

# MediCine

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## Vaccine Nationalism: Balancing National Interests and Global Needs

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This is how I cared for my dying dad

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## PEOPLE OF NUS MEDICINE



# Dean's Message

Dear Reader,

It has been 17 months since life as the world knew it was turned on its head by a virus. The advent and impact of COVID-19 made the global pandemic literally the mother of all black swan events. Classroom lectures and tutorials went virtual and key research work was suspended as previously bustling campus facilities emptied and fell silent when Singapore went into a five-week lockdown to flatten the trajectory. It forced the Yong Loo Lin School of Medicine to review and revalidate the way we worked. It made us revise and reconstitute our approach to medical education and research, even as we reorientated and pivoted to a whole new way of working.

While previous graduating classes could celebrate the end of medical studies, the graduating Class of 2020 marched off the campus on their last day of medical school and started work soon after, joining the fight against an implacable, rampaging, unseen enemy that had already infected thousands here and was imperilling millions more. Fifteen months later, we realise that technology makes many things possible. It enabled much of the work of the School to carry on, with staff taking turns to work from home. Productivity and morale remain high. COVID-19 has taught us many things and challenged us to be and do more than what we thought we were capable of. I am sure we will have many more lessons to learn before we see the end of this pandemic.

The Year of the Black Swan that was 2020 has also washed away notions of life continuing in a linear and uninterrupted way. While we can look forward to returning to some aspects of a *status quo ante*, I believe we must accept the reality of the new ab-normal. We are now



in a time when not everything will go back to pre-COVID-19 days. New opportunities, new ways of doing things better await and we must seize the opportunities. In that spirit, Professor Shawn Chen of the Department of Diagnostic Radiology, together with colleagues from the Peking Union Medical College Hospital and the Chinese Academy of Medical Science has found a way to reduce toxicity and dose levels for Peptide Receptor Radionuclide Therapy, used in the treatment of neuroendocrine cancers. The technology has been licensed to a US company and an Investigational New Drug (IND) application has been approved by the U.S. Food and Drug Administration (FDA). Prof Chen is now planning a clinical trial with the National University Cancer Institute, Singapore at NUH.

The issue of female fertility has come into sharp focus in recent years, with more women getting married later and having children later in life. In Singapore, the number of women giving birth in their 40s has almost doubled in the last three to four decades, according to data from Singapore Department of Statistics. Conception is an uphill task for women above 40 as fertility declines with age. The chances of natural conception fall to fewer than 5% and this also often comes with serious health risks and complications, such as miscarriages and premature live births, and higher chances of having a child with Down's Syndrome. The Bia-Echo Asia Centre for Reproductive Longevity and Equality that has just been established here at the School will study

ways to advance female fertility, reproductive longevity, and health-span. Research initiatives at the Centre will be led by scientists and clinicians from NUS Medicine and other institutions here as well as the Asia-Pacific, US and Europe, specialising in women's reproductive health, ageing, and digital medicine. The effort will seek to find ways to improve and lengthen female reproductive health and longevity, helping women to preserve and improve their reproductive systems for conception and general health, potentially enabling women to conceive safely in their later years.

Still on the women's health issues: a local research paper published in January found that 40% of pregnant women have clinical depression or high levels of depressive symptoms. It drew data from Singapore's largest birth cohort study, titled *Growing Up In Singapore Towards Healthy Outcomes (GUSTO)*, which has been tracking some 1,000 mother-and-child pairs since 2009, when the children were conceived. About 10% of the pregnant mums in the study probably had clinical depression, based on the widely used Edinburgh Postnatal Depression Scale, while the rest had high levels of depressive symptoms. Depressive symptoms do not just affect the pregnant mother, but may have an impact on her unborn child's long-term development as well. This is because elevated hormones or decreased blood flow from the mother to the child may reprogramme the structure and function of the foetal brain. The resulting "negative impact" includes problems with self-control and self-discipline, as well as managing their emotions.

In the post-pandemic, ab-normal, the work of the School continues apace. We aim to educate and train competent and compassionate doctors and find solutions and approaches for better health, human potential, and healthcare.

Yours sincerely,  
*Yap Seng*

## MediCine

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Yong Loo Lin  
School of Medicine

NUS Yong Loo Lin  
School of Medicine  
1E Kent Ridge Road  
NUHS Tower Block, Level 11  
Singapore 119228  
Tel 6772 3737  
Fax 6778 5743  
Email medmedia@nus.edu.sg  
Web medicine.nus.edu.sg

Follow us on



@NUSMedicine

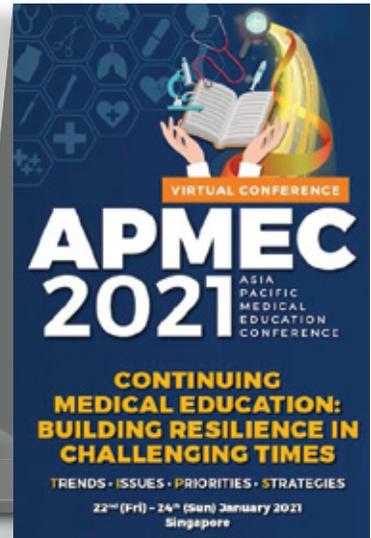


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PHOTO: Participants learning the best practices from international and local experts during the APMEC 2021 pre- and post-conference workshops.



# APMEC Goes Viral

The 18<sup>th</sup> edition of the Asia Pacific Medical Education Conference (APMEC) was held online from 22 to 24 January 2021, in consideration of the ongoing COVID-19 pandemic and suspension of global travel.

**G** racing the occasion was Guest-of-Honour, NUS President, Professor Tan Eng Chye. Over a three-day period, close to 1,300 medical and healthcare professionals from 36 countries attended the conference, which is organised annually by the Centre for Medical Education.

The theme of APMEC 2021 was "Continuing Medical

Education: Building Resilience in Challenging Times—Trends • Issues • Priorities • Strategies (TIPS)". A total of 116 speakers explored and shared on how best to develop a holistic healthcare practitioner who is able to effectively and efficiently manage future practice challenges during challenging times.

The programme of talks, workshops, panel discussions and symposia over the course of three days also incorporated



**1,300**  
medical and healthcare professionals from  
**36**  
countries attended APMEC 2021

several social activities, including Latin dance, yoga and mindfulness sessions. Participants also had the chance to visit virtual trade exhibition booths as well as interact with other participants in a virtual networking room.

In addition, 79 Free Communication and 68 Short Communication presenters shared their scholarly works at oral presentation sessions. Dr Pin-Hsiang Huang (Taiwan) and Ms Qianhui Cheng (Singapore) emerged as the Winner and Runner-up respectively, in the Young Scholar category. Dr Sabrina Lau (Singapore) and Dr Karen Szauter (US) were the Winner and Runner-up respectively, for their presentations under the Free Communications category.

APMEC 2021 concluded with an awards presentation followed by a short trailer on APMEC 2022, which will be held in Kuala Lumpur, Malaysia, together with the University of Malaya and International Medical University.

Professor of Medical Education (Emeritus), University of Dundee, Professor Ronald Harden giving a plenary during APMEC 2021, moderated by Associate Professor Lau Tang Ching, Vice-Dean (Education) of NUS Medicine



# Visiting Scientist Tackles Data at MIT

BY WESLEY YEUNG, RESIDENT, NATIONAL UNIVERSITY HEALTH SYSTEM INTERNAL MEDICINE RESIDENCY PROGRAMME

An NUHS resident gets immersed in data, machine learning and more at the Massachusetts Institute of Technology (MIT).

I was given the opportunity to work as a visiting scientist at the Laboratory for Computational Physiology (LCP) at MIT in spring 2020, under the supervision of Dr Leo Anthony Celi, Principal Research Scientist at the LCP and Intensive Care Physician at Beth Israel Deaconess Medical Center. The LCP curates several large, open access clinical databases on their Physionet platform. These include the Medical Information Mart for Intensive Care data sets and the

eICU Collaborative Research Database. It is also the pioneer of the datathon model, having held over 35 datathons across the globe. The datathon is a short two to three-day event where clinicians and data scientists form teams to tackle research questions using clinical data.

While at the LCP, I was plugged into multiple research projects involving the use of machine learning techniques to perform a variety of tasks, from the estimation



>35

global datathons  
have been  
organised by  
MIT LCP

of the causal effect of blood transfusions in critically ill patients using observational data, to predicting patient mortality from COVID-19 using multimodal learning. Besides research work, I helped to mentor groups at the first MIT COVID-19 datathon where several hundred participants around the world (including a handful from Singapore!) gathered to hack urban and public health data from New York, and come up with solutions to tackle the COVID-19 pandemic.



PHOTO:  
LCP members after  
the daily workout:  
Dr Leo Anthony Celi  
(2<sup>nd</sup> from left),  
Wesley Yeung  
(3<sup>rd</sup> from left).

My own journey in medical informatics began in my third year of medical school when I picked up the R programming language through online courses. I continued to develop programming skills alongside my clinical work and was able to develop several internal applications for use in the Singapore Civil Defence Force during my National Service. Programming languages such as R and Python allow one to access and manipulate data on a much larger scale and complexity than traditional statistical packages and spreadsheet software.

### **Employing data in healthcare systems**

Healthcare systems generate vast amounts of data every day within their electronic health records in a variety of media, including numeric records, textual clinical notes, waveform data and radiologic images. Such digitalisation of clinical data has brought forth tremendous opportunity to reduce uncertainty in clinical decision making, better ways to treat diseases and safer health systems. The field of medical informatics aims to develop tools and methods to make use of health data to improve medical systems and practice.

