to consider what a virus variant is and what their implications are for the course of the pandemic and public health.

Viruses rapidly and constantly change through mutations or changes in the virus DNA. A SARS-CoV-2 variant is a form of the virus that contains one or more mutations that differentiate it from the original SARS-CoV-2. Similar to other pandemics, several SARS-CoV-2 variants have emerged throughout the world.

Several scientific groups are tracking and reporting on the variants. These include the Global Initiative on Sharing Avian Influenza Data (GISAID) and the SARS-CoV-2 Interagency Group (SIG), which is made up of Centers for Disease Control and Prevention (CDC), National Institutes of Health (NIH), United States Food and Drug Administration (FDA) and other agencies. They classify variants into three groups:

1. Variant of interest (VOI),
2. Variant of concern (VOC), and
3. Variant of high consequence (VOHC).

Variants of interest (VOI)

A VOI has specific genetic mutations that can change how the virus binds to its receptor on human cells. This may in turn make the variant less susceptible to neutralisation by antibodies that are generated from vaccination or COVID-19 infection. A second criteria for a VOI is evidence that the variant caused an increased proportion of cases or unique outbreak clusters, but with a limited prevalence globally. Therefore, a VOI must be monitored to determine how easily the virus is transmitted from person to person, the severity of disease, the effectiveness of therapeutics and the ability of currently authorised vaccines to protect against the VOI.

The current VOIs are Eta, Iota, Kappa, Lambda and Mu. The Mu variant is the one drawing the most attention now as a VOI, but is likely to fade away soon, according to Professor Paul Tambyah, an infectious diseases specialist in the Department of Medicine, NUS Yong Loo Lin School of Medicine.

Variants of concern (VOC)

In order to be classified as a VOC, the variant has to show evidence of an increase in transmissibility and more severe disease (e.g. increased hospitalisations or deaths). The variant must also show significant reduction in neutralisation by antibodies generated during previous infection or vaccination, and/or cause reduced effectiveness of treatments or vaccines.

Presently, four SARS-CoV-2 variants are listed as VOCs: Alpha (B.1.1.7), Beta (B.1.351), Delta (B.1.617.2)



The vaccines used in Singapore are

40%
effective against
infection and
more than
80%
effective against
severe illness

In the UK study, the Pfizer-BioNTech vaccine's effectiveness fell to 90%, 85% and 78% at 30, 60 and 90 days, respectively, after vaccination with the second dose.

Although the Oxford-AstraZeneca vaccine was 69% effective at preventing a high viral load 14 days after the second dose, this protection fell to 61% by 90 days.

and Gamma (P.1). Although the Alpha variant, which was first identified in the United Kingdom, dominated the landscape between January and May 2021, the COVID-19 vaccines have been effective at generating immunity against this variant and in preventing severe disease. The GSAID website shows that, around the world, cases due to the Alpha variant have declined considerably. Infections with the Beta and Gamma variants are relatively few. Delta was far and away the cause of most of the SARS-CoV-2 infections in the four weeks preceding the writing of this article.

Among all the variants reported, Delta is the most contagious variant. First detected in India in December 2020, it became the most commonly reported variant in the country starting in mid-April 2021. By 19 May, 2021, the variant had been detected in 43 countries across six continents. Two studies, one from Canada and a second from Scotland, noted that patients infected with the Delta variant were more likely to be hospitalised than patients infected with Alpha or the original virus strains. Breakthrough infections in fully vaccinated people occur much

less often than in unvaccinated people; when they do occur however, people infected with the Delta variant can transmit the virus to others. However, vaccinated people may be infectious for a shorter period.

Variants of high consequence (VOHC)

A VOHC is defined as the mutant in which all the preventive measures or medical countermeasures are not adequate or have reduced effectiveness relative to those previously used against other circulating variants. Currently, there are no SARS-CoV-2 variants that satisfy the criteria to be VOHC.

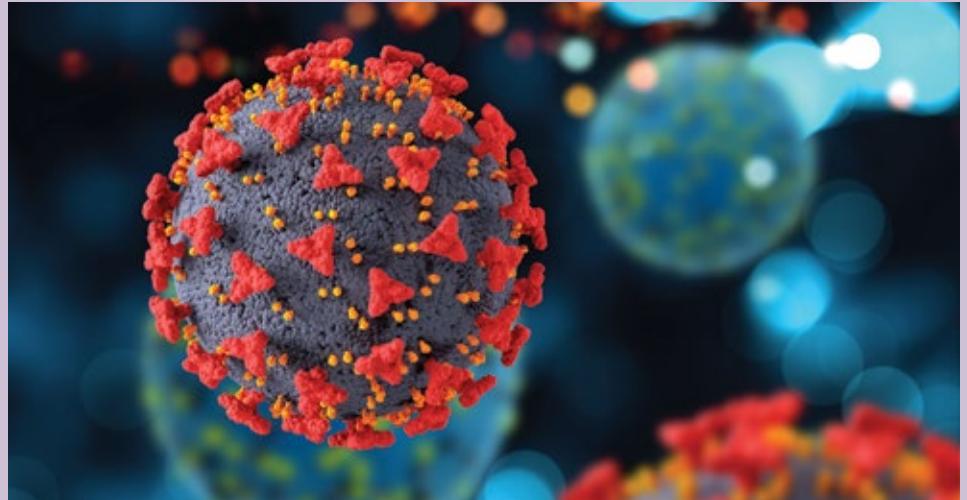
How effective are the current COVID-19 vaccines against these virus variants?

A big question on everyone's minds is whether the COVID-19 vaccines protect against infections by these new variants. In a study in the United Kingdom, the Pfizer-BioNTech vaccine was 92% effective at preventing people from becoming severely infected with the Delta variant. This was measured by the viral load in each person, which is the number of virus particles in the body. According to Singapore's Health Minister, Mr Ong Ye

Kung, the vaccines used in Singapore are 40% effective against infection (almost all infection in Singapore is caused by the Delta variant) and, strikingly, more than 80% effective against severe illness. The vaccines were associated with a seven-fold reduction in the rate of severe infections or death. These findings suggest that the Pfizer-BioNTech and Moderna vaccines used in Singapore are effective at preventing severe COVID-19 in the short term.

Does this protection last over the long term? The quick answer is, probably not (at least not with the two-dose vaccination). In the UK study, the Pfizer-BioNTech vaccine's effectiveness fell to 90%, 85% and 78% at 30, 60 and 90 days, respectively, after vaccination with the second dose. Although the Oxford-AstraZeneca vaccine was 69% effective at preventing a high viral load 14 days after the second dose, this protection fell to 61% by 90 days. This waning in protection is consistent with results seen in studies in Israel, which show higher levels of breakthrough infections in people who were vaccinated very early in the pandemic (most people in Israel received the Pfizer vaccine), compared with robust protection in those who were recently vaccinated.

Based on such reports of decreasing immunity over time in fully vaccinated people, the FDA approved a third dose for the Pfizer-BioNTech vaccine. Some experts, such as Dr Georg Behrens, an immunologist at the Hannover Medical School in Germany, have proposed that using a different type of vaccine for the booster rather than the vaccine used for the initial doses may be more effective at preventing



breakthrough infections. The rationale is that different types of vaccines, such as the RNA-based Pfizer-BioNTech vaccine and the adenovirus-based Oxford-AstraZeneca vaccine, would stimulate different aspects of the immune system and a more comprehensive immune response.

What's coming up?

As Prof Tambyah sees it, "Right now, the world is dominated by Delta but there is a chance that it might be displaced by another variant, although that is not likely in the next few months. The key would be to look out for viruses that have mutated so that they are no longer addressed by the current vaccines and which have been reported with other vaccine preventable illnesses such as hepatitis B. Those have not been

widespread but are a cause for concern in certain situations." He emphasised that "ongoing molecular surveillance of all cases is important...targeted sequencing and surveillance [of SARS-CoV-2] should help us be prepared for what is coming."

The upshot of all this? Although the data is still coming in, it appears that the currently approved vaccines are effective at preventing serious illness from virus variants such as Delta for at least several months. The greatest risk of transmission of virus variants is among unvaccinated people, who are much more likely to contract and then transmit the virus. So, getting as many people fully vaccinated as possible remains our strongest weapon against current and emerging virus variants.

- 1 The Centers for Disease Control and Prevention. <https://www.cdc.gov/coronavirus/2019-ncov/variants/variant.html>.
- 2 Bernal JL, Andrews N, Gower C, et al. Effectiveness of Covid-19 vaccines against the B.1.617.2 (Delta) variant. *N Engl J Med*. 2021 Jul 21;doi:10.1056/NEJMoa2108891external icon.
- 3 Brown CM, Vostok J, Johnson H, et al. Outbreak of SARS-CoV-2 Infections, Including COVID-19 Vaccine Breakthrough Infections, Associated with Large Public Gatherings – Barnstable County, Massachusetts, July 2021. *MMWR Morb Mortal Wkly Rep*. <https://www.cdc.gov/mmwr/volumes/70/wr/mm7031e2.htm>.
- 4 Pouwels, K. B. et al. Preprint at the University of Oxford. 2021. <https://www.ndm.ox.ac.uk/files/coronavirus/covid-19-infection-survey/finalfinalcombinedve20210816.pdf>.
- 5 Kurohi R. Covid-19 vaccines are 40% effective against infection in S'pore, 'very effective' against severe illness. September 3, 2021. <https://www.asiaone.com/singapore/covid-19-vaccines-are-40-effective-against-infection-very-effective-against-severe>.



Using AI to Find that Proverbial Needle in a Galactic Haystack:

Optimising COVID-19 Treatment with IDentif.AI

BY PROFESSOR DEAN HO, PROVOST'S CHAIR PROFESSOR AND DIRECTOR, THE INSTITUTE FOR DIGITAL MEDICINE (WISDM), NUS MEDICINE

Finding drugs to treat COVID-19

When the COVID-19 pandemic emerged, the global biomedical community moved at an unprecedented pace to search for drugs that could improve patient outcomes while vaccines were being developed in parallel. Using traditional drug development strategies, a vast array of drug combinations was developed to enhance the potency of the treatment candidates. From this pool of potential regimens, hundreds of clinical trials were initiated, with some promising findings, authorisations, as well as approvals emerging. Despite these accomplishments, however, clear challenges in optimising combination treatment has become evident.

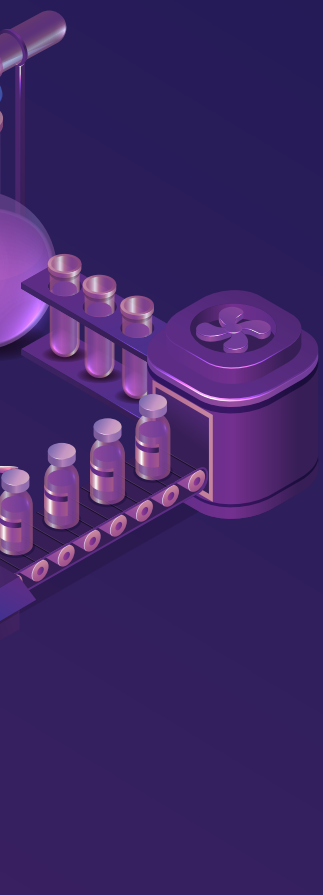
After more than a year of searching for effective therapies

to treat COVID-19, a broad spectrum of suboptimal or ineffective single drugs and combinations were still being proposed. To accelerate the process of pinpointing the best combinations against SARS-CoV-2, our team at the Institute for Digital Medicine (WisDM) at NUS Medicine along with a community of collaborators, set out to re-imagine how multi-drug treatments could be rapidly developed with the help of digital medicine and Artificial Intelligence (AI).