Predictive analyses in medicine use past data about certain phenomena to derive mathematical relationships between the state of the patient at a certain point in time and the state of the disease in the future. Prediction is useful as it could potentially alert

**"Healthcare systems generate vast amounts of data every day within their electronic health records in a variety of media, including numeric records, textual clinical notes, waveform data and radiologic images. Such digitalisation of clinical data has brought forth tremendous opportunity to reduce uncertainty in clinical decision making, better ways to treat diseases and safer health systems."**

clinicians to future adverse events such as a developing disease, or a particular failing treatment. This could then prompt clinicians to adjust the treatment plan for the patient.

To make use of the vast amounts of data generated by electronic health records for prediction, there are several necessary steps. Firstly, data curation and harmonisation involve the development of systems and processes at the software and network levels to extract operational data generated during the course of clinical practice in a format and structure accessible to researchers. The next step involves applying robust statistical and machine learning methodology to generate algorithms that answer clinical questions. Lastly, and arguably the most difficult part, is bringing these algorithms to the bedside through robust clinical trials and evaluating its performance in a safe and unbiased manner.

### **Homecoming**

I am working with Assistant Professor Kenneth Ban on the Health Informatics Pathway at NUS Medicine to train the next generation of medical students and physicians on the fundamentals of clinical informatics and data science. In addition, I also teach a data science workshop for clinicians in National University Hospital (NUH). I continue to be actively involved in research projects that use machine learning techniques to solve clinical problems.

I thank Dr Leo Celi for the guidance provided to me during my time in the US; Associate Professor Dan Yock Young and Dr Adrian Kee for the support they have provided; Dr Ngiam Kee Yuan for endorsing me; and A/Prof Kenneth Ban for providing the opportunity to contribute to the Health Informatics Pathway. Lastly, I thank the Yong Loo Lin School-NUHS-Harvard-BIDMC Programme for the funding support.



# Tackling Heat Stress: Optimising Human Health and Potential in a Warming World

Singapore is heating up twice as fast as the rest of the world, but it does not mean we cannot do anything about it. As part of his research work looking at heat stress management, Associate Professor Jason Lee is leading a team of researchers to undertake heat-related research on various fronts.

**F**eeeling hot in Singapore's tropical climate is often perceived as normal, but most are unaware of how detrimental heat can be to our overall health, well-being and performance. While heat stress is the effect of the environment on the individual, heat strain is the resultant thermal load the body experiences predominantly from the weather, workload and clothing.

The three pillars of human health and performance are diet, exercise and sleep, and each of these can be hindered by heat stress. In this regard, Assoc Prof Jason Lee, the Deputy Director of the Human Potential Translational Research Programme at NUS Medicine, is leading a team of researchers from various disciplines to undertake heat-related research.

Although heat stress is typically associated with outdoor work, it is also present in indoor workplace environments involving processes that emit radiant heat with inadequate ventilation. Workers, including military personnel, firefighters, law enforcers, construction workers, healthcare workers, and food stall hawkers are particularly affected by the heat.

Heat stress not only increases the risk of heat injury but can also interfere with work productivity. In addition, heat stress can compromise decision making, thereby increasing the risk of accidents.<sup>1</sup> Long-term exposure to heat stress can also induce diseases such as chronic kidney disease of non-traditional causes even in healthy working adults.<sup>2</sup>

**PHOTO:**  
Assoc Prof Lee sharing about heat management with school children. The nation's next generation will be particularly vulnerable to effects of heat due to global warming. (Photograph taken before implementation of COVID-19 safe distancing measures.)

## Knowledge to safeguard well-being

To inform the public on managing the risk of heat injuries in Singapore, Assoc Prof Lee recently chaired a workgroup with representatives from local ministries to revise the Workplace Safety and Health Guidelines on Managing Heat Stress in the Workplace<sup>3</sup>, which incorporates evidence-based causes and methods to measure heat stress, its symptoms, and ways to minimise excessive heat stress in the workplace. The report also highlights that downstream heat-related incidents are often due to a poor start state and therefore, special attention must be given to individuals who are unwell, under-recovered or on medication, as these risk factors would increase one's susceptibility to heat injury.

Beyond the workplace, heat stress can also affect our way of life. The Singapore government has continuously encouraged the public to adopt an active lifestyle through exercise. However, high local temperatures do not favour outdoor activities.

"Many would therefore choose to exercise only during the cooler periods, hence limiting our opportunities to exercise outdoors. If we do not act to reduce heat stress, it is expected that as temperatures continue to rise prospectively, the avoidance of outdoor exercise due to thermal discomfort would ensue.<sup>4</sup> Chronically, this implies that both our physical and mental health would be compromised," said Assoc Prof Lee.

Besides the benefits to health and wellness, Assoc Prof Lee recommends aerobic fitness conditioning to alleviate heat stress<sup>5</sup>, as aerobically fitter individuals also have higher thermal tolerance.

The ageing population in Singapore, which includes those suffering from chronic diseases, is also affected by heat stress. Reported decrements in skin blood flow and sweating response can predispose them to a higher level

of heat strain. Clinical studies have also described Type-2 diabetic patients to suffer from impaired balance and greater loss in strength.<sup>6</sup> Assoc Prof Lee and his team are working to investigate if heat exacerbates these functional outcomes, and build on existing knowledge about this group of patients, in hope of improving their quality of life in our tropical environment.

## Multidisciplinary approach for a multifaceted public health problem

Assoc Prof Lee is confident that the way forward to tackle heat stress is to adopt a multidisciplinary approach. He collaborates with climatologists, engineers and material experts to create human-centric technology<sup>7</sup>, such as personalised heat strain monitoring wearables and effective cooling vests to reduce thermal strain during exertion. He also works with social scientists to better describe the problems at hand, and partners economists to quantify the cost-benefits of the eventual solutions.

At present, Assoc Prof Lee is co-leading a multidisciplinary project—*Heat-Safe*—with the Singapore-ETH Centre to examine implications of heat stress, and provide sustainable policies and solutions to improve worker's health and work productivity in the tropics.

The goal of project *Heat-Safe* is to alleviate the problem of heat stress, with a focus on working adults. In addition, the project examines the impact of heat on pregnancy and fertility, as well as learning in children in tropical environments.

Current evidence suggests that heat stress can influence pregnancy outcomes, inducing preterm birth, stillbirth and low birth weight.<sup>8</sup> Therefore, Assoc Prof Lee believes that it is crucial to intervene in the effects of heat stress even during prenatal care. A recent analysis revealed that thermal stress hinders learning ability in children internationally.<sup>9</sup>

Under the National Research Foundation's Campus for Research Excellence and Technological Enterprise (CREATE) programme, project *Heat-Safe* aligns with Singapore's Research, Innovation and Enterprise 2025 (RIE2025) mission, in the domain of Human Health and Potential, which aims to make use of research and technology to preserve health and maximise human capabilities.

Through project *Heat-Safe*, an international collaboration between Assoc Prof Lee's team and a team in Cambodia will assess the impact of thermal stress on learning in children.

"If a similar association is found in our region, it would inspire more to be done in schools through various approaches, such as enhancing the classroom environment—beyond air-conditioning—or even manufacturing more thermally comfortable school uniforms," shared Assoc Prof Lee.

Through this concerted multidisciplinary approach, Assoc Prof Lee and his team hope that their studies on heat stress can go beyond scholarly research, and be translated into recommendations, policies, educational resources and technological advancements to truly improve human health and potential.



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# Women's Reproductive Longevity the Research Focus at New Centre

To be established at the Yong Loo Lin School of Medicine, the Bia-Echo Asia Centre for Reproductive Longevity and Equality will study ways to advance female fertility, lifespan and health-span.

**T**he Centre was made possible by a US\$8 million gift from the Bia-Echo Foundation, based in the US, whose founder is attorney and entrepreneur Nicole Shanahan.

Research initiatives at the Centre will be led by scientists and clinicians from NUS

Medicine and other institutions here as well as the Asia-Pacific, US and Europe, and specialising in women's reproductive health, ageing, and digital medicine.

The effort will seek to find ways to improve and lengthen female reproductive health and longevity, helping women to preserve and improve their reproductive systems for conception and general health, potentially enabling women to conceive safely in their later years.

### **Declining fertility and associated health risks**

The issue of female fertility has come into sharp focus

in recent years, with more women getting married later and having children later in life. In Singapore, the number of women giving birth in their 40s has almost doubled in the last three to four decades, according to data from Singapore Department of Statistics.

The number of births per 1,000 women aged between 40 to 45 was 9.9 in 2019, nearly double the number recorded between 1980 to 1989. However, conception is an uphill task for women above 40 as fertility declines with age. The chances of natural conception fall to less than 5% and this also often

comes with serious health risks and complications, such as miscarriages and premature live births, and higher chances of having a child with Down's Syndrome.

Furthermore, as women in their 40s approach menopause, they also face increasing health issues such as metabolic diseases, neurocognitive decline, osteoporosis, and poor urogenital health, which result in poorer general health. Current medical approaches to assist conception include the use of fertility drugs, as well as reproductive assistance technologies. Their efficacy, however, remains limited as the woman ages.

"It was during my time as a study-abroad student at NUS Law school that I came to realise the unique position Singapore is in to be a pioneer in science and governance for this generation of innovators. I couldn't be happier to support NUS Medicine's leadership in women reproductive longevity and equality. Professor Chong Yap Seng has long been a leader in reproductive health in Singapore, and has created a world class team of researchers and scientists that connects the fields of women health and longevity. Expanding the reproductive lifespan of women is an investment that I know will serve generations to come, have a positive and everlasting effect in how we approach women health, and provide greater confidence to families as they plan for the future. I hope that we can ameliorate the pain and fear so many women face today of losing



9.9

out of every 1,000 births were given by women aged between 40 to 45 in 2019

reproductive capacity in their 30's. As overall lifespan is increasing, so should reproductive lifespan," said Ms Nicole Shanahan.