Hence, we developed IDentif.AI (Optimising Infectious Disease Combination Therapy with AI). IDentif.AI differs substantially from traditional AI-based approaches. For example, it is not a drug discovery platform as we do not use it to design novel drug candidates.

Rather, IDentif.AI harnesses clinician-selected drug candidates

and develops truly optimised combination regimens. Secondly, IDentif.AI does not use pre-existing datasets to train algorithms to predict drug synergy or combination designs. Instead, we use carefully acquired data from actual experiments on the live SARS-CoV-2 virus. This information is then optimised with IDentif.AI to provide a comprehensive list of data-backed combinations, ranked from most effective to least effective, to give clinicians options that account for drug availability, patient comorbidities, and other factors. Finding an optimal combination from a pool of drug candidates is akin to searching for a needle in a galaxy instead of a haystack, since both the right drugs and right corresponding doses need to be identified. In a pool of 12 candidate drugs, this could represent as many as one trillion possibilities. IDentif.AI overcame this seemingly insurmountable



barrier by showing that we have to think beyond how much data is acquired and instead think about acquiring the right data, which can then support an effective optimisation process that provides the clinical and drug development communities with dependable and actionable recommendations.

Mixing and matching: not just tech alone

Following early successes with uncovering potent drug combinations against SARS-CoV-2, our team initiated a new project with an improved platform, termed IDentif.AI-x, which expanded the range of possible combinations that could be recommended to clinicians for further consideration. In this study, we partnered with clinicians at NUS Medicine, the National University Hospital, National University Cancer

Institute, and the National Centre for Infectious Diseases to select a starting pool of locally accessible, tablet-based therapies. This strategy was selected in an effort to design regimens that could potentially be deployed in the community as Singapore moves to address COVID-19 as an endemic disease.

Our findings revealed molnupiravir to be a promising therapy as it was found to comprise many effective combinations. An example includes a combination of molnupiravir with baricitinib, a drug that has received emergency use authorisation in the United States. Importantly, IDentif.AI-x revealed the possibility of dose-dependent synergy within certain drug combinations. This may serve as important guidance for future clinical trial designs to ensure that drug combinations are administered at doses that maximise efficacy and safety.

The impact of IDentif.AI-x has shone a light on the core ethos of our team WisDM: Technology alone cannot transform healthcare.

Our ability to bridge technology ideation with actionable deployment has been driven by active engagement with a broad spectrum of disciplines. In fact, IDentif.AI-x implementation in and of itself could be a case study in optimal ecosystems for collaboration. For example, the clinician community has been an essential starting point for IDentif.AI-x implementation. Their drug recommendations have played a critical role in establishing a clinically relevant starting pool of candidate therapies.

Our team worked closely with DSO National Laboratories to

coordinate experimental design, live virus validation, and data processing, ultimately realising a workflow that could be completed within three weeks. Importantly, the outcome of this three-week process was an experimentally-driven list of combinations, ranked from best to worst in terms of efficacy, with subsequent studies demonstrating low toxicity for the resulting combinations of interest. Beyond the use of technology to optimise combination therapy, the IDentif.AI-x process has led our team to explore a host of other domains ranging from supply chain to clinical trial design, healthcare economics, global health security and more.

More to IDentif.AI-x

As the world continues the fight against COVID-19, we have been fortunate to be part of a united community where safe and effective vaccines have been successfully deployed. Our hope is that the IDentif.AI-x workflow plays a supporting role in the primary strategy of vaccination, detection, and tracing. In the meantime, our team is preparing to harness IDentif.AI-x to develop even newer drug combinations against SARS-CoV-2 while also exploring other areas requiring attention, such as addressing antimicrobial resistance, dengue, and a range of other pathogens.



Finding an optimal combination of drugs and doses from a pool of drug candidates is akin to searching for a needle in a galaxy, not a haystack. 12 drug candidates, for example, could represent as many as one trillion possibilities.”

Body Mass Index May Be a Poor Indicator of Health in Older Adults

Waist circumference is a better indicator of obesity and poor health.

The prevalence of obese and overweight adults continues to increase, affecting at least one in three men and women in the world. Both obesity and excess weight are known to be independently associated with adverse outcomes such as reduced life expectancy, mortality, disability, poor quality of life, increased healthcare utilisation and cardio-metabolic diseases such as diabetes and ischaemic heart disease.



At least
1 IN 3
men and women in
the world are obese
and overweight

Watch that waistline

The measure of obesity often used in daily practice is Body Mass Index (BMI), but a study led by Associate Professor Reshma Merchant from the Department of Medicine, NUS Medicine, who is also the Head and Senior Consultant of the Division of Geriatric Medicine, National University Hospital, has found that BMI should be interpreted with caution as it may be a poor indicator of

fat distribution, especially in older adults. Instead, waist circumference may be a better indicator of obesity and predictor of adverse outcomes, such as cognitive and functional impairment and cardiometabolic diseases, in this group of people. Abnormal fat distribution is thought to signal the release of inflammatory chemicals which can contribute to insulin resistance and poor outcomes. In fact, high BMI, which is an indicator of obesity, does not necessarily lead to poorer outcomes if one has a low waist circumference.

Waist circumference instead of BMI may be a better indicator of obesity, cognitive and functional impairment, and cardiometabolic diseases in older adults.



Waist circumference is a measure of central obesity, which is reflective of visceral fat and associated with disability and mortality, and more recently, increased respiratory deterioration in COVID-19 patients. Defining central obesity as a waist circumference of 90cm for men and 80cm for women, and high BMI as any value above 23.0kg/m², the study collected BMI profiles, waist circumference measurements as well as cognition and physical assessments, from a total of 754 participants aged 65 years old and above. The assessments included minimal state examination (MMSE) which is a marker of cognition and memory; handgrip strength (HGS) which measures muscle strength that is associated with conditions such as sarcopenia, frailty and diabetes; and Timed-Up-and-Go (TUG) time which is a marker of walking speed and falls.

Results from the study showed that participants who had high BMI but were not centrally obese had the best scores for the assessments, reflecting better functional and cognitive outcomes, especially in males. Central obesity, in isolation or in combination with high BMI, was associated with worse scores for the assessments. There was also significantly higher prevalence of hypertension, diabetes and multimorbidity in participants who had high BMI and were centrally obese, compared to those with normal BMI and who were not centrally obese.

Losing weight may trim muscle as well as fat

With high BMI as a marker of obesity, prevention efforts are often centred on losing weight. However, a focus on weight loss presents another problem, as weight does not differentiate between muscle and fats. BMI cannot distinguish between fat mass, muscle mass and distribution of adipose tissue. Emphasis on weight reduction, without a balanced diet which includes protein and resistance exercise, could result in greater loss of muscle, along with fats. This could compromise ability to maintain muscle mass and function, leading to other detrimental outcomes such as frailty, sarcopenia, increased mortality, and even impaired glucose tolerance. While frailty refers to a state of decreased physiological reserve that makes individuals vulnerable to stress, potentially resulting in falls, disability and increased mortality, sarcopenia is defined as a progressive age-related loss in muscle mass, strength and quality affecting physical performance.

Resistance training burns fat, builds muscle mass

The right types and 'doses' of exercise that would achieve the sweet spot of losing fats while maintaining muscle mass are therefore critical in leading to healthy outcomes in older adults. In a set of international exercise recommendations in older adults published by a team led by Assoc Prof Merchant, these highlighted resistance training as most important in maintaining high muscle mass. Programmes or exercise interventions that include



A focus on reducing BMI and losing weight alone may not necessarily lead to healthy outcomes. Instead, it is critical to consider central obesity in the equation, and do the right kinds of exercise that can reduce waist circumference, while maintaining and building muscle strength.”

Assoc Prof Reshma Merchant, Department of Medicine, NUS Medicine, Head and Senior Consultant, Division of Geriatric Medicine, National University Hospital

robust resistance training have been shown to improve muscle strength in older adults with frailty and sarcopenia. Examples of resistance training include the bench press and squat, exercises with free weights and machines with slow to moderate lifting capacity, carried out in repetition at varying levels of intensity.

Public education on preventing obesity should also consider waist circumference and central obesity, rather than BMI alone in the older adults, with increased emphasis on frailty and sarcopenia prevention, said Assoc Prof Merchant. “With a globally ageing population, the prevalence of older adults with obesity will increase. But a focus on reducing BMI and losing weight alone may not necessarily lead to healthy outcomes. Instead, it is critical to consider central obesity in the equation, and do the right kinds of exercise that can reduce waist circumference, while maintaining and building muscle strength.”

How Do You Care?

Sympathy and Empathy in Healthcare



BY PAULA SAY, YEAR 4 STUDENT,
NUS ALICE LEE CENTRE FOR NURSING STUDIES

“I have no time to talk to you.” That was what I heard a healthcare provider tell a patient’s relative, as they hurriedly moved on to the next patient during rounds.

As a Nursing student, that was not new to me; I have had enough hospital postings to write a novel on that kind of behaviour. I learnt to quickly “accept” and adapt to each colleague’s working style—especially that of senior doctors (mild hasty generalisation noted).

They could just be having a bad day, I thought, attributing their seemingly rude demeanour to stress, fatigue, or simply the sheer number of patients to see. But one would expect a little more sympathy (I will not even ask for empathy at this point) towards Mrs Tan¹, a patient who came in for migraines, only to discover that she had metastatic liver cancer.

Sympathy and empathy are qualities often misunderstood, be it in the medical field or beyond. When we were gunning for Medicine in junior college, “empathy” was a buzzword everyone tried to decode. Perhaps rightfully so, as it is considered one of the top traits a doctor-wannabe *must* have, along with excellent communication, teamwork, and leadership skills. Sympathy? Not so much. At 17, we relied on Google’s definition of sympathy and empathy, which I am sure many also did for their medical school interviews two years later.

Sympathy, empathy, and apathy are derived from the same Greek word “pathos”, which means “feeling” or “suffering”. While sympathy and empathy are often confused, their defining characteristic comes from the different prefixes: “sym” means “with” or “together”; “em” (derived from “en”) means “in” or “to go into”; while “a” means “without”.

Let’s dive deeper.

The emotional gap in expressing sympathy

With my dad’s death last year, I had and have been on the receiving end of sympathy for a while. “This must be a difficult time”, “hope you’re doing well”, or my (least) favourite: “I’m sorry for your loss”.

Sympathy, in its simplest form, is feeling “bad” when someone is going through a difficult time. While *having* sympathy is recognising another’s adversity or misfortune, *embodying* it generally amounts to the various acts of expressing the idea; get-well-soon texts, sympathy cards, or, in my case: condolence messages and unlimited hugs.

As the Greek prefix suggests, sympathy encompasses being “with” or “together” with someone as they go through adversities. It’s feeling bad for someone’s *situation*, without necessarily understanding the suffering that they are going through. A Forbes article describes it as “compassion (that) allows you to.. remain at a safe distance,” and in doing so, one’s “emotional state of mind probably isn’t profoundly compromised”. It’s true—friends who attended my dad’s wake expressed tremendous love and concern, and I could not be more grateful; but none of them were the hot, vulnerable mess that my family and I were.

In other words, sympathy maintains or enables an emotional distance between, for example, you and a friend: instead of understanding and experiencing the pain, you merely acknowledge its presence and impact—and more often than not, it is more than enough.



Sympathy and empathy are qualities often misunderstood. Sympathy is feeling ‘bad’ when someone is going through a difficult time. Empathy is a much deeper, more emotional response to another’s suffering. You are feeling what they are feeling, seeing things from their vantage point.”

Sympathy in healthcare

The emotional gap that sympathy creates is often undervalued in healthcare. Yes, sympathy enables a healthcare provider to recognise and acknowledge suffering. But more importantly, it is a separation that allows healthcare professionals to express humanity towards patients’ experiences—without the added complexity of compromising our own mental health.

It is what enables us healthcare providers to function effectively at work. It allows oncologists to issue grave prognoses every day; palliative nurses to do the last rites efficiently; labour ward staff to deliver stillborn babies—all without breaking down and crumbling at each instance.

The emotional distance enables us to treat and care without absorbing all the pain that comes with it.

Is sympathy seen as somehow inferior to empathy? Sympathy is not one of the top 10 traits of a doctor, nor was it present in my *Communication for Healthcare Professionals* module in nursing school. Why is sympathy not as valued as empathy in medicine?

The Hippocratic Oath's cry for empathy

"If you can do no good, first, do no harm."

While historians debate on the "poor translation" of the Hippocratic Oath that supposedly gave rise to the famous phrase above, it's a life mantra that I hold dear today (so much so that I had it engraved on my nursing pouch).

Humans are, most times, inherently compassionate. And yes, sympathy is a great way to quench our innate inclination to express compassion. However, it is only through *empathy* that we will be able to fully live up to the essence of the Hippocratic Oath—to act, and treat, in the best interests of the patient

How could we possibly know what is best for them, and would the patients agree with us about what is "best" for them? Cue: empathy.

Defining empathy

When I first started learning some *high-level* English here in Singapore, there was a phrase that sounded funny to me: "walk a mile in someone's shoes". With limited conversational English abilities as an immigrant, nine-year-old me was of course left to wonder why I would walk 1.6km using another person's footwear. Turns out, that idiom is the perfect definition of empathy.

Empathy, as the original Greek suffix "en" suggests, is about going "in" or "into" the feeling of others. It is a much deeper, more emotional response to another's suffering; the gap of distance mentioned earlier is virtually non-existent. You are feeling what they are feeling, seeing things from their vantage point.

That is the critical difference between sympathy and empathy. While sympathy elicits an "I feel bad" response towards someone running in the rain without an umbrella, empathy heightens the response by evoking the feeling of walking drenched in the rain for 1.6km.

Is feeling what a patient is feeling enough to know what is best for them? Perhaps occasionally. Shall we stop there? Of course not. Beyond *being* empathetic, it is more important to *demonstrate* that empathy in our day-to-day patient interactions.

Expressing empathy in healthcare

Ask any healthcare student in Singapore about empathy and they would recite *N.U.R.S.E.* by heart (unless, of course, they were not listening during their Communications module in Year 1). The acronym is a handy tool to demonstrate empathy, especially in the healthcare setting.

Practise it (in school) plenty of times and it will come naturally after a while. In my hospital postings as a student nurse, I've used *N.U.R.S.E.* numerous times, often unknowingly, only to realise it after the fact.

I have helped a GCS 8* (and dropping) patient's adult children accept the fact that their father may not recover from his severe brain haemorrhage and to instead focus their strength on being the pillar of support for their mother.

Remember Mrs Tan, the patient in my introduction? Upon discharge, they left the ward in a huff. I ran after them, apologised for the provider's

- N** Name the emotion - "I can see that you're scared"
- U** Understand the emotion - "As someone who's gone through this, I know that you're worried"
- R** Respect the emotion - "The way you're handling this difficult situation has been great so far"
- S** Support the patient - "Know that we are here to help; I will direct you to others who can"
- E** Explore the emotion - "Is there anything else that is scary to you or you're worried about?"

demeanour, and reassured them that things may be confusing and rocky now but it will eventually settle down. "I hope you find strength and peace through this journey," I said. "Just like my family and I did".

In all humility, I'm thankful for my ability to exhibit empathetic behaviour in those instances. Why is that so? How does empathy come so organically and instinctively to some of us?

Experience is key in empathy

I believe that empathy can only be truly, completely felt if and when you have gone through what the other person is going through, or at least something similar. "It's okay, I understand," or "I know what you're feeling" should NOT be uttered by healthcare providers if they have not experienced what a patient is going through. We do not actually understand. We do not actually know what they are feeling. Not until and unless we have been there before, or walked a mile in their shoes.

As for me, I understood. Having journeyed through cancer with my dad for the final 2.5 years of his life I knew what Mrs Tan's family was feeling, and I knew what my GCS 8 patient's family needed. All I needed was a dash of empathy-driven confidence to approach them and share my experiences.

The unfairness of demanding empathy too early

Why is empathy a "must have" trait for aspiring medical and nursing students? Though I did not manage to apply for entry to a medical school in the end, I wonder how many applicants raise the textbook definition of empathy every single year during the interviews. At such a tender age, medical school hopefuls are pressurised to know what it means to be empathetic, and share accounts of them demonstrating empathy. But is this truly fair?

How many fresh junior college or polytechnic graduates have had life-changing experiences at 18 years of age to develop the level of maturity that is expected? How can we demand the sophisticated level of empathy from them during interviews, when we took years to grasp its concept?

I talked to my close friends in different undergraduate healthcare courses (mostly medicine), and the response was unanimous: it was, indeed, an unfair ask. But one friend said something that stuck with me: instead of expecting a full, working mechanism of empathy in healthcare students who lack experience, we should instead pay attention to the person's *willingness* to practise it. This encompasses genuinely *conceptualising* and *imagining*



how it is like to walk a mile in another's shoes, when the shoes themselves are not available.

Empathy can be derived from experience, or envisioning. Regardless, at its essence, it is about putting the best interests of the patient first, and acting accordingly.

Sympathy vs empathy

Sympathy and empathy should intertwine in practice.

Working in healthcare, it is only responsible to be sufficiently *compos mentis*, even if it means "prioritising" feelings of sympathy more than empathy on hard days. Constantly feeling the pain empathetically, all the time, can be unhealthy and draining.

Additionally, sympathy is a "stepping stone" for the younger ones before experience, and subsequently empathy, kicks in. It allows healthcare workers to express their compassion and care for patients, even those with limited life experiences. "I'm sorry you're going through this" is good, but can also transform to "I completely understand, this is how we should proceed".

The danger of apathy

There is one thing in this field that *cannot and must not* ever take root: apathy. This refers to the lack of interest, concern, or just sheer indifference towards our patients and work environment.

From my observations, the danger stems from fatigue and burnout; an impassive healthcare provider may not act in the patient's best interests, give the wrong dose of medication, or even dismiss confused patients with a harsh "I have no time to talk to you".

Some days, even the best ones are not immune. Nonetheless, we have no choice but to fight it. No matter how we ended up in this profession, we are in a field where we move not for ourselves; where every action puts someone's life on the line. Hence, it is up to us to care; to sympathise, to empathise. It is up to us to consciously choose to do better, be better, *to make time*. And, ultimately, do no harm.

¹ Name has been changed.

^{*} The Glasgow Coma Scale (GCS) is used to objectively describe the extent of impaired consciousness in all types of acute medical and trauma patients. The scale assesses patients according to three aspects of responsiveness: eye-opening, motor and verbal responses.

A Vaxxing Situation

KELLY LIEW, CLASS OF 2009, ALICE LEE CENTRE FOR NURSING STUDIES, NURSE MANAGER, NATIONAL UNIVERSITY POLYCLINICS

NUS Nursing alumna Kelly Liew shares her experience as a member of a vaccination operations team at the National University Polyclinics (NUP).



Early this year, the NUP was asked by the Ministry of Health (MOH) to set up a COVID-19 vaccination service. It came as a surprise as we already had a lot on our plate with dormitory support, manning Swab and Isolation facilities (SIF) as well as conducting COVID-19 swab tests for the public. These were responsibilities that came in addition to our usual work. Our initial reservations were assuaged when our NUP leadership reminded us that the Polyclinics were the best place to get the vaccination exercise going. The elderly tend to be our patients, relying on us for their chronic care needs, and there is a greater likelihood that they will choose to be vaccinated, if the shots are delivered by the team and in an environment they are familiar with.

Looking back, it amazes me how quickly eight months have passed since NUP joined the effort to help vaccinate the nation. When the news came at the National Day Rally that we

had reached the '80%-vaccinated' milestone, I was not only elated, but also very proud that we have come so far. A new agency nurse told me not too long ago that things would definitely go awry when the MOH announced that patients could walk into polyclinics without appointments. She was certain that this "major change" was going to affect staff morale and the management of vials. I reminded her that change is constant and we should be ever ready for anything that comes our way.

When we first started, we did not really know what we were dealing with. Everything came in a flash and information about the vaccines arrived fresh from the Health Sciences Authority. It was a constant struggle to deal with the short expiry date of the Pfizer-BioNtech vaccine. Every vial we received had to be used within the next three to four days! Often we feared wastage and had to rush the unused vials to another polyclinic to be used before expiry. The lead nurses,

who were in charge of managing vial-ordering based on projected appointments, were often under a lot of stress as they had to bear the consequences of under or over-ordering for the week. We also had to be accustomed to a new IT system that was foreign to us, and provide support to the many agency staff employed solely for "VaccOps", as we called it. I could even remember us doing trial runs on "pretend patients" to make sure everything was smooth for our first vaccine roll-out date at NUP.



Kelly supervises her nurse as she dilutes the COVID-19 vaccine.



As healthcare providers, staff knew the importance of not wasting the vaccines. They would be on the standby list as the last patients to 'soak up' the remaining doses for the day."

Another challenge was the number of doses we could get from each vial. The first batch of syringes and needles only yielded five doses per vial and we were almost always competing with one another to see who could get the sixth dose. As much as we wanted to get that extra dose, we were also afraid that if we reported a sixth dose, we would be asked to do it again: it was something that we definitely did not have confidence to do then. Some of us Googled for solutions and I even suggested to friends in MOH to bring in Low Dead Volume (LDV) syringes and needles to help us squeeze more out of each vial. LDV syringes are designed to reduce the amount of vaccine remaining within the syringe and needle after an injection is completed. So when the first batch of LDV syringes arrived, we were extremely grateful as it almost always produced the desired dose number six. Shortly after, the second batch of consumables arrived and they were even better, making a seventh dose possible from each vial.

Doses aside, there was also the uncertainty of the side effects of the vaccine. Initially, even the vaccinators were not convinced it would be safe for us as the reported side effects were just too scary. People who volunteered to go first were seen as putting themselves at risk, myself included. I believe in the importance of good leadership in this pandemic. Prime Minister Lee Hsien Loong himself took his first dose on 8 January 2021 and so did many members of our NUP senior leadership, and I felt that I needed to follow their example and take that leap of faith.