"The vision of the US-based Bia-Echo Foundation, a private enterprise founded to accelerate social change to establish a fair and equitable society for generations to thrive, aligns with that of the NUS medical school," said Dean, Prof Chong Yap Seng.

"The reproductive health of women is paramount to the well-being and progress of a nation. The field of women reproductive health has not progressed much beyond *in-vitro* fertilisation and hormone replacement therapy and there is a pressing need for us to reimagine approaches and possibilities in this field, especially with fast-ageing

population in many Asian societies, including Singapore," said Prof Chong Yap Seng.

Adds Prof Chong, "We are deeply appreciative of the generous gift from the Bia-Echo Foundation, whose vision aligns with our work in women health. With this gift paving the way forward in the study of fertility and reproductive ageing, I believe the Centre is uniquely positioned to lead this conversation and, in time to come, shift the needle in enhancing the reproductive longevity and reproductive health of Asian women across generations."

Watch video about the research here:



### The Work to be Done

These obstacles that women confront comprise the focus of the work to be done at the Bia-Echo Asia Centre for Reproductive Longevity and Equality. Specifically, the Centre will aim to:



Lead female reproductive biology research in the Asia-Pacific region



Translate basic discoveries to enhance female reproductive success and mitigate menopause-associated functional decline



Establish a global network dedicated to understanding the health consequences of reproductive health and longevity in Asian women

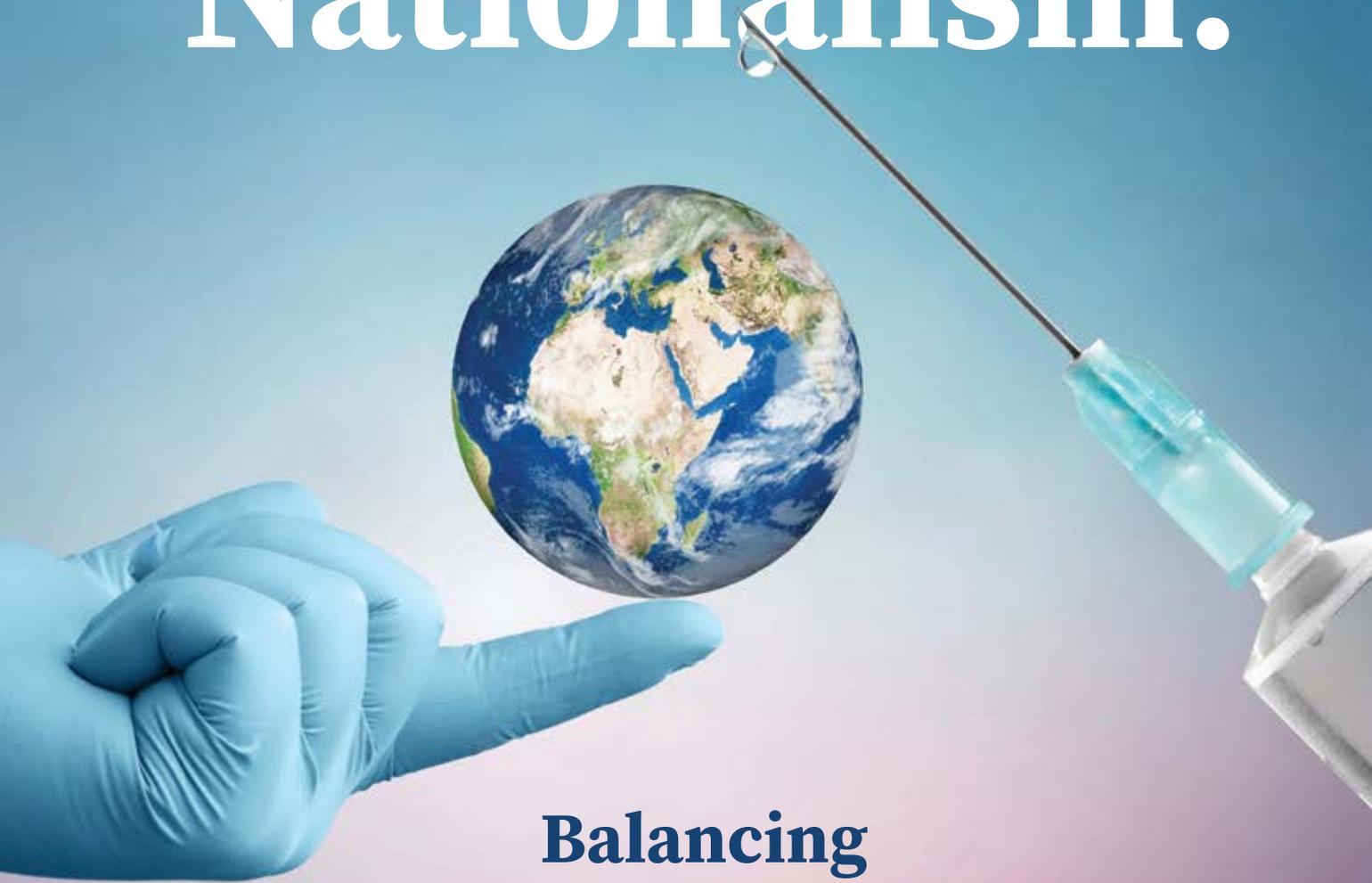


Construct partnerships and collaborations with academic and private sector entities to push the boundaries of reproductive longevity and women's long-term health



Advocate and lead in reproductive equality in Asia-Pacific through sustainable pipelines of public health messaging through governmental, professional and advocacy groups, leading to evolving public policy change

# Vaccine Nationalism:



## Balancing National Interests and Global Needs

*BY ASSISTANT PROFESSOR OWEN SCHAEFER, CENTRE FOR  
BIOMEDICAL ETHICS, AND PROFESSOR JULIAN SAVULESCU,  
UEHIRO CHAIR IN PRACTICAL ETHICS AND DIRECTOR OF THE  
OXFORD UEHIRO CENTRE FOR PRACTICAL ETHICS,  
OXFORD UNIVERSITY*

**O**n 2 February 2021, the Director-General of the World Health Organization, Dr Tedros Adhanom Ghebreyesus, issued a broadside against COVID-19 vaccine nationalism, calling it “morally indefensible” and “tantamount to medical malpractice at a global scale.” Rich countries representing 16% of the global population have snapped up 60% of the global supply of COVID-19 vaccines.<sup>1</sup> Meanwhile, the COVAX facility—an international effort to get COVID-19 vaccines equitably distributed around the world—currently only projects capacity to offer vaccines amounting to about 3% of participating countries’ populations by mid-year.<sup>2</sup>

COVID-19 vaccine nationalism is not the exception to normal practice. In almost all matters, countries spend the vast majority of budgets on local needs, and only a small fraction of that goes to foreign aid, even when the latter represents much greater need. But the fact that this is normal or expected does not amount to a moral defense.

Here, we explore a question of practical ethics: what is the appropriate extent to which a country can prioritise its own people over those in other countries in the securing of vaccines for COVID-19?

**Moderating nationalism**

There are two extreme positions that could be taken with regard to vaccine allocation: pure cosmopolitanism and pure nationalism.

According to pure cosmopolitanism, which

**There are two extreme positions that could be taken with regard to vaccine allocation: pure cosmopolitanism and pure nationalism.**

country a person lives in is morally irrelevant to what they are owed. So, countries should fund and supply vaccines (to the extent practicable) to the global population irrespective of nationality.<sup>3</sup> Certain ‘impartial’ ethical frameworks might be used to determine which particular countries receive how much vaccine. For example, a utilitarian frame would suggest vaccines should go to countries where it will benefit the local population the most. A more egalitarian frame might instead spread vaccines more evenly across the global population, giving each population similar levels of protection against the virus. The latter is roughly the current approach of COVAX, which at this point distributes vaccines in proportion to a country’s population, not their need.<sup>4</sup>

Another extreme is pure nationalism, according to which countries may strictly prioritise the interests of their own people over those of others. This may be justified on a variety of grounds: it is most conducive to promoting human rights and interests for countries to primarily promote the interests of their own citizens; countries owe reciprocal duties to its people, who are subject to its laws and taxation; and co-nationals possess associative ties that create special obligations to each other which the country

can enforce through national priority.<sup>5</sup> Importantly, in practice there will be a connection between democratic legitimacy and nationalism: if the will of the people is to protect themselves first (as it typically is), governments must to a certain extent be responsive to this. The precise role of responsiveness in democratic legitimacy is a long-standing dispute in political theory,<sup>6</sup> but more deferential approaches to popular opinion may in practice favour nationalism.

Actual best practice is likely a compromise between the two extremes of nationalism and cosmopolitanism. Pure cosmopolitanism ignores the morally salient features of nationhood, while pure nationalism ignores the moral interests of those outside a country’s own borders. Democratic nationalism also obscures the further question of what citizens should demand of their governments vis-à-vis meeting the needs of the international community. A position of ‘moderate’ nationalism (or perhaps ‘moderate’ cosmopolitanism) would allow countries (or citizens to demand of their governments) to prioritise the interests of their own people to some degree, while also requiring them to provide meaningful support to the global population.<sup>7</sup>



**16%**  
of the global population have snapped up

**60%**  
of the global supply of COVID-19 vaccines



### Models of balancing

Even accepting moderate nationalism, the question remains of what exactly is the appropriate balance. In practice, a number of models have been proposed and carried out. We survey four, and discuss the ethical balance underpinning each.

#### *Cash support*

While the US, under the new Biden administration, has pledged to fund COVAX to the tune of billions of dollars, it has also stated that it will not send any actual vaccines abroad until the US is fully vaccinated.<sup>8</sup> This is an important distinction, because while funding goes some way towards securing vaccines in the future, wealthy countries have secured priority access to current production through advance market commitments. In other words, this approach keeps a country's own people at the 'front of the queue' while offering a degree of financial assistance for other countries.