As more people got vaccinated, our staff gained more confidence and joined in too. We vaccinated healthcare staff first, followed

by people who were working on the front lines, such as national servicemen. It was quite a sight to see the team from the Police K-9 unit in our polyclinic, all in their smart uniforms, though without their canine friends. Our staff also took it upon themselves to standby as “soakers” at the end of the day. As healthcare providers, staff knew the importance of not wasting the vaccines. They would be on the standby list as the last patients to “soak up” the remaining doses for the day. On days where no extra doses were available, staff were understanding and would continue to standby the next day. This display of understanding and team spirit by the entire clinic team was the key to success in ensuring zero wastage of vaccines in our clinics.

I must also applaud the nurses for never saying anything negative about the vaccine despite their reservations. They soldiered on and gave their best, with the knowledge available then. As more information about the vaccine became available, we opened up to more people, such as people with a history of allergies, pregnant women and even teenagers. So many things have changed since we first started and I cannot imagine what goes through the vaccinators’ minds

as they deal with these changes every day. I often wondered why they did not complain.

Being on the ground and pulling through with gritted teeth, I wonder, how do our senior leaders deal with this? As they continue to receive first-hand information on the vaccine, they have to work together with the ground leads to come up with a proper workflow in a short period of time. It does not sound easy but it definitely makes me feel at ease knowing that we have their full support in what we do. This inspires me to not only go further but to also continue to encourage the nurses on the ground to fight on.

COVID-19 has changed us and will continue to do so. But being part of this national vaccination drive is such a surreal experience. As we embark on the next leg of our journey to provide booster doses to our seniors and immunocompromised patients, I am grateful that we are embracing these changes so well as they come. Most of all, I am grateful for all the doctors, nurses and screeners who stood by us through this tough journey. Who can say they were part of the team that helped vaccinate the nation? We can, because that’s exactly what we did!

Kelly briefs the nurses before the start of their duties.



Trustworthy Governance for Sharing Health Related Data



BY ASSISTANT PROFESSOR TAMRA LYSAGHT, DIRECTOR, PHASE III HEALTH ETHICS, LAW AND PROFESSIONALISM PROGRAMME, AND RESEARCH DIRECTOR, CENTRE FOR BIOMEDICAL ETHICS, NUS MEDICINE,

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Like many major health economies, Singapore is investing in precision medicine and health research.¹ Precision medicine is an emerging approach aimed at optimising health outcomes with information from various sources to better tailor medicine and healthcare.² Those sources include genome sequencing data that is linked with electronic health records and other lifestyle and environmental information.

Many large health datasets, including those used for precision medicine, use an opt-in model of broad consent for de-identified data to be shared with researchers and third parties. With broad consent, the research goals and future potential research uses are described to participants in broad strokes rather than in specific details. Programmes use broad rather than specific consent due to the impossibility of predicting, in advance, all the specific research projects the data might

be accessed for in future. Data is typically de-identified and data security processes are used to protect the data during storage and when shared.

Health data research sharing raises several ethical issues, partly because of inherent trade-offs between competing ethical values. For example, while autonomy and privacy are important, these may sometimes be overridden. In the absence of specific consent, people responsible for governing health data must make decisions about how and when to share data in a way that respects public expectations in balancing the ethical trade-offs. The concept of a social licence refers to a privilege that is implicitly granted by society to an organisation or profession to operate, often in the absence of specific consent. Where there is social licence for an activity, people are willing to accept the activity as morally and

socially permissible. However, public trust is eroded whenever the licence is breached, which negatively impacts future health data sharing initiatives.

Thus, it is important to understand what activities and data sharing arrangements are socially and morally acceptable for trustworthy data governance.

A mixed methods study

To address these issues, we conducted mixed methods research to examine the ethical trade-offs and make recommendations for designers of health data governance systems in Singapore. Our research provides important insights on the ethical views Singaporeans have about sharing health-related data for large-scale initiatives like precision medicine, and what trustworthy data governance might look like in this context. As summarised in Figure 1, the research was conducted over three phases:

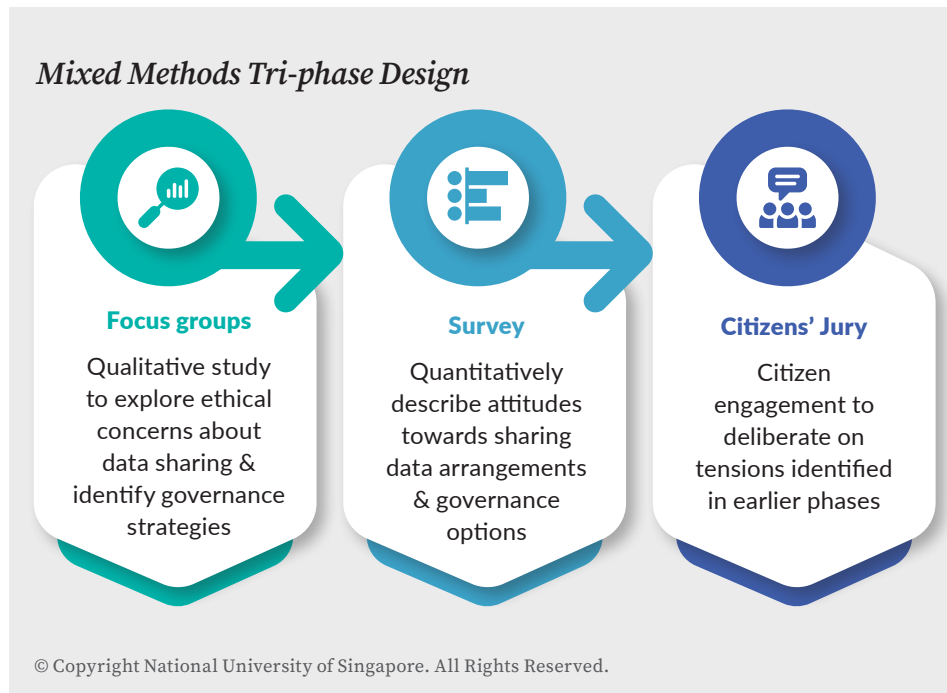


Figure 1. Mixed methods tri-phase design

Phase 1. Focus groups

In 2019, we conducted seven focus groups with 62 participants in Singapore in three languages (English, Mandarin and Malay). The focus groups aimed to find out the ethical concerns Singaporeans have about data for precision medicine research and identify suggestions for governance strategies.

Phase 2. Survey

In 2020, we conducted a national survey of 1,000 Singapore residents in three languages (English, Mandarin and Malay). The survey measured public priorities and preferences for sharing health-related data. The survey was an adaptive choice-based conjoint analysis (ACBC)³⁻⁴ with four key values identified in the focus groups: uses, users, data sensitivity and consent.

Phase 3. Citizens' Jury

In 2020 and 2021, we convened a four-day Citizens' Jury with 19 Singaporeans. The Citizens' Jury is a deliberative method for

engaging the public in complex policymaking processes.⁵⁻⁷ This group of people should be diverse and inclusive of the community, although they do not aim to be 'representative' of the population. As jurors spend several days talking to experts and relevant stakeholders, and deliberating on the issues with one another, they can generate more informed recommendations than survey respondents or even focus group participants. A Citizens' Jury is therefore useful because it allows non-experts to become familiar with a complex topic and offer informed policy advice. The aim of our Citizens' Jury was to ask an informed group of Singaporeans to deliberate on the question:

Under what circumstances, if any, is it permissible for a national precision medicine programme to share data with private industry for research and development?

We developed this question for the Jury to consider with guidance from an advisory panel

representing key stakeholders in the implementation of precision medicine in Singapore.

Key findings

The key findings from our qualitative focus groups suggest there would be conditional support for precision medicine research that shared genomic sequence data and information contained within electronic medical records, with university researchers and healthcare institutions. Support was conditional on the perceived social value of the research and appropriate de-identification and data security processes.

The discussions demonstrated relatively sophisticated understanding of the inherent risks of storing and sharing large linked datasets, and analysis of the trade-offs between possible harm and potential benefits of a hypothetical precision medicine programme. Compared to prior research reported overseas, our focus group participants projected an international outlook and similar attitudes towards the potential benefits of precision medicine. Although it was also suggested that an independent oversight body may help to strengthen public trust of data sharing arrangements for precision medicine research, that is governed under broad consent regimes.

Participants in the focus groups all expressed high levels of trust in government to ensure data security and privacy protections, despite several large-scale breaches having occurred in recent years, as in the cases involving SingHealth and the HIV Registry. This finding was consistent with outcomes of our national survey where government agencies and public institutions were the most trusted users of health-related data for research (Figure 2).

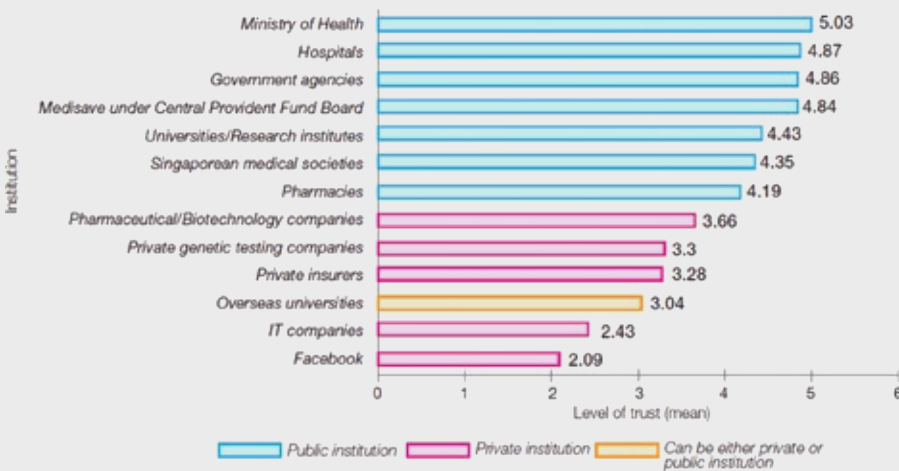
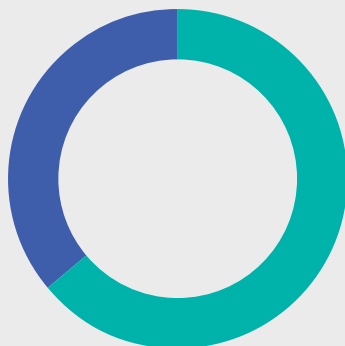


Figure 2. Mean trust score for institutions using de-identified health data for IRB-approved research. A score of 6 represents “trust totally” and 1 represents “distrust totally”. The whiskers indicate 95% confidence intervals.

Most, but not all, of the survey respondents (64%) indicated that they would be willing to share de-identified health data for research that has approval from an Institutional Review Board (IRB) without needing to re-consent for each study (Figure 3). For the ACBC analysis, the most important values in respondents’ decision-making were the user of the data (39.5%) and the reasons why they were using it (28.5%). The least important values were the sensitivity of the data (19.5%), and what type of consent was obtained (12.6%). Most respondents indicated that it would be acceptable for government agencies and hospitals to use de-identified data for health research with broad consent; more so than sharing with universities and pharmaceutical companies. Sharing health data with private insurance companies for any purpose, was unacceptable, even with specific consent.

Finally, in response to the question we asked the Citizens’ Jury, they concluded that sharing data with private industry would be permissible under some circumstances. Those circumstances were set out in recommendations that were made with three prevailing assumptions:

1. Data shared with private companies should be de-identified.
2. Users to be required to opt in to precision medicine and have the right to withdraw at any point.
3. When people consent to the precision medicine programme, information should be comprehensible.



Reasons for unwillingness to share de-identified data include:

- 215 (60%) reported that they want to have control at all times even if this means being asked for consent many times.
- 125 (35%) reported that they don’t trust the research processes and protections.
- 86 (24%) reported that there are potentially more risks than benefits.
- 12 (3%) reported other reasons.

Reasons for willingness to share de-identified data include:

- 430 (67%) reported that the potential benefits of health research are greater than the potential risks.
- 348 (55%) reported that they trust the research processes and protections.
- 123 (19%) reported that it would be too troublesome to consent to every single research project.
- 10 (2%) reported other reasons.

Figure 3. Willingness to share de-identified data for Institutional Review Board approved health research without needing consent for each study.

While the Jury was generally open to sharing precision medicine data with pharmaceutical and biotechnology companies, and technology companies, there was much resistance towards sharing with private insurance companies in the current regulatory environment.

Implications for trusted health data governance in Singapore

Across the three studies, four values emerged as key considerations for ethical and trusted health data governance in Singapore: public interest, fairness, accountability and transparency.

The core justification for data sharing was public interest. Participants in both our focus groups and Citizens' Jury offered examples of public benefits: more accurate and beneficial medical care, fewer adverse events, cheaper medicines, extended longevity and better quality of life, improved understanding of the health of Asian populations, treatments for rare diseases, strengthening of Singapore's research and development sector and job creation. Some suggested

health and genomic data were "public resources" and should only be shared for the public good. Sharing data from a public resource with private companies solely for their commercial benefit would not be acceptable. Profiteering may be acceptable when there is corresponding public benefit for Singapore.

Focus groups and Citizens' Jury participants expressed persistent concerns about social justice, particularly on perceived rising health and financial inequality in Singapore, the cost of healthcare, and potential genetic discrimination and/or stigmatisation. The benefits of precision medicine should be fairly accessible to those in need.

While study participants recognised the potential benefits of sharing data for precision medicine outweighed the potential harm; they were cognisant of various risks including data breaches, misdiagnosis, and group harm such as stigmatisation, discrimination, and loss of access to medical care. Accountability for data breaches and misuse are essential to mitigate these risks.

Punishment should include criminal charges proportional to the offence, be punitive, and apply to individuals, teams and organisations, both local and overseas. Transparency would be crucial for demonstrating trustworthiness in data governance, to allow the various members of the public with stakes in precision medicine to assess the benefits and risks of data sharing for themselves, and decide whether the trade-offs are worth it.

Finally, an interesting finding was the de-emphasis of consent. Existing literature on public attitudes to health data sharing assumes consent is the decisive and over-riding ethical issue,⁸ and prior research suggests that individuals often prefer specific consent.⁹ However, consent was the least important concern in our survey and none of the Citizens' Jury's recommendations focused on consent. This finding suggests that resource intensive consent options (such as specific and dynamic consent) may not influence Singaporeans' decisions to support data sharing or participate in precision medicine.

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Becoming and Being: Learning to Come Alongside Communities in Need

BY DR ANN TOH, ADJUNCT CLINICIAN EDUCATOR, DIVISION OF FAMILY MEDICINE, NUS MEDICINE,
DR VICTOR LOH, EDUCATION DIRECTOR, DIVISION OF FAMILY MEDICINE, NUS MEDICINE

The Health and Humanity Pathway summer school was conducted over a period of three weeks from May to June 2021. The aims of the summer school were to inspire students to come alongside vulnerable communities to serve them from a place of compassion.

To meet the aim of the summer school programme, teaching and learning activities were delivered with two broad overarching learning objectives: to learn more about the needs and challenges faced by individuals in need from a ground-up, real-world perspective, as well as to nurture an attitude of service within the participants. A total of 44 students participated including a mixture of students from NUS Medicine Phase I to Phase III, and

the Yale-NUS and University Scholars Programme.

The summer school adopted a novel conceptual framework for curriculum design of 'A Camino to Serve'. This framework used the concept of 'Camino' (journey) in a dual process of the external journey and the internal journey of service. In the external journey, students are guided to see the world from the lens of persons in need and are equipped with knowledge to serve. In the internal journey, students are guided through reflective processes to deepen self-awareness and

compassion as an attitude of service.

Learning with guidance

The learning within the Camino is facilitated through 'guides' who come alongside students to act as mentors, companions and role models, sharing their lives with students through mentoring interactions. 'Camino guides' included faculty from both the medical sciences, clinical departments, social service organisations and student advisors from student affairs. During each teaching and learning



Reflecting as a community in the 'Arrival' space with Dr Victor Loh.



activity, a team of faculty staff members was present to inspire lively dialogue and discussion, thus socialising students into the values of serving leadership.

The external journey to develop knowledge and skills to serve those in need addressed topics of disability, physical poverty, inequality, women-at-risk, vulnerable elderly and youth facing adversity. These topics were taught daily—learning began with ‘Living Conversations’ session, where a teaching and learning activity highlights the patient’s voice expressed through dialogue

sessions with an emphasis on the patient’s narrative. This was followed by ‘Getting Real’ case-based discussions where students worked hand-in-hand with faculty staff to discuss real-life case scenarios and were challenged to demonstrate perspective-taking and practical problem-solving skills in a community-centric, multidisciplinary manner. Through the case-based discussion, students had the opportunity to learn from other members of the multidisciplinary team including social workers, counsellors, key leaders of the social service sector.

Joining the dots: medicine, the humanities and self-reflection

Last, but not least, the learning for each day’s topic was developed further by broadening the students’ mindsets and paradigms through an interdisciplinary symposium, including keynote speakers from diverse backgrounds spanning anthropology, medical ethics, psychology, family medicine, and public health. The panel discussions allowed students to appreciate how problems faced by patients are addressed at multiple levels, within the healthcare system’s context of society with its rules and norms, as well as from the global health perspective.



The internal journey placed an emphasis on becoming serving leaders not through merely ‘doing’ but also through one’s way of ‘being’. To facilitate this goal, the three-week summer school started and ended with sessions which focused on self-awareness and self-discovery using reflective spaces and the medical humanities. Some of these sessions included ‘The Power of Story’, a workshop led by Dr Anita Lim which impressed on students the need to honour the narratives of those they serve, as well as their own journeys and narratives even as they serve others. Another keynote event was two pairs of full day workshops held in the middle of the summer school, titled ‘To See the Suffering’ and ‘To Be with Suffering’, where Dr Maleena Suppiah used various creative art forms to facilitate compassion training in students anchored on serving the communities in need. To nurture a sense of community

and weave a sense of belonging anchored on meaning and purpose, each day of summer school learning started with ‘Arrival’ and ended with ‘Safe Spaces’ sessions facilitated by Dr Victor Loh and Dr Ann Toh, which acted as reflective spaces for students to process their learning as a community.

In the last three days of the summer school, students were given a choice of four workshops to attend to deepen their knowledge in areas they were drawn towards—‘Medicine for Marginalised’ Experiential

Journey facilitated by Associate Professor Tan Lai Yong, ‘Serving Globally’ by Dr Pang Ning Yi and Dr Lois Hong, ‘Humanising Healthcare’ by Dr Maleena Suppiah and ‘Eudaimonia’ by Dr Ann Toh.

Students were invited to capture and crystallise the lessons learnt, through the creation of reflective pieces where they were given the option of choosing the form of expression that they were most comfortable with. These included reflective writing, photo-journaling, poetry, drawings, and paintings



A word cloud of students’ favourite segments of the programme.



The internal journey placed an emphasis on becoming serving leaders not through merely ‘doing’ but also through one’s way of ‘being’. To facilitate this goal, the three-week summer school started and ended with sessions which focused on self-awareness and self-discovery using reflective spaces and the medical humanities.”

Creative responses by students



“Common Humanity” by Teo Yao Neng, Phase II NUS Medicine student

“One thing I discovered over the course of the Health and Humanity summer school was to see people in different underprivileged communities as they are, without judgement but with love, acceptance and honesty. That inspired the theme for this drawing, “Common Humanity”, which refers to the commonality that we all share as human beings. We all desire similar things—from food and shelter, to love, acceptance and belonging. And so my vision for serving vulnerable communities is to always look for the common humanity in people, to remind myself constantly that I am serving people who are human, as I am, and to always try my best to see them as they are, instead of seeing only the needs that are portrayed of their community. Recognising this commonality in any person unites all of us in this world, regardless of nationality, race, gender, socioeconomic status, occupation, language, and disposition.”

Teo Yao Neng, Phase II NUS Medicine student



“Hope” by Elizabeth Wu, Phase I NUS Medicine student

“Entitled “Hope”, my drawing depicts two foreign workers (a construction worker and a domestic helper) looking upwards at all their dreams and wishes—pertaining to their current working situation and to their families—which are all held together by a string called hope. It sheds light on the plight of many foreign workers in our midst: All too often we forget that they are beloved and respected mothers, fathers, sons, daughters, farmers and businessmen, in their communities back home. While there is much that can be improved with regard to our response to foreign workers in our midst, this picture reminds us of the hope that we, and our foreign workers, have. I hope to tell the foreign workers to keep their heads up and not despair, for there is hope, which in time may become reality.”

Elizabeth Wu, Phase I NUS Medicine student

“Lexicon”

these are blanks—a void, an empty space, a missing voice of those unheard unseen, unaccounted for, uncatered to the very fact of this lacking of my singular perspective is telling what other lexicon do I have to learn?

An anonymous Phase I NUS Medicine student



The Agony and the Ecstasy – A Medical Student Reflects on Her Learning Journey

BY FAYE NG YU CI, PHASE IV STUDENT, NUS MEDICINE

Almost all medical students would have heard this exclamation of disbelief: “Examinations? Again? Didn’t you just finish them a few weeks back?”

Friends, half-joking, half-serious, resent our schedules when they try to coordinate group outings or class gatherings. With clinical years and the School of Medicine’s out-of-sync calendar from the rest of the university, it is often difficult to arrange meet-ups with friends.

Learning for the future

In medical school, our intense workload and compacted curriculum mean that we dedicate much of our time to studying. A large part of Medicine is about sitting down

with the books and putting in the hours. Familiarity of content only comes with revision and repetition, with years of effort culminating in knowledge integration and internalisation. In addition, *Medicine is difficult*—not just for the sheer volume of facts to remember (recollect: listing the different branches and sub-branches of the celiac axis) but also the logic of the concepts themselves, which may not be immediately apparent (case in point: distinguishing between the causes of nephrotic and nephritic syndrome). The body’s

mechanisms are complex and at times elusive. Not everything is as straightforward or intuitive as imagined, and it takes time to reason and arrive at explanations.

I was 18 years old when I signed the MOH Holdings bond, I don’t think I knew the full extent of what I was getting myself into. It is common to fixate on the final outcome of something, without giving thought to the process leading up to it. I still find it slightly mind-boggling, how you decide what to commit to for the rest of your life—a gargantuan and momentous decision—at such a young age. Because how many of us can say with certainty that we are *sure* of what we want, who we are, and what we value? In these few years alone, I have changed in more ways than I can imagine.