In present context, this approach leans heavily in favour of national priority, because the world faces an absolute scarcity of vaccines; one country securing a given supply of vaccine means another country will not receive that supply. Much of the current global production has already been secured through advance market commitments. While cash assistance to COVAX now will help contain the pandemic in the future, it still comes too late to reverse the worst near-term effects of vaccine nationalism.

#### *Concurrent distribution*

French President Emmanuel Macron has proposed countries to reserve 3-5% of their purchased vaccine supply to redistribute to countries most in need.<sup>9</sup> This allocation of vaccines, rather than cash, is more sensitive to the current scarcity of vaccines and so more cosmopolitan than the US' current policy.

Still, this proposal would allocate only a small fraction of vaccines to meet global need, leaning still heavily towards national priority—just not as much as with only offering cash support. By design, richer countries would keep 20 times as many vaccines for themselves as compared with that made available to others. Other countries might supplement that donated supply with their own bilateral deals, but many low and middle income countries will still have to wait months if not years to reach the same level of coverage as wealthier countries.

#### *Vulnerable only*

Risks of COVID-19 are not distributed evenly within a population. The elderly and individuals with certain comorbidities are at particular risk of getting sick and dying of COVID-19, while healthcare workers are at especial risk of exposure. One proposal is to draw a line: a country can strictly prioritise vaccinating its own population until such a time as healthcare workers, the elderly and vulnerable are vaccinated. At that point, a country should be able to open up safely while donating their vaccine supply to international efforts to ensure such vulnerable populations around the world are protected.<sup>10</sup>

This framework somewhat more evenly balances cosmopolitan demands with obligations to prioritise one's own people. It is in this way analogous to a form of rescue ethics that would permit an individual to save the lives of their family members before those of (perhaps more) strangers, but once their family is saved, obligate them to save the strangers before tending to the injuries of their family. However, it focuses primarily

on demographic measures rather than actual outcomes, potentially excusing some countries from donating abroad when their need is very limited, while requiring others to donate abroad when many are still dying locally of COVID-19.

*Eliminating excess mortality*

An alternative is for countries to focus first on eliminating excess mortality through vaccines. Excess mortality refers to the unusually high number of deaths experienced as a result of the pandemic. This will include deaths directly from COVID-19, as well as indirect deaths caused by, for example, lack of access to essential services due to lockdown disruptions. In this model, countries can vaccinate their populations until such a time when they have brought down excess mortality to a tolerable and non-emergency level, perhaps the level experienced during a somewhat bad year of a seasonal flu outbreak.<sup>11</sup>

This model balances cosmopolitanism with nationalism by identifying a point at which the interests of other countries in receiving vaccine can reasonably trump that of domestic need. Eliminating excess mortality will come at different points for different countries, and so is more sensitive to local contextual factors than a purely demographic-based approach like the preceding one. It also appeals more directly to what matters most during a pandemic: saving lives, whether directly or indirectly threatened by the virus. It will, however, be challenging to operationalise real-time metrics of excess mortality, and requires more willingness than is currently evident on the part of countries to trade off the interests of their own people compared with the much more pressing needs of those abroad.

**Each option espouses a somewhat different balance between national priority and global need, and so which is preferable will depend on how heavily a country weighs those competing interests.**

**Weighing up**

There is not space here to offer a proper defense of these options over the other. Each espouses a somewhat different balance between national priority and global need, and so which is preferable will depend on how heavily a country weighs competing interests. Notably, even the more nationalistic approaches like Macron’s 3-5% proposal are substantially greater than the normal aid distribution. By comparison, France in 2019 spent 0.44% of its Gross National Income on foreign development aid.<sup>12</sup> In addition, recent polling suggests that even in countries like the US—often perceived as highly nationalistic—there is widespread support for prioritising global over domestic need.<sup>13</sup>

This exceptional level of international support might be reflective of the more pragmatic concern that it is in countries’ national interests to ensure the pandemic is controlled globally. Yet this does not mean that vaccine

cosmopolitanism and nationalism collapse into each other—shared interests in global pandemic control will only go so far in justifying support for of international distribution of vaccines. Ethical concerns like those espoused in this article should generally push countries and their citizens to be more generous than they otherwise would be to ensure globally equitable access to COVID-19 vaccines.

However, ultimately, democratic governments are responsible to the people who elect them. Whatever policy they believe is best to pursue, they must persuade their citizens in a democracy that that policy is the one which should be adopted. This requires not propaganda, but sound argument and evidence. In short, we require ethics first to identify the best or most justifiable policy and practical ethics to rationally persuade the people that this is the policy they should support.

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#ICYMI:

# The COVID-19 Chronicles

Part of public education efforts, NUS Medicine created “The COVID-19 Chronicles”, a series of educational comic strips which provide bite-sized information about the ongoing COVID-19 pandemic.

Since it was launched over a year ago on 14 February 2020, the Chronicles has been engaging an audience

with some humour and encouragement, seeing readers through difficult and unsettling months after the coronavirus arrived in Singapore.

The Chronicles took a break after releasing the 100<sup>th</sup> comic strip on 6 October 2020 and has since returned on 14 December 2020, to accompany readers through Singapore’s largest vaccination programme with the latest updates and developments.

In case you missed it, here are some highlights of the Chronicles from the first quarter of 2021.



Scan to read all comic strips:

## 12 January 2021: Vaccinations have kicked off in Singapore

**Panel 1 (Top Left):** NUS Yong Loo Lin School of Medicine logo. Text: "THE COVID-19 CHRONICLES DON'T I GET A CHOICE? GOARN | 2020 YEARS".

**Panel 2 (Top Middle):** A man asks, "I've been reading a lot. Did you know that the vaccines coming in are different? So why don't I get to choose which one I want to receive?!" A woman replies, "Why do you want a choice?"

**Panel 3 (Top Right):** The man asks, "So I can choose the safest and most effective one for me! It's my body!" The woman replies, "How does Singapore select the vaccines?" She answers, "Oh, we put the vaccines through a rigorous process. And choose only the best, safest and most effective!"

**Panel 4 (Bottom Left):** The man asks, "And what would happen if everyone were given a choice?" The woman replies, "Singapore would have to buy bigger quantities of each vaccine it chooses, which would result in wastage. And other countries who need them won't have enough." He replies, "Exactly."

**Panel 5 (Bottom Middle):** The man says, "OK, we should order! The chicken rice, nasi padang, dumpling noodles and Hainanese curry rice are ALL very good. I've tried them all. What do you want?" The woman replies, "I dunno... You're the foodie. You decide."

**Panel 6 (Bottom Right):** A man says, "Singapore places utmost care in selecting vaccines for us. They are only approved after going through stringent review, ensuring they are safe and efficacious for use. There is no need to worry whether one vaccine is better than the other." Below the panel, it says: "Dr Dale Fisher is Professor in Infectious Disease, NUS, and Chair of the Global Outbreak Alert and Response Network, WHO."

23 January 2021: Maintaining vigilance is key – the new normal since Singapore detected its first COVID-19 case

**THE COVID-19 CHRONICLES**  
**LET'S NOT GO BACK TO THE START**  
GOARN | 2020 YEARS

One year ago, on 23 Jan 2020, Singapore detected its first case. When clusters formed, we implemented the Circuit Breaker on 7 April. Many things shut down. If we needed to step out to buy food,...

Remember to wear a mask and keep a safe distance. It's compulsory!

After cases started to fall, Phase 1 started on 1 June. Businesses, schools and shops gradually opened.

But only two people from my house can visit Grandma at one time.

Phase 2 began on 19 June after cases fell to single digits. Dining in was allowed again.

Finally, I can meet my friends in public, but within groups of five.

What a relief!

When new cases continued to stay at zero on most days, Phase 3 started on 28 Dec. Then the vaccine arrived!

Now, we can have up to 8 guests in our homes!

This feels almost like the old normal again!

We've been through a lot, and our combined efforts have paid off. But community cases will rise again if we don't remain vigilant. Let's help stop new clusters from forming by visiting the doctor at the first sign of symptoms, or our previous efforts will be wasted.

Dr Dale Fisher is Professor in Infectious Disease, NUS, and Chair of the Global Outbreak Alert and Response Network, WHO.

3 February 2021: As COVID-19 poses a greater risk to the elderly, seniors are strongly encouraged to get vaccinated

**THE COVID-19 CHRONICLES**  
**IF YOU ARE A SENIOR, TAKE THE SHOT**  
GOARN | 2020 YEARS

According to WHO, over 95% of COVID-19-related deaths worldwide occurred in those older than 60 years old.

Yes, we should get vaccinated. But I'm afraid the vaccine will harm me!

Before receiving the vaccination, all will go through a pre-screening assessment to check for any allergies that might cause a reaction with the vaccine. If there are...

Sorry. It's not for you.

If you are eligible to take the vaccine, you will be observed for 30 minutes after, and attended to immediately should you have any adverse effects.

Soreness, headaches, fever and fatigue are normal.

It will dissipate soon.

In the unlikely chance you are among the 0.003% to develop a serious reaction to the vaccine, healthcare staff are prepared and equipped to provide immediate treatment.

It's normal to have doubts. However, if you are a senior, you are more vulnerable to the virus. So please book an appointment when vaccination is offered to you. We will take every precaution to ensure your safety.

Dr Dale Fisher is Professor in Infectious Disease, NUS, and Chair of the Global Outbreak Alert and Response Network, WHO.

9 February 2021: An advisory with the latest safety regulations for the Lunar New Year



NUS  
National University of Singapore

Yong Loo Lin School of Medicine

THE COVID-19 CHRONICLES

# HUAT TO DO DURING CHINESE NEW YEAR

GOARN | 2020 YEARS

We receive up to only 8 guests a day and visit just 2 homes each day.



Do you have a boyfriend yet?

When are you getting married? And have kids?

Only 1 more home to visit today... Yay!

We keep our masks on all the time while visiting.



But we can remove them when we are eating. Pineapple tarts?

We refrain from loud festive cheering. (we let recordings do that for us.)



HUATAH!

HUATAH!

We make sure there is no intermingling between tables when dining out.



15 people split between 2 tables?

With kids, it's impossible not to intermingle. Let's keep the booking to 8 pax.



As new clusters are able to form easily during festive gatherings, please observe these precautions. This way we can all have an enjoyable and safe Chinese New Year.

Dr Dale Fisher is Professor in Infectious Disease, NUS, and Chair of the Global Outbreak Alert and Response Network, WHO.

24 February 2021: We explain why a second dose of the vaccine is needed



NUS  
National University of Singapore

Yong Loo Lin School of Medicine

THE COVID-19 CHRONICLES

# WHY WE NEED A SECOND DOSE

GOARN | 2020 YEARS

Getting the 1st dose of the vaccine is like putting your immune system through Basic Military Training for a couple weeks.



Then there is a short break and the training starts to wear off a little.



Getting the 2nd dose of the vaccine is like returning for a 2nd dose of training.



... until your immune system is fully prepared to defend you and your community.




The 2nd dose of the vaccine reinforces the training of the immune system to respond. This gives you maximum protection against the virus. Remember to receive your 2nd dose so we can better protect our community.

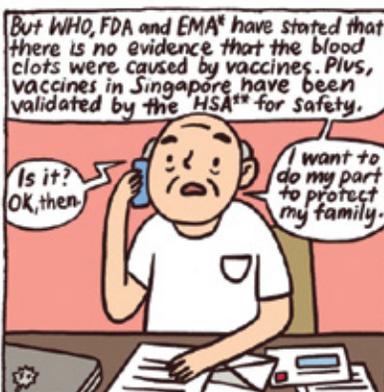
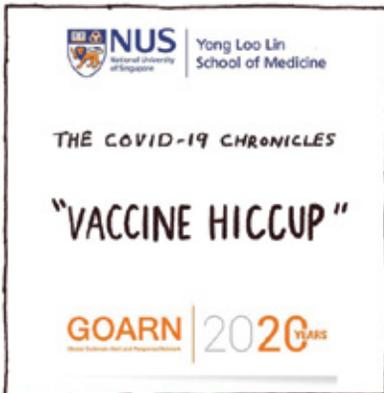
Dr Dale Fisher is Professor in Infectious Disease, NUS, and Chair of the Global Outbreak Alert and Response Network, WHO.

8 March 2021: Dedicating this day and honouring the strength and selflessness of women



\* A community engagement initiative aimed at supporting migrant workers.

24 March 2021: With the low risks associated with most vaccines, there is no reason to hesitate



\*WHO: World Health Organization, FDA: Food and Drug Administration, EMA: European Medicines Agency. \*\*HSA: Health Sciences Authority

*Inspirational*  
**Women of  
NUS Medicine**



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Women hold up half the sky, China's Mao Tse-tung once famously declared. Singapore marked 2021 as the Year of Celebrating SG Women, to acknowledge and hail women's immense contributions to the country. Five alumnae share what motivates them.

CLASS OF 1983

# Prof Leo Yee Sin: Fighting the Good Fight



## About:

Prof Leo Yee Sin is an Adult Infectious Disease specialist and is the Executive Director of the National Centre for Infectious Diseases. Her clinical interests are HIV Medicine, Communicable Diseases, General Infectious Diseases and Outbreak Disease Management.



**P**rof Leo Yee Sin confessed she felt “a little bit of anticipation, a little bit of uncertainty, and a little bit of anxiousness” as she waited for the novel coronavirus to arrive in Singapore back in January 2020.

### All in a day's work

In a year defined by how the COVID-19 pandemic is affecting the lives of one and all, Prof Leo, Executive Director of the National Centre for Infectious Diseases (NCID), has spent every waking moment leading her team in the fight against the virus. With more than three decades of experience working in infectious diseases, Prof Leo oversees the NCID's efforts in clinical services involving patient-care; public health units that include laboratory testing and epidemiology studies; research; training and education; and community outreach.

She is no stranger to dealing with mysterious pathogens, having led her team through multiple outbreaks in Singapore, notably the Nipah outbreak in 1999 and Severe Acute Respiratory Syndrome (SARS) in 2003, which claimed 813 lives worldwide and 32 in Singapore<sup>1</sup>. Prof Leo's work on SARS saw her conferred with the Public Service Star.

While her efforts at helping to contain COVID-19 have drawn kudos again—she received the Public Administration Medal (Silver) at the National Day Awards in August last year, and the BBC included her in its list of 100 inspiring and influential women in 2020—it is Prof Leo's work in caring for HIV patients that set her on the path to a life dedicated to fighting infectious diseases.

### Championing the health of the marginalised

“I started my infectious disease training in 1989, when the HIV epidemic in Singapore began. Case numbers at that point were very small, but the people with HIV were badly affected by the disease. Many of them were very young, and basically their future and careers were completely damaged by HIV,” Prof Leo recalled.

She was undergoing her clinical fellowship training in California, where she cared for mostly patients with HIV/AIDS, and picked up a fair bit about the management of acute complications of the disease. “When I came back from my clinical fellowship, the situation in Singapore remained relatively unchanged. I decided that I could use my knowledge to give better quality care to the HIV population then, motivated by the room for improvement I saw in HIV management.”



Working in HIV/AIDS in the early days was challenging and healthcare workers felt underappreciated. “It was a very gloomy period for HIV medicine,” Prof Leo explained, “There was no access to medication, and no access to subsidised care.”

The situation is different now. Prof Leo mused, “I think people began to understand more about HIV, and a lot has changed. Medications are now universally accessible, and the available treatments have vastly improved the outlook of a typical patient’s condition.”

She remains firmly convinced that she made the right decision to step into this “very challenging” area of healthcare.

“Once you put in the commitment to care for HIV patients, the conviction to continue is very strong. As a result, you have a very dedicated team, who will support one another and do almost everything to fight

**“Once you put in the commitment to care for HIV patients, the conviction to continue is very strong. As a result, you have a very dedicated team, who will support one another and do almost everything to fight against discrimination and inequality.”**

against discrimination and inequality,” affirmed Prof Leo, who continues to care for HIV patients, some of whom have been consulting her for the past 20 to 30 years. Providing that kind of long-term care for people in need requires commitment. It is also a practice that, like all the rest of the medical specialties, offers much scope for growth and development. “Medicine is a very challenging field... there are opportunities for individuals to develop and aspire to, and I will strongly encourage them to put extra effort to excel in their own field and own career.”

She is not a fan of multitasking or hurried decision-making. Her approach to work is to focus

on one thing at a time. “I think it’s important to stay calm, and I prefer to think three times before acting on something. Keeping calm also allows you to analyse, crystallise thoughts and make better judgement calls. Thinking ahead also means having ready solutions so that you can respond and be flexible to situational changes.”

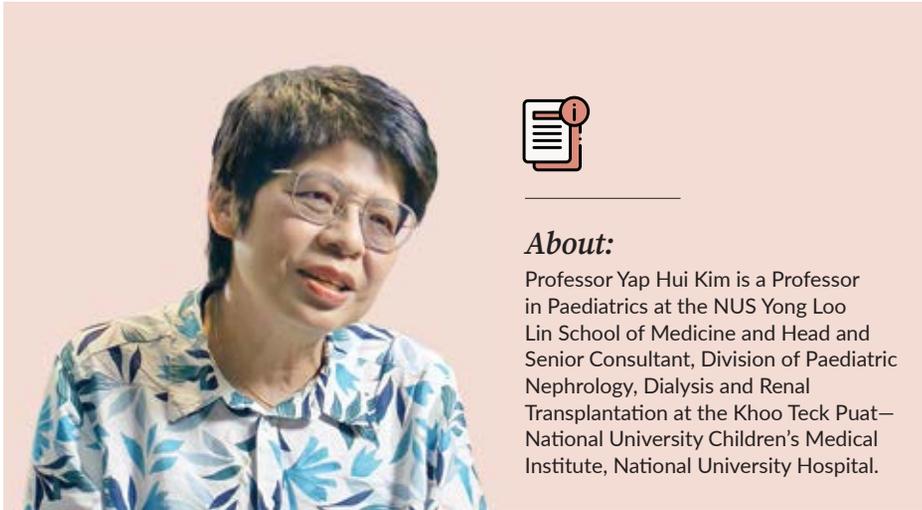


Scan to watch  
Prof Leo Yee Sin:

1. From “Cumulative Number of Reported Probable Cases of SARS” [https://www.who.int/csr/sars/country/2003\\_07\\_11/en/](https://www.who.int/csr/sars/country/2003_07_11/en/), accessed 5 March 2021.

CLASS OF 1978

# Prof Yap Hui Kim: A Heart for Kids with Kidney Disease



## About:

Professor Yap Hui Kim is a Professor in Paediatrics at the NUS Yong Loo Lin School of Medicine and Head and Senior Consultant, Division of Paediatric Nephrology, Dialysis and Renal Transplantation at the Khoo Teck Puat—National University Children's Medical Institute, National University Hospital.

“Having the diagnosis of kidney disease can be devastating to the family. We need to help them understand that the kind of treatment that we give to the child is to help them lead a normal, active life.

“The key is patient outcome. If the child wants to go to school and we haven't done enough to help him achieve the desired outcome, then we would have done nothing.

“We have to ask ourselves what is medicine for. Giving medication is part of the process of helping the family reach their desired outcome. Without the medicine, they don't feel well enough to go to school. If we don't help them, they might never finish school, so we need to help by giving families that extra leg up.