The study of Medicine is a long journey of mixed feelings. There are times when a nagging voice questions: *is this all worth it? Are you sure?* While I am kept bright-eyed by the prospect of using my medical training to help patients and journeying with them at their most vulnerable and unguarded, I inevitably also experience moments of stress, fatigue and disillusion. Processing both the joys and the let-downs, I remind myself of what set me on this path in the first place, urging myself to stay faithful to the course. When all is said and done, I do enjoy the learning tremendously, and I cherish the skills and experiences I gain day by day. There is a sense of fulfilment as I chart my milestones—on listening to a patient's heart and correctly identifying the murmur, or scrolling through radiological investigations on the patient record system and making sense of them.

Learning in medical school carries a heightened sense of purpose, beyond the tedium of memorisation and regurgitation we were so used to in secondary school and junior college. Here, there is an awareness that we no longer just study for ourselves or intellectual edification, but for real patients we will meet in the future. How well I grasp the knowledge now will have an impact on lives when I become a doctor, and the onus is on me to do a good job.

I knew Medicine was going to be hard, consistent work when I wanted to become a doctor, and this is what I chose to commit to when I became a medical student. The struggle is a part of the journey there, with the privilege and trust of practising medicine being earned, not given.



Being a junior doctor

The journey from medical student to doctor is a metamorphosis and unsheathing of sorts, from figuring out how to pronounce the Latin terms of anatomical structures, to being able to clerk patients, come up with diagnoses, and devise management plans on the spot. Eventually, it becomes second nature, a routine and ritual performed deftly under time constraints.

Nevertheless, starting out as a junior doctor can be daunting. There is the juggling of clinical learning with on-the-job demands, along with managing inter-collegial relations and being accountable to bosses, surviving overtime hours and multiple calls, while attempting to retain a semblance of normalcy in life outside of the job. There is also the equally critical, but seldom talked about aspect of patient interaction, which can either be a blessing or a terror: delivering bad news, handling delicate emotions, and addressing patient concerns and expectations. While expertise and experience are accumulated over time, the myriad of responsibilities expected of

a doctor still overwhelms me, especially when the professional I want to become seems so far away from the medical student I am now.

The doctors of today

With Google at our fingertips, the medical environment we practise in today is a unique one, and so are the demands placed upon doctors. In this day and age, we are more informed yet increasingly challenged: when our patients are as equipped with medical information as we are, the focus shifts from factual recall to creating insight and meaning with information.

The doctor's task today is no longer knowledge acquisition, but knowledge synthesis and inquiry to create a coherent narrative for each patient. Why do the risk factors and presentation of this elderly gentleman lead to a suspicion of colorectal cancer? If diagnosed, how will his condition affect his life? How will the treatment plan and care change, based on his priorities and goals? Our patients no longer just want to know *what*, but also *why*, *how*, *when*, and *what now?*



Being inducted into the medical fraternity at the White Coat Ceremony.

To answer these, we need to be well-versed in our medical knowledge and clinical reasoning. Narrowing the differentials to arrive at a final diagnosis requires a firm grasp of common and critical conditions, bringing us back to good old conscientious studying.

Medicine as a Science and an Art

More than any machine, the human body is the most intricate of systems: its compartments and cascades, its enzymes and electrolytes kept in perfect homeostasis. Appreciating the human body and its complexities, its inclinations yet inconsistencies, has convinced me of the wonders of creation—profoundly and irrefutably. It has helped me to avoid taking good health for granted, and to treasure time spent with the people I love. Moreover, knowing the detrimental effects of my own unhealthy habits has prompted me to lead a healthier life, advising those around me to do the same.

Prior to university, we were introduced to the Arts and the Sciences as dichotomies: you were either an Arts student or a Science student. The humanities were described to be quaint and fanciful, while the sciences were declared as utilitarian, unembellished and impartial. Yet, as I progress through my education, I am realising how so many of these lines are blurred, with our man-made distinctions being arbitrary and imprecise. It does not have to be a choice of either/or. There is beauty in the unfurling of the trigeminal layers of the embryo, as there is truth in the Freudian theory of the id, ego, and super-ego—our bodies are made up of equal parts fact and imagination.



Essentially, the practice of Medicine is about humanity—the entire premise of the humanities being to help us understand and relate to each other. I can think of nothing more human than witnessing a family come together in the face of grief, or helping a couple work through the implications of a genetic disorder on their plans to conceive. The eventual decision to let go of a patient when all possible therapies have failed, when all that sustains life is a fleet of beeping machines and a tangle of wires—I wonder how difficult it must be. I imagine the conversations that transpire, the flux of emotions and moral awakenings. Death, the white elephant lurking behind every prognosis, diminishes and humbles us as we realise how futile we are in the face of nature's laws and rhythms—doctors and patients alike.

Ambiguity in Medicine

Stepping into the realm of Medicine is like walking through a very small door, into an unfamiliar and entirely breathtaking world, much like Alice tumbling into Wonderland. In medical school, we first

acquaint ourselves with what is normal, before inquiring what is abnormal. Our textbooks illustrate the construct and make-up of the body, explaining to us the consequences and complications when it breaks down. We examine the body progressively: from regional anatomy to systems-based physiology, to more minute details of histology, biochemistry, and microbiology. We then explore pathology to unravel disease processes and their manifestations, and later on pharmacology, where we tackle drugs and their therapeutic effects.

As medical students, we struggle to keep afloat in the sea of knowledge we are thrown in, never knowing how far away the shoreline is. With an expansive and boundless curriculum, there will always be more conditions to learn about, and more about a particular condition to learn about, with the constant pressure to know as much as possible. At times, I am unable to see the immediate relevance of every piece of information I am learning. It frequently feels like playing a game of catch-up with memory—reading about one condition and forgetting most of it by the next day, but having to



Striking a pose in front of Angkor Wat's temples on a Project Lokun trip.

move on to a different condition to keep pace with revision by then. Simultaneously, we grapple with discerning between what is tested in theory for examinations versus what is clinically relevant in practice, and reconciling the two.

Ambiguity, perhaps, is inherently a part of Medicine. Despite the great strides and progress we have made in modern medicine, there remain enigmas we are unable to unravel. We contend with disease pathways that have not been completely elucidated, and conditions for which there are no curative remedies. Much of what is done today in clinical practice relies on a reverse-engineered process of decision-making, whereby management algorithms are based upon evidence from clinical trials.

Apart from written knowledge, however, functioning as a doctor requires the translation of theory into approaches, with the development of diagnostic algorithms and illness scripts. In the clinic, the patient invariably presents as a symptom complex, not a diagnosis. The patient does not say: "Doctor, I have acute pancreatitis!", he says: "Doctor, I have a sharp pain in my belly." Even then, history-taking and physical examination may be unrewarding at times, and the exact diagnosis can only be concluded based on investigations or even surgical exploration. If medical school is to prepare us for a life of Medicine, it might do us well by exposing us to ambiguity from the onset.

New beginnings

Medical school encompasses a series of transitions: from junior college to university, preclinical to clinicals, and then medical school to housemanship. On my first day of school, I was as uncertain and nervous as I imagine some of my juniors might



The doctor's task today is no longer knowledge acquisition, but knowledge synthesis and inquiry to create a coherent narrative for each patient... Our patients no longer just want to know what, but also why, how, when, and what now?"

be now, on the cusp of their medical careers, the first of five years of medical school.

As I leave my preclinical years behind, I enter my third year of medical school, a year awaited with much trepidation yet eagerness. Ward life was what we imagined when we were restless in our lecture seats, wondering what the amassing of all this knowledge was preparing us for. The thought of applying what we have learnt so far to the wards and witnessing Medicine in action is exhilarating. As we rotate through General Surgery, may we finally recognise the significance of our surface landmarks and abdomen anatomy; as we elicit the drug history of an elderly patient in the polyclinic, may we finally comprehend the dangers of polypharmacy and strive to reduce it for our own patients. The transition from preclinical to clinical years will surely be intimidating, but it brings us one step closer to what we signed up for when we applied to medical school: morning rounds, hands-on procedures, and the human touch so sacred and central to the practice of Medicine.

Parting words

During orientation, I asked my seniors how I could make the most out of medical school. "Run your own race," one of them said, adding on: "And don't forget to take it all in; smell the roses once in a while."

It took me time to realise what he meant.

Two years in, and I can't say I know all there is to how to survive and thrive in medical school. What I have gleaned, however, is a deepened understanding of the human body, lessons with professors and doctors who have inspired me with their wisdom and good humour, and friendships which I know will last me a lifetime. In these two years, I have taken on roles and responsibilities that grew me as a leader and a team-player, and embraced opportunities I previously would have shied away from. Through these, I have emerged more resilient, assured, and giving.

In these years, I have laughed and cried, loved wholeheartedly and been deeply broken. There were days when I was spent, burying my head on the table of the medical library before pulling out my books again, instances where I fell short of the expectations of myself and others, guilt-ridden for not giving more, yet already on the brink of my capacity. On greater occasions, though, I have been graced by the kindness of loved ones and friends. Along the way, I was also encouraged by small and unexpected victories.

I hope to continue growing, learning, and extending towards the light.

Images were taken before implementation of COVID-19 safety measures.



Photo:
Doris (back to camera)
conducting training for
Phase IV NUS Medicine
students in July 2020.
(Photo courtesy
of Doris Fok)

The Milk Run

A pioneering advocate of breastfeeding in Singapore, Doris Fok, from the Department of Obstetrics and Gynaecology, is the first Singaporean to become an International Board Certified Lactation Consultant (IBCLC).

Back in 1984 when Doris first became a mother, breastfeeding was a rare practice in Singapore. Knowledge on breastfeeding was scarce, and the practice was seen as one that belonged only to those who could not afford formula milk. Additionally, in the midst of a huge push for the economy to grow, many women relied on formula so they could return to the workplace, most of which did not have policies and practices to support breastfeeding employees.

Convinced that breastfeeding offers the best possible start for children, Doris chose to breastfeed her baby and started a neighbourhood group to provide help and support for mothers breastfeeding their children. She recalled, “I was the nosy neighbour who went around asking if the mothers needed help. It actually came as quite a shock to me when I learnt that many of them gave up within the first week when they encountered difficulties with breastfeeding. Many of them experienced pain or failed attempts, and received little support.”

Determined to champion breastfeeding, Doris began her journey as an advocate in the field of lactation. She joined the Singapore Breastfeeding Mothers’ Support Group and enrolled in a course to learn more about the subject, and train more mothers at hospitals. With experiences that inspired her to pursue a profession in the field, she set out to study for the IBCLC Examinations, despite

having no medical or nursing background.

Over seven tumultuous years of learning, during a time when there was no available curriculum nor local teachers, with the Internet non-existent and research in lactation scarce, Doris had to rely on her existing network of friends in the medical field as contacts for help. “I had to send many letters by post as there was no e-mail back then. After a long time, I finally managed to find three mentors from other countries who guided me on the journey.” In 1992, she became the first IBCLC in Singapore and Asia; this offered her several opportunities to share about the profession with various community groups, hospitals and organisations in Asia.