I have only met Prof Yap Hui Kim once before today's interview. We had met her for a discussion on a research paper that we were planning to publicise, but which was eventually put paid to by the pandemic. She struck me as a serious doctor who would not tolerate any nonsense.

It is on this warm, sunny morning in June that we meet again. The mood is tentative as we have just come out of the two-month circuit breaker.

She cuts an unassuming figure as she walks briskly into the room and plonks herself down in a chair. I motion for the make-up artist to start doing her make-up.

Despite the early morning rush, Prof Yap is as chirpy as the proverbial lark.

I tell her that she may want to retain the powder and mascara that had been applied (very lightly) for the interview. She laughs and tells me that she is allergic to some cosmetic products, and they may make her eyes swell.

I silently pray in my heart that this is not going to happen today.

We usher her to the room once her hair and make-up are done. To warm up, we get her to talk about her field of expertise—kidney disease—and how it happens in children. There is no stopping her after that.

She candidly challenges the traditional perspective of medical treatment being an end in itself.

**“If we don't see the patient as the centre of why we are there, then it becomes just a job. You really have to put your patient first and ask yourself what you can do better.”**



“The crux of chronic disease management is more than just giving medication. It is about ensuring that the children and families are able to achieve the outcomes they desire.”

The passion is apparent as she continues.

“If we don’t see the patient as the centre of why we are there, then it becomes just a job. You really have to put your patient first and ask yourself what you can do better.”

We turn the conversation to the annual camp that she has been organising for the children since the turn of this century, under the auspices of the Shaw-NKF-NUH Children’s Kidney Centre which she runs.

Her eyes light up.

“One of the things we do at the centre is that we run an annual camp every year. A three-day camp, like the school camps, we bring these children together so that we can run leadership programmes for them. At the same time, my doctors and nurses are there to ensure medical safety.”

She pauses and chuckles: “I am the chief advisor, the big busybody of the whole camp.”

She regales us with heartwarming stories of a patient whom she sees since he was 12, and who wants to pay it forward by helping to organise these camps.

“One of the things that we want to show them [the children] is that they are as good as their peers in school. This is important for their self-esteem,” adds Prof Yap, on why these camps are important to the children, who are on dialysis.

We ask her to talk about her hobbies, and she enthusiastically recounts how bird-watching became a part of her life.

“It was the fault of an English Paediatric nephrologist. I was a young lecturer at the university and he was coming here to teach the Masters of Medicine in Paediatrics. I picked him up at the airport, and he asked, where can I go to watch birds? So I said, Jurong Bird Park.”

She laughs.

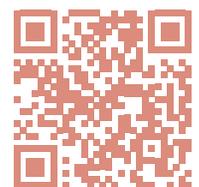
“He stared at me and said, I don’t mean the park. He explained to me what bird-watching was all about and I thought he was a bit nutty. In the end we went to Sungei Buloh. When I first saw the eyes of the birds through the binoculars, I couldn’t believe there were so many colours. It was really very pretty. I introduced it to my sister and we actually enjoyed seeing the different colours.”

Our conversation goes on for more than an hour, but Prof Yap shows no sign of impatience.

I have met many eminent and prolific clinicians in my short two years here. A few of them have left a deep impression on me, not so much for their outstanding achievements, but for their authenticity and humanity.

Prof Yap is one of them. Her genuine and compassionate demeanour bring so much hope to this world, and most certainly to her patients. Her passion and devotion to medicine is as infectious as it is inspirational.

I note that Prof Yap is from the class of 1978—the year I was born. I think most people would call this trivial or even silly, but somehow it brings a smile to my face that I have that little connection, no matter how small, to a role model like her.



Scan to watch  
Prof Yap Hui Kim:

This article is written by Sally Toh



CLASS OF 1974

# Dr Geh Min: Healing Holistically



## About:

Dr Geh Min is an ophthalmologist and eye specialist at Mount Elizabeth Medical Centre. She was also a Nominated Member of Parliament from January 2005 to April 2006. In 2000, she became the Nature Society's first female president and remained at its helm until 2008.

**D**r Geh likens her first brush with ophthalmology to love at first sight; it was a magical moment that was followed by deep consideration for the practical prospects. As someone who loved working in a hands-on environment, surgery was an exciting choice. "It is not life-saving, but it is sight-saving. That,

to me, is very important," she states.

The first two years of medical school were a drag for her. With rote memorisation, test tube experiments and peering into microscopes, she wondered if she had made the right decision to pursue medicine. However, when she entered her clinical years, everything started to make

sense—the path she had chosen would enable her to apply her knowledge and help people get better.

Throughout her career as a doctor, she emphasised the importance of the doctor-patient relationship. She realised that while technology could be applied in fulfilling her commitment as a doctor to her patients, it is a good servant and a bad master. With each innovation helping to do things more efficiently, it remains critical to her that she never loses that "human touch" with her patients.

"If we allow things to deteriorate or change to the extent where the patient can just go to an instrument and get everything done without any other human interference, it shows that we have neglected this doctor-patient relationship."

**"If we allow things to deteriorate or change to the extent where the patient can just go to an instrument and get everything done without any other human interference, it shows that we have neglected this doctor-patient relationship."**

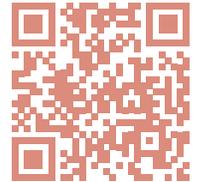
With so much technology at our fingertips today, Dr Geh feels that to remain human, we need to have a lifeline to the humanities; this is especially so for doctors. To her, this is the best way to continually connect with those around us.

Referring to the humanities as a type of technology that allows the individual to more effectively tap on emotions to reach out to another, Dr Geh advocates for the greater inclusion of humanities into medical education. With research showing the patient benefits of alternative treatments like music therapy and art therapy, she believes that the administration of such therapies would also be beneficial to doctors and doctors-in-training.

This belief also stems from her appreciation for nature: she finds solace in being outdoors, gazing at the sky or trees.

As the President of Nature Society Singapore from 2000 to 2008 and a Nominated Member of Parliament from 2004 to 2006, Dr Geh championed environmental causes. Many questioned her impetus for doing so; she was a medical doctor after all. She explains it this way, “To me, there is absolutely no contradiction or discrepancy—I am not just treating the disease, I am looking at the patient holistically. You cannot have a healthy person in an unhealthy environment. (The natural environment) takes

you out of yourself and restores something in you. I think it is very important for everyone’s mental, emotional, psychological and physical health.”



Scan to watch  
Dr Geh Min:



Photograph taken before implementation of COVID-19 safe distancing measures.

CLASS OF 2015 (PHD)

# Dr Lim Su Fee: Nursing the Community



### About:

With 30 years of experience in nursing, Dr Lim Su-Fee, Advanced Practice Nurse (APN) and Deputy Director of Nursing, Rehabilitation Medicine and Community Nursing, Singapore General Hospital (SGH), believes that the practice of medicine is not just about treating a disease, but also comforting patients and soothing their spirits. The alumna from the Class of 2015 (PhD), NUS Alice Lee Centre for Nursing Studies, explains the role of an APN, and how it epitomises the expansion, evolution and progression of nursing in Singapore.

**T**he seeds of passion for nursing that grew in Dr Lim were first sown through a story about rambutans. When she was once hospitalised in her younger days, she shared the same ward as an old woman who repeatedly requested for rambutans. Her delight was palpable when one of the nurses came into the ward with a bag of rambutans and a warm smile. The thoughtful gesture from the nurse moved Dr Lim, who witnessed the episode from just a few beds away. “The incident left a deep impression on me, as I saw how a nurse’s simple act of kindness helped make a patient happy in the last days of her life.”

Dr Lim began her career in nursing at SGH in 1992, where she developed a special interest in caring for people who had suffered a debilitating illness or injury, requiring

rehabilitation. She desired to help patients lead lives of quality beyond regaining their functionality. “It’s not enough to keep someone alive, as it is not just about treating the disease. We want to help them attain a good quality of life, and push them to their full potential.”

To specialise as an APN in rehabilitation medicine, Dr Lim pursued further studies at various overseas institutions and enrolled in the Master of Nursing course in the Department of Graduate Medical Studies at NUS Medicine in 2006. She also obtained a PhD in Nursing in 2015.

One of the most versatile and autonomous nursing roles today, the role of an APN demonstrates how nursing in Singapore has evolved over the years. “Previously, nurses had always been perceived as

**“We were often questioned on whether there was a need to embed nurses in the communities when people could just go to clinics and see a doctor. But it is important to understand that some elderly residents can be extremely vulnerable—they are prone to falls, take their medication incorrectly, not understand their condition or treatment, and even forget their medical appointments. That is why having community nurses is critical.”**



assistants to the physicians. Today, APNs can examine and diagnose patients, order tests, initiate and evaluate treatment, and even prescribe medicine, in collaboration with physicians. We also conduct research, lead clinical programmes, and teach at academic institutions.” Aside from rehabilitation medicine, Dr Lim leads a community nursing initiative at SingHealth, where a team of 34 community nurses provide healthcare services to a cohort of residents with conditions that range from pre-frail to end of life.

To ensure that there is timely intervention to keep residents well, community nurses trained in specialties are sited within neighbourhoods for residents to have easier and quicker access to healthcare. These nurses provide healthcare services such as health assessments, health coaching and monitoring of chronic diseases, medication management, and coordinate with other health and social care agencies to provide necessary support for the residents. These services are provided at the community nurse posts located within the community or residents’ homes.

Setting up the programme was however, a challenging process which involved convincing several stakeholders. “We were often questioned on whether there was a need to embed nurses in the communities when people could just go to clinics and see a doctor. But it is important to understand that some elderly residents can be extremely vulnerable—

they are prone to falls, take their medication incorrectly, not understand their condition or treatment, and even forget their medical appointments. That is why having community nurses is critical,” explained Dr Lim.

Being in the community allows nurses to better understand the living conditions of the residents, and they are then able to provide more effective care to help their patients manage their health conditions. Dr Lim once had an elderly patient whose health condition was exacerbated by the pet parrot he had at home. “When he visited the clinic, we could just tell him to remove the pet so that his condition can be well-controlled. But when we visited his home, we realised that the pet was his only

companion. So we decided to instead teach him how to handle the pet’s feedings, as his parrot helps keep him going and motivates him to live for another day.”

These experiences have strengthened Dr Lim’s conviction of the importance of community nursing. She hopes the programme to eventually expand to the whole of Singapore, with nurses forming an integral part of the community, and are welcomed by residents as they go about their daily lives in the neighbourhoods.



Scan to watch  
Dr Lim Su Fee:



Photograph taken before implementation of COVID-19 safe distancing measures.

CLASS OF 2020

# Dr Sarah Tham: Caring for the Down And Out



## About:

Dr Sarah Tham—NUS Medicine alumna (Class of 2020), recipient of the Lee Hsien Loong Award for Outstanding All-Round Achievement 2020, and currently a House Officer at the KK Women's and Children's Hospital—is constantly relearning that true healing does not necessarily come through clinical therapy, offering hope and comfort can also work wonders.

**"E**veryone has an expressive urge. But it's particularly pronounced in those who pursue medicine. It's like being a soldier. You've seen great and terrible things." That quote by writer Ethan Canin, a physician, was in Dr Tham's head when she entered medical school.

She counts it a privilege to be able to meet and connect with people from all walks and stages of life, at their moments of greatest need, grief and suffering—and yet celebrate with them in their moments of joy.

"People still fall ill, and people still pass away. And sometimes the best thing that we can actually offer is a simple thing. Like a word of comfort."

Serving the underserved and forgotten had always been a passion for this NUS Medicine alumna. As a medical student, she had actively sought opportunities to serve her local community and communities beyond. These included volunteering with Assisi Hospice to care for the dying, tutoring children from broken families at Chen Su Lan Home, participating as a case writer at her local Meet-the-People sessions, and working with Healthserve to organise health screenings for migrant workers in their own dormitories.

Having previously picked up sign language, Dr Tham co-founded the club SIGNapse to teach healthcare students sign language and engage with the deaf

**"In medicine we can only cure sometimes, but we treat often and we can comfort always."**

community. Since its inception in 2016, SIGNapse has taught more than 1,000 medicine, nursing, pharmacy and dentistry students. It offers free interpretation services at health screenings, greatly facilitating communication for the hearing impaired.

While a student at NUS Medicine, Dr Tham also served as the director of the Public Health Service (PHS) in 2017. The student-led PHS organises the largest annual



student-run health screening in Singapore. That year, PHS served approximately 1,100 Singaporeans with its comprehensive free screening and follow-up programme.

Outside of Singapore, Dr Tham is also actively involved in medical missions and humanitarian work in places like Ipoh (Malaysia), Kathmandu (Nepal), Nagaland and Lucknow (India), and Sangkhlaburi (Thailand). She has worked with children with HIV, victims of sex trafficking, lepers rejected by their families, refugees and minority groups. She says she wants to serve in rural populations where basic

healthcare and sanitation needs are unmet. That led her to head a team of students and doctors to the slums in Lucknow in 2018. During the trip, they worked with a local organisation to provide education, women's empowerment programmes and healthcare for slum dwellers.

Dr Tham believes that such experiences are humbling. Rather than just training the mind, they train the heart to grow in compassion. She is constantly relearning that true healing does not necessarily take the form of medicine and surgery. It can be as simple as offering comfort and hope to a broken spirit.



In 2020, Dr Sarah Tham was awarded the Lee Hsien Loong Award for Outstanding All-Round Achievement. The award recognises outstanding academic and non-academic achievements of post-secondary students, particularly those who have made outstanding contributions to the community and demonstrated the spirit of innovation and enterprise.

Scan to watch  
Dr Sarah Tham:



# When the Brain's Housekeeping Cells Fail

## The “astrocyte” case of Jekyll and Hyde

BY DR IRA AGRAWAL, RESEARCH ASSOCIATE EMMA SANFORD, RESEARCH ASSISTANT JOLIE HO WAN YUN, AND ASSISTANT PROFESSOR LING SHUO-CHIEN, DEPARTMENT OF PHYSIOLOGY, NUS MEDICINE

**J**ust like the prime minister is the most important person in a country's governance, the neurons are the most important cells of the central nervous system (CNS). They are responsible for the transmission of information throughout our bodies and help coordinate our actions, reflexes, and sensations. But working in the background with every prime minister is a large team of secretaries, advisors, publicists, security, and more, who are vital for the minister to do his role efficiently, taking care of his schedule and every need.

Without the support of this team, the minister's schedule would fall apart and their efficiency would be severely affected. In the CNS, the support team for the neurons are the glial cells, made up of cells like astrocytes, oligodendrocytes, and microglia, each of these cells has a specific and collaborative role. The numbers and complexity of glia evolve hand-in-hand with the complexity of the nervous system. Conversely, abnormalities in any of these cells can have a devastating impact on the performance and operation of the nervous system and this study demonstrates the interdependence of the glial cells for function.

### The varied roles of glial cells

Oligodendrocytes are highly specialised cells that produce and assemble the myelin sheath, important for speedy signal conduction across the neurons, while microglia perform the role of security in the CNS, responsible for the immune response.

Astrocytes are the multitasking secretaries or housekeepers, essential for a wide range of key functions, including delivering important metabolites and energy to the neurons and maintaining a homeostatic, i.e. an optimal, balanced environment for the neuronal function. Additionally, astrocytes can become reactive in response to CNS stress due to infection, or trauma. This response can be classified into two types:

- 1) The A1 or cytotoxic reactive astrocytes, that usually occur in response to bacterial infections, which activate the complement immune response and cause death of other cells in the CNS.
- 2) The A2 or neurotrophic reactive astrocytes, that are protective and promote repair and neuron survival.

In other word, astrocytes seemingly have at least two personalities: the good, A2 side; and the bad, A1 side (see figure). Not surprisingly, when



**Interesting fact:** Albert Einstein had more glia than average in his brain.

this multifunctional housekeeping cell has a problem, everyone has a problem—these are the cells we are interested in.

### TDP-43: The ubiquitous director

Our laboratory studies adult-onset neurodegenerative diseases, in particular amyotrophic lateral sclerosis (ALS). ALS is a progressive neuronal disease that results in a gradual deterioration and eventually death of motor neurons (the cells that control voluntary muscle movement). As these cells die, the muscle tissue wastes away while the person's mental faculties and sensory functions remain healthy. The career of Yankee baseball player, Lou Gehrig, was cut short due to ALS. Stephen Hawking was confined to a wheelchair because of ALS.

Unfortunately, there is no effective treatment for ALS at present. How do we study this horrifying disease? The surviving motor neurons and their surrounding glia, including astrocytes, have abnormal protein aggregates containing a protein called TDP-43. Therefore, we and others have hypothesised that dysfunctional TDP-43 in neurons and glia may hold the key to understand ALS. The majority of ALS patients have been found to have mutations in TDP-43, which causes the now defective proteins to aggregate in the cell cytoplasm. These aggregates have been found not only in the neurons but also the glial cells of the patients, suggesting that the loss of TDP-43 function in glial cells

also contributes to ALS disease pathogenesis.

To understand how glial cells and specifically astrocytes contribute to ALS pathogenesis, we studied the effects of TDP-43 loss in astrocytes on the CNS using mice models. Using a genetic trick, known as a the *Cre-loxP* system, we selectively eliminate TDP-43 from astrocytes, but not other cell types, in mice. Although the mice were born and developed normally, they displayed deficits in their motor functions, with poor balance, low grip strength and reduced mobility, accompanied by minor weight loss.

However, surprisingly, these motor deficits were not accompanied by any change in astrocyte or neuron number, no change in either proliferation or cell death was detected in these two cells types. How then was a loss of TDP-43 in astrocytes causing motor deficits? Using unbiased gene profiling and bioinformatic analysis, we found that the TDP-43 deleted astrocytes turned themselves into the bad A1-like reactive astrocytes.

### The domino-effect of the missing TDP-43

Interestingly, these A1-like astrocytes were found to activate microglia (the resident security or immune cells of the CNS) resulting in an increase in expression of Complement component 1q (C1q). C1q is the initiation component of the classical complement pathway, an important immune response pathway that results in the punching of a hole in the target cell's membrane that induces cell death. Furthermore, we found a down-regulation of the genes involved in myelin production and a reduction



Astrocytes are “star-shaped” cells, illustrated as stars in this figure. At least two states of astrocytes are known: a good state, represented by the yellow stars; and a bad state, represented by the red stars. Astrocytes in the good state are beneficial to oligodendrocytes (represented in blue), microglia (represented in green) and neurons (represented in brown). In contrast, astrocytes in a bad state are detrimental to these three major cell types in the central nervous system. In this study, we found that TDP-43 is required to maintain astrocytes in the good state and when TDP-43 is deleted, astrocytes shift to the bad state.

in the number of mature oligodendrocytes. By contrast, there were no corresponding changes in oligodendrocytes progenitor cells (OPCs). OPCs are the source of replenishing mature oligodendrocytes. The data suggests that there is a selective reduction in mature oligodendrocytes without any effect on oligodendrocyte progenitor cells.

Taken together, the data suggests that loss of TDP-43 in astrocytes causes them to activate into A1-like astrocytes that release factors which in turn activate the immune cells, microglia, to initiate the complement system. This dominos-like cascade leads to the death of oligodendrocytes in the CNS, thus reducing myelin production and hence the appearance of motor deficits in the mice. Thus, the loss of TDP-43 expression in just astrocytes led to motor deficits via a complex tri-glial dysfunction of oligodendrocytes, microglia and astrocytes (see figure).