In addition, Doris was the first lactation fellow designated by the International Lactation Consultants’ Association (ILCA) in 2011. She joined KK Women’s and Children’s Hospital as their first lactation consultant

in 1991, before becoming a member of the research team at the National University Health System (NUHS) in 2003 at the invitation of Prof Chong Yap Seng, the current Dean of NUS Medicine and an obstetrician and gynaecologist.

Working closely with Prof Chong, Doris was part of the first committee that looked into how baby-friendly hospital practices could be implemented within NUH. The team under the leadership of Dr Yvonne Ng, the current chairperson of NUH Baby-friendly Hospital Initiative (BFHI) steering committee, then set out to train allied health, nursing and medical staff, studied practices in Australia, and drove changes to the hospital's policies and protocols. The hospital became the first in Singapore to be awarded the BFHI certification in 2013, marking a significant shift towards more positive attitudes and increased knowledge of breastfeeding in the country.

At NUS Medicine and NUH, Doris does research as part of the Growing Up in Singapore Towards Healthy Outcomes (GUSTO)—the first and largest birth cohort study in Singapore—and the Singapore Preconception Study of Long-term Maternal and Child Outcomes (S-Presto) which looks at how the health, nutritional status, and mental state of women before pregnancy influence their subsequent pregnancy outcomes. Besides GUSTO and S-Presto studies, she is also involved with the NUH BFHI committee in developing resources and materials for new parents and doing pertinent research to encourage the practice of exclusive, effective and extended breastfeeding.



Apart from helping mothers, it is my hope to increase awareness among the people around them—employers, communities and authorities—of how we can all come together to support mothers and effect greater positive change.”



She also teaches the students and residents at NUS Medicine and NUH, and collaborates with various specialists in many research projects both locally and internationally, including the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF).

With a career in the field of lactation spanning close to four decades, Doris has helped mothers with a wide range of needs. “Apart from helping mothers, it is my hope to increase awareness among the people around them—employers, communities and authorities—of how we can all come together to support mothers, in order to effect greater positive change in the field.”



Top:
Doris (fourth from left) with her colleagues from the Department of Obstetrics and Gynaecology in 2019. (Photo taken before COVID-19, courtesy of Doris Fok)

Bottom:
Doris with her daughter in 1984, who was just a few days old. The baby needed a burp after having been breastfed, experiencing what is commonly known as “milk coma”. (Photo courtesy of Doris Fok)

Scan to watch Doris share about lactation here:



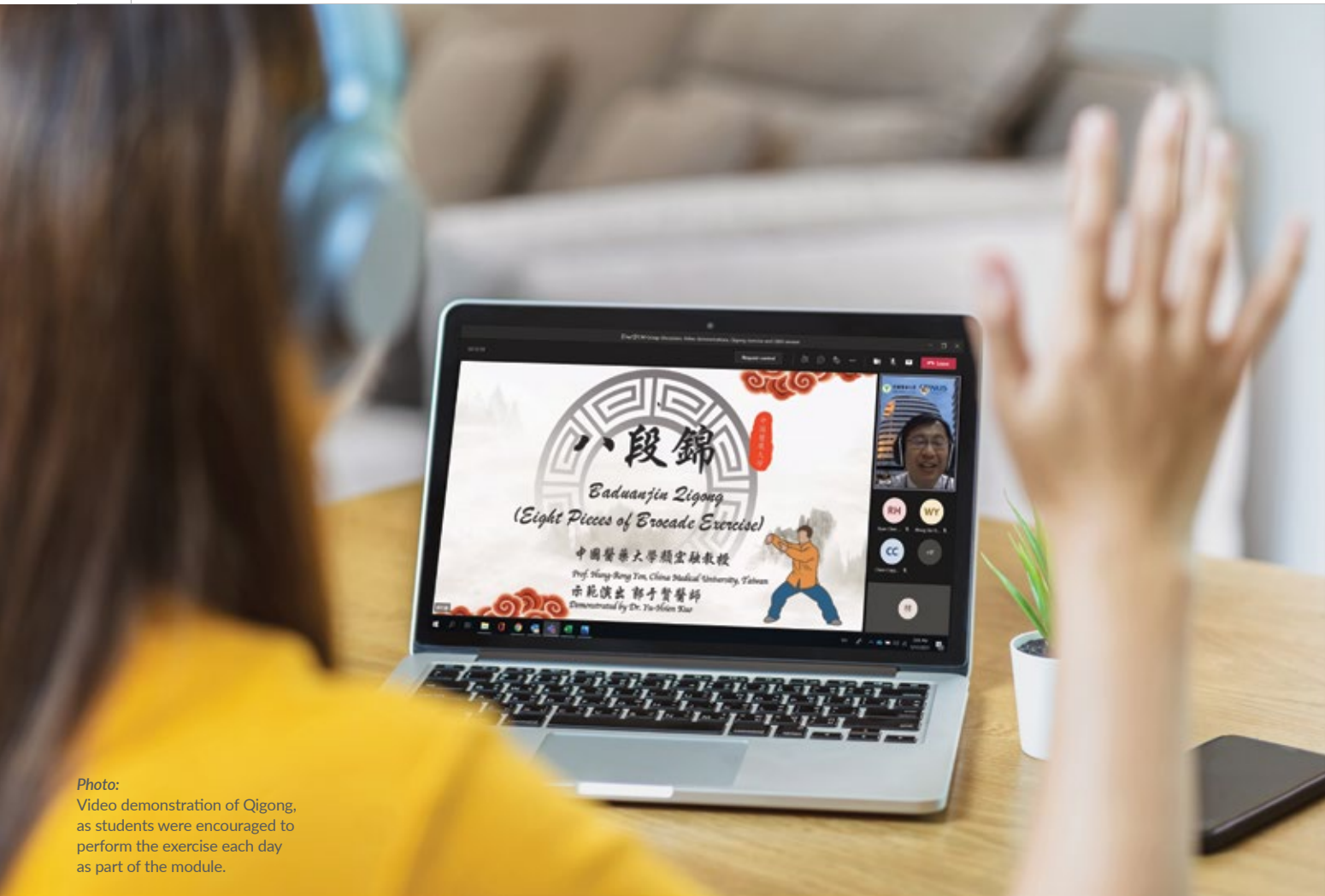


Photo:
Video demonstration of Qigong,
as students were encouraged to
perform the exercise each day
as part of the module.

Learning in the New Normal

To enhance learning for medical students who are keen to explore courses outside of their usual curriculum, the NUS Yong Loo Lin School of Medicine introduced a series of enrichment modules between May and July 2021. International medical and nursing students from 19 schools, across 11 countries, in addition to NUS Medicine students, participated and benefitted from these enrichment courses.

Despite initial plans for the modules to be conducted in person, with field trips and experiential learning, most of them had to be held virtually in light of the developments surrounding the pandemic.

The enrichment modules sought to enable medical students to gain knowledge in other health-related fields outside of clinical medicine, and included Design for Health and Medical Practices (healthful design), Sleep and its Role to Sustaining Health, Well-being and Learning (why you should sleep more), *Salut* to the Everyday

Microbes (microbes in everyday life), Traditional Chinese Medicine: From Basic Theory to Clinical Application (integration of TCM), The Art of Practising Interprofessional Learning (significance of collaborative learning across disciplines), Neuroscience, AI and Medicine (deep learning), Music, Health and Well-being (music therapy), Foundation of Medical Education (students as future educators), Natural Intoxication in the Tropics: The Vietnam Perspective (toxic mushrooms and snakes), and, Introduction to Health Informatics (data science in healthcare).

The virtual modules comprising didactic lectures, group discussions, group projects and presentations were conducted via Zoom and Microsoft Teams. This enabled students to engage in asynchronous learning and provided the platform for students from various countries to interact and continue discussions. As a pilot run, the average class size for each module was capped at a maximum of 20, to allow for better student engagement and interaction.

Among the modules, two were conducted in collaboration with international partners. The Vietnam Military Medical University (VMMU) arranged for lecturers from the Centre of Military Toxicology to share about the various toxic mushrooms and venomous snake bites that were common in Vietnam (well documented with many photos of real patient cases), but very rarely seen in Singapore's urban landscape. China Medical University's College of Chinese Medicine, which offers curriculum integrating Traditional Chinese Medicine with Western Medicine while maintaining the distinctive features of each discipline, offered our students (who are taught in Western Medicine) a new perspective about Medicine as a whole. In addition to the insightful introductions to these novel areas, the lecturers showed great hospitality to our students, who shared that “[the module] felt very much like a cultural exchange”.

The pandemic had brought about new challenges with the travel restrictions and suspension of clinical electives. The face-to-face interactions are difficult to replicate over



The pandemic had brought about new challenges with the travel restrictions and suspension of clinical electives. The face-to-face interactions are difficult to replicate over virtual platforms, but having the modules online also allows a wider reach, allowing more students to benefit from it.”



Student trying on a device in “Sleep and its Role to Sustaining Health, Well-being and Learning”, the only face-to-face module conducted.

virtual platforms, but having the modules online also allows a wider reach, allowing more students to benefit from it. Beyond the fascinating content offered in each module, the interaction among medical students all over the world enhanced the whole learning and enrichment process, as they shared experiences and local context. “The various backgrounds of the participants gave us different perspectives about the current conditions in other countries. I learnt that all the students had similar concerns regarding medical education, especially during

the pandemic—and somehow that made me realise that we are not facing this hardship (pandemic) alone,” remarked Fona Qorina, student from the Faculty of Medicine, University of Indonesia.

The organising committee is grateful for the support from all the lecturers and students, and will run the next cycle of the programme next year, potentially with a hybrid format allowing for both in-person and virtual learning, to cater for students who can travel to Singapore as well as those who may face travel restrictions.

The Case for Lifelong Learning

Learning is not an episodic event but a continuous journey. Staying informed and updated is critical especially in the knowledge-driven medical profession. For healthcare professionals, lifelong learning is not only an occupational responsibility but also a moral commitment to provide safe, effective and high-quality healthcare for patients.

THE BANYAN TREE

This new column is dedicated to the pursuit of continuous learning and development and takes its name from the banyan tree. It has roots that grow deep, anchoring it firmly in the soil. The tree spreads its shade wide and far and provides space for reflection and discussion. We invite you to come and take a seat under its shade.



Training amid labour crunch

However, job demands and the busy working environment mean that healthcare professionals have little time for continuing education and training. According to the World Health Organization, the world will face a projected shortage of 12.9 million healthcare professionals globally by 2035. Understaffing, as a result of evolving healthcare trends, including ageing populations and increasing chronic disease burdens, as well as slower workforce growth, make it difficult for healthcare organisations to send employees for training.



A shortage of
12.9 MILLION
healthcare professionals globally by 2035

Singapore too grapples with a shortage of nurses. According to the Ministry of Manpower's 2020 report on job vacancies, nursing jobs were the hardest PMET (Professionals, Managers, Executives and Technicians) positions to fill. The COVID-19 pandemic has compounded the manpower shortage with parts of the healthcare workforce redeployed.

Learning “on-and-in the job”

With work urgencies overshadowing the luxury of learning, how can organisations make lifelong learning a part of daily work life for healthcare professionals? Tomoko Yokoi, a researcher at IMD's Global Center for Digital Business

Transformation suggests possible ways of finding opportunities to learn “on the job” and “in the job” as a practical way to accelerate lifelong learning in organisations.

To fit learning into busy schedules, learning should be assimilated within the flow of everyday work. By creating a learning-for-all culture, organisations can encourage employees to continue learning as part of their daily work. Organisations can promote e-learning and online live courses to allow healthcare professionals to train more efficiently at their convenience and without having to leave work.

How organisations can integrate learning into the normal flow of work



Learning as a community

From the onset, Singapore's DBS Bank sought to create a learning environment that sparks employees' curiosity. As part of the bank's “GANDALF Scholars” scheme, employees receive funds to learn anything they want. The catch? They must agree to teach what they learnt to at least 10 other persons.



High impact micro-learning

Micro-learning delivers short bursts of content for learners to study at their convenience. American food corporation, Cargill, engages employees to micro-learn with short lessons. Employees have to immediately apply their new knowledge by filling out a learning report, including lessons learnt and questions raised.



Curating learning content

Content curation allows Accenture to constantly provide the most current insights on emerging technologies to help train its consultants to deliver innovation to their clients. To avoid information overload, Accenture identifies useful external content and combines it with internal content developed by in-house subject matter experts.



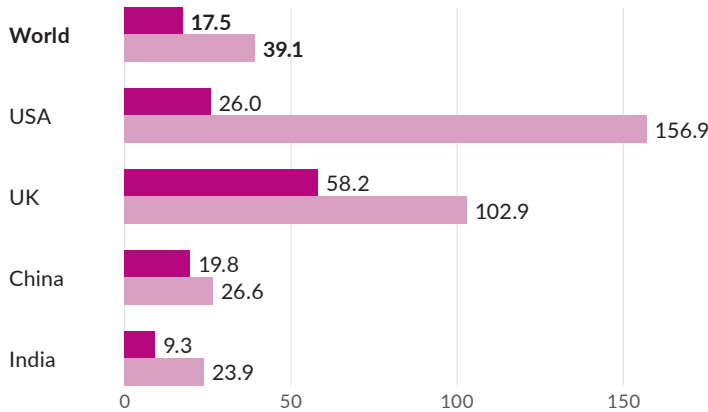
Encouraging lifelong learning

The advantages that organisations gain in promoting continuing education for healthcare professionals are obvious—highly skilled staff, high staff retention, impeccable reputation and better patient outcomes. The downsides are equally obvious—by not investing in their employees, organisations risk losing their staff to other employers. To encourage healthcare professionals to embrace lifelong learning, organisations can find ways to make learning fit within the flow of daily work life.

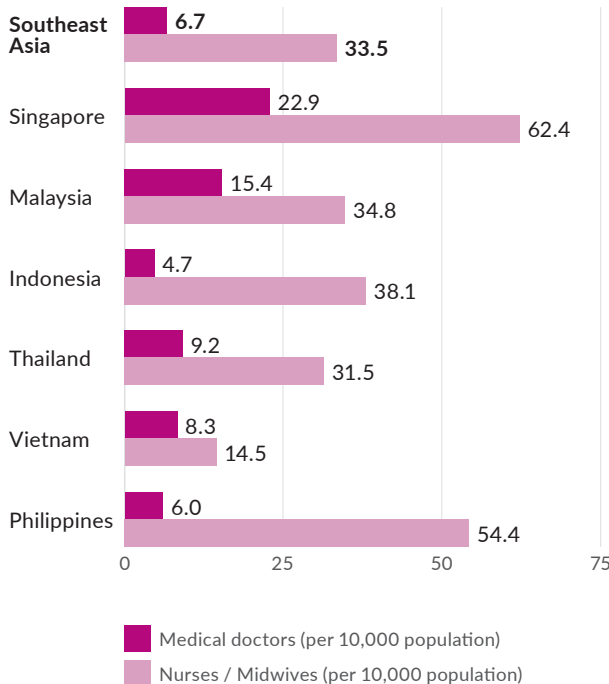
Figures

How Singapore's Healthcare Workforce Measured Up in Southeast Asia and the World

AROUND THE WORLD

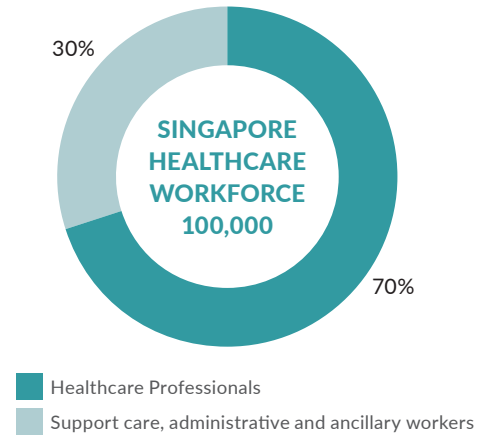


SOUTHEAST ASIA

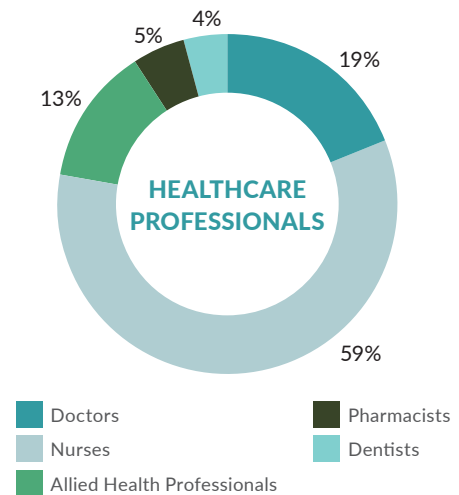


Source: World Health Organization, Density of select health workforce per 10,000 population, 2013-2019 (latest available)

Breakdown of Singapore's Healthcare Workforce



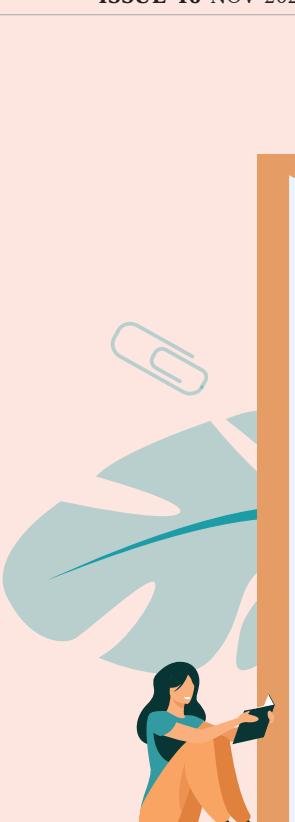
Source: Ministry of Manpower, Job Situation Report (15th Edition, 2020)



Source: Ministry of Health, Health Manpower (2019)



¹ <https://www.mom.gov.sg/newsroom/press-releases/2020/1210-jobs-situation-report-15th-edition>.
² <https://www.straitstimes.com/singapore/health/singapore-needs-more-nurses>.
³ <https://www.forbes.com/sites/tomokoyokoi/2020/08/11/enabling-lifelong-learning-in-the-workplace/?sh=49e450a13477>.
⁴ <https://www.who.int/data/gho/data/themes/topics/health-workforce>.



Take 5 Breakfast: Q&A with our NUS Medicine Continuing Education and Training Faculty



About:

Dr Chong Choon Seng is Assistant Dean (Enterprise) at the NUS Yong Loo Lin School of Medicine and Senior Consultant, Division of Colorectal Surgery at the Department of Surgery, National University Hospital. As the Programme Director of General Surgery Residency at the National University Health System (NUHS), Dr Chong is involved in both undergraduate and postgraduate medical education. He has also garnered numerous awards, including the Best Teacher Award, an NUH Excellence Teaching Award and has been a nominated role model for students for several years.



Dr Chong Choon Seng tucks in to his favourite kickstarter meal.

Q: What is your favourite breakfast?

A: Definitely minced pork noodle, otherwise known affectionately as “bak chor mee” in our Singapore colloquial tongue. This is my go-to meal to kick-start my busy workday.

Q: What is your biggest motivation in delivering continuing education?

A: I believe the rewards of being a teacher are similar across undergraduate and continuing education. It always fills me with great joy to see learners improve their critical

thinking skills, as well as the multiplier effect of learners sharing and teaching their newfound knowledge within their community. This motivation is a common thread shared by many of my faculty colleagues. This spirit of guiding learners toward achieving competency and paying it forward by teaching others is a strong motivator for me to keep on delivering continuing education.

Q: What are the main differences between undergraduate teaching and

continuing education?

A: I would say there are three main differences: the audience, the amount of time and the complexity. In continuing education, our learners consist of working professionals who come to class bringing their rich experience and expertise in their respective domains. They are not content with fundamentals and theoretical concepts. Instead, they seek applications, examples and case studies that enable them to draw upon their experience to maximise the takeaways from the course.



Lifelong learning is inherent to us as healthcare professionals...when it comes to continuing education in healthcare, an absence of progress means regress.”

The need to maximise the course takeaways brings me to my second point on a major hurdle faced by many healthcare professionals when it comes to training. And that is the amount of time they can spare. Due to the nature of their work and work environment, face-to-face courses are often a challenge for healthcare professionals. It also comes with the drawback of troubling colleagues to cover for them when they need time off for professional development. To support the training needs of our time-starved healthcare professionals, we offer both self-paced asynchronous online courses and synchronous virtual classes.

My last point is that the nature of healthcare education lacks absolutes and thus creates complexity in the delivery. While absolute “yes or no” are acceptable answers for most undergraduates, this is hardly the case for continuing education learners. Through their working experience, they would have undergone situations of uncertainties that demand greater critical thinking skills to navigate through the complex decision-making process.

And this is the reason why we emphasise case studies and facilitate discussions to allow our healthcare professionals to learn from each other’s experiences.

Q: Why do you think lifelong learning is important for healthcare professionals?

A: Lifelong learning is inherent to us as healthcare professionals as science and technology are constantly evolving. New medicines and new diagnoses develop, such as when we face novel diseases like COVID-19. This, coupled with improved technology, which widens our armamentarium, are just a few of the ways that healthcare evolves with time. Hence, when it comes to continuing education in healthcare, an absence of progress means regress.

It is especially challenging as healthcare workers are constantly on their feet and hardly have time for themselves, let alone pursue professional development. Thus, providing affordable and readily available continuing education is a cornerstone for our healthcare system to remain competitive and updated.

Q: What is your most memorable teaching moment?

A: When I was a medical officer in the Singapore Armed Forces (SAF), I was offered the opportunity to teach Advanced Cardiac Life Support (ACLS) to senior medical colleagues, including seasoned cardiologists. It was daunting as at that time I was still starting out as a basic surgical trainee and I felt that my colleagues probably had accumulated vast experience in the subject matter that I was delivering. They likely have saved more patients suffering cardiac arrests than I have witnessed!

Despite my early apprehension, the session was a pleasant experience. I believe a big part of the reason is that I have always viewed my teaching sessions as sharing sessions that I help facilitate. In fact, having our senior medical colleagues there was brilliant as it meant that I could invite them to share beyond the textbook content I had to deliver. I learnt a lot from this experience and the feedback for that session was one of the best that I have ever received and still treasure. In all, the session turned out to be a great blessing.

This goes to show how we adult learners value authenticity and relevance when it comes to continuing education and training. It also points to the many hats an educator has to wear. At times a facilitator, other times a guide, and occasionally a mentor which I feel requires more interpersonal relationship building, beyond academic correspondence.

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