To fall back on the support team analogy: Not only does each member of the support team need to work well individually, but every member needs to work in-sync and coordinate with each other for smooth running of the prime minister's schedule without any hiccups. If any teammate lags behind, the performance of the entire team is affected.

Our study demonstrates that TDP-43 is required for maintaining the protective properties of astrocytes in the CNS, i.e., keeping the defensive and maintenance of astrocytes. Conversely, deleting TDP-43 in astrocytes turns astrocytes into a bad guy, as they bully microglia and oligodendrocytes. These bad interactions among astrocytes, microglia and oligodendrocytes are sufficient to cause motor deficits. Thus, one potential therapeutic strategy is to protect and promote the defensive and maintenance astrocytes.



**PHOTO:**  
Retinal pigment epithelial implant  
embedded in the sub-retinal space  
of a non-human primate model.  
(Credit: A/Prof Su Xinyi)

# Stem Cells Lead the Way to Saving Sight

BY DR KHOR ING WEI

Age-related macular degeneration (AMD) is a debilitating disease that results in blurring or loss of the sharp central vision, which we use to see fine details. AMD affects approximately 196 million people worldwide, a number that is projected to increase to 288 million in 2040<sup>1</sup>.

**T**he macula is a small area in the middle of the retina. In AMD, a single layer of cells under the macula called the retinal pigment epithelium (RPE) is damaged, resulting in blurriness and even central vision loss. In the initial stages, straight lines may also look wavy.

The RPE has many roles, including acting as the blood-retina barrier, controlling fluid transport, and recycling parts of worn-out photoreceptors (special cells in the retina that convert light into an electrical signal for the brain). To carry out their recycling function, the cells of the RPE must be able

to phagocytose (engulf) and recycle photoreceptor outer-segments.

Over the years, researchers have tried different methods to replace the essential RPE layer. These include autologous RPE patches via macular translocation. A promising new approach involves transplanting stem cell-derived RPE cells to the damaged area under the macula.

A team of researchers at NUS Medicine, led by Assistant Professor Su Xinyi, extracted retinal stem cells from donated cadaver adult eyes, grew them into RPE cells and transplanted them into the eyes of monkeys. They found that RPE patches transplanted under the monkey's macula

stably integrated for at least three months with no serious side effects. What is more, the stem cell-derived RPE partially took over the function of the monkey RPE and was able to support normal photoreceptor function.

Importantly, these cells did not undergo transformation to cause retinal scarring, or exhibit any other deleterious effect post-transplantation. Also, these unique cells have the potential to serve as an unlimited resource of human RPE, with the possibility of donor compatibility matching.

Altogether, this demonstrates the feasibility of using adult retinal stem cell-derived RPE transplants to replace defective RPE as a possible treatment for macular degeneration. However, further experiments need to be conducted. This includes evidence to demonstrate adult retinal stem cell-derived RPE can restore vision in diseased non-human primate models, and eventually in regulatory human clinical trials. Nonetheless, this proof-of-principle study is an important early step in validating this approach.

By demonstrating the success of a stem cell transplant to re-establish a new RPE monolayer in preclinical models, A/Prof Su and colleagues offer hope to the many millions of people who are losing their sight to AMD and other macular degenerative diseases.

"These results encourage optimism that hRPESC-RPE



**196 million**

people are affected by AMD globally today

**288 million**

people are projected to be affected by AMD worldwide by 2040

**"These results encourage optimism that hRPESC-RPE may become a promising alternative source of RPE for cell replacement therapy for patients with RPE-dysfunction-related vision loss. In the near future, we hope to conduct first-in-man clinical trials to further validate these results."**

*A/Prof Su Xinyi*

may become a promising alternative source of RPE for cell replacement therapy for patients with RPE-dysfunction-related vision loss. In the near future, we hope to conduct first-in-man clinical trials to further validate these results," said A/Prof Su.

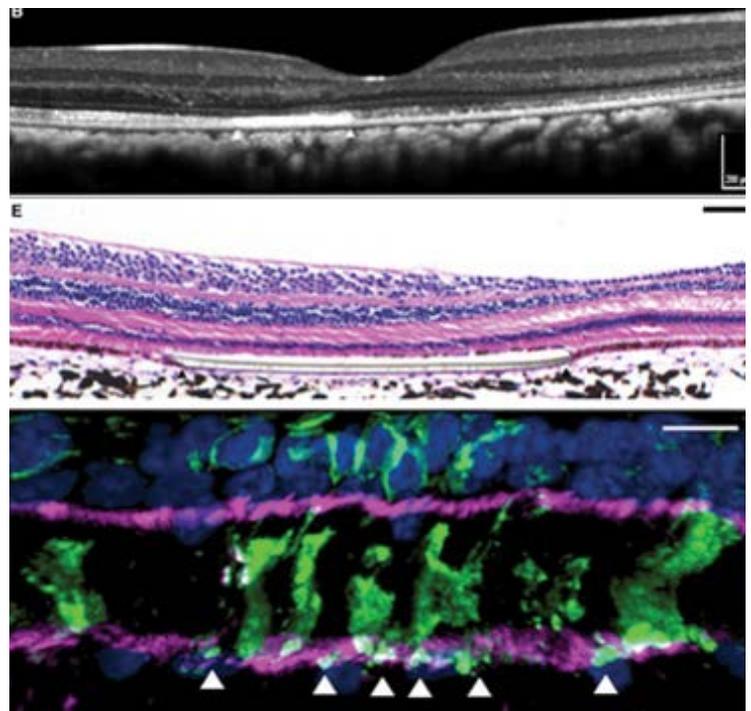
"I am honoured to be part of this international collaboration between Assistant Professor Tim Blenkinsop at the Icahn School of Medicine at Mount

Sinai (New York) and Associate Professor Boris Stanzel from Eye Clinic Sulzbach (Germany)."



Scan to see the full paper:

1. Wong WL, Su X, Li X, Cheung CMG, Klein R, Cheng C-Y. Global prevalence of age-related macular degeneration and disease burden projection for 2020 and 2040: a systematic review and meta-analysis. *Lancet Global Health*. 2014;2:e106-e116.



Transplanted RPE demonstrated functional phagocytosis by the presence of internalised rod photoreceptor outer segments stained with rhodopsin (white arrowheads) within transplanted RPE. (Credit: A/Prof Su Xinyi)





# Efficient Lymphatic Drainage Slows Atherosclerosis Progression

Researchers from the NUS Medicine Immunology Translational Research Programme also demonstrated that the regression of atherosclerosis induced by the cholesterol-lowering drug, Ezetimibe, was dependent on efficient lymphatic drainage.

**T**he lymphatic system, one of the body's two major circulatory systems, primarily consists of a network of lymphatic vessels connected to lymph nodes. Lymphatic vessels are a vital but often overlooked component of the cardiovascular system when seen in contrast to blood

vessels, and have thus been comparatively neglected by scientists and clinicians. However, research advances in the past decades have begun to uncover the importance of lymphatic vessels in health and diseases.

Lymphatic vessels help to rid the body of toxins, fluid

and other waste materials such as lipids from the spaces in tissues. Although lymphatic vessels have been shown to be essential for the drainage of cholesterol from interstitial tissues, their potential role in atherosclerosis, is still largely unknown. Now, researchers led by Associate Professor Veronique Angeli, Director of the Immunology Translational Research Programme, have discovered that efficient lymphatic drainage is an important determinant of atherosclerosis progression.

Atherosclerosis, commonly referred to as the “hardening of the arteries”, is a progressive disease which causes a person’s arteries to become narrow and their walls to lose elasticity due to the accumulation of deposits on the inner lining of these blood vessels<sup>1</sup>. In patients with this condition, substances such as cholesterol, fats, calcium, and fibrin (clotting factors in the blood) build up into plaque and narrow the openings of the affected arteries. As atherosclerosis worsens, it may lead to the blood vessels becoming so narrow as to decrease blood flow. In time, the plaque could break off, causing a blood clot. If the clot is large enough, it can block blood flow through a coronary artery and cause a heart attack.

Consistent with existing scientific evidence, the team of researchers showed that atherosclerosis is associated with the expansion of the lymphatic vessel network. However, despite the increased number of lymphatic vessels draining the affected artery, lymphatic drainage in the vicinity was compromised. This poor lymphatic drainage resulted in lipids, white blood cells and inflammatory substances accumulating in the arterial wall, aggravating atherosclerosis.

The team also demonstrated that the regression of atherosclerosis induced by the cholesterol-lowering drug, Ezetimibe, was dependent on efficient lymphatic drainage. This could point to maximal regression of atherosclerosis happening when circulating atherogenic factors, such as cholesterol and inflammatory mediators, are reduced and

**“These findings are a step forward in understanding a very prevalent disease, showing that atherosclerosis may not only result from increased entry of lipids, white blood cells and other inflammatory factors into the arterial wall, but also from the reduced lymphatic clearance of these factors. Hopefully this knowledge allows clinicians and scientists alike to work towards better diagnosis, treatment and outcomes for patients”**

*Assoc Prof Veronique Angeli, Director of the Immunology Translational Research Programme*

efficient aortic lymphatic drainage is promoted.

“These findings are a step forward in understanding a very prevalent disease, showing that atherosclerosis may not only result from increased entry of lipids, white blood cells and other inflammatory factors into the arterial wall, but also from the reduced lymphatic clearance of these factors. Hopefully this knowledge allows clinicians and scientists alike to work towards better diagnosis, treatment and outcomes for patients,” said Assoc Prof Angeli.

“This knowledge suggests that strategies to improve or preserve lymphatic drainage should be considered in conjunction with using existing drugs as treatment options for atherosclerosis, which is a dominant cause of cardiovascular diseases in Singapore and in the rest of the world,” she added.



*More details of the paper can be found here:*



The NUS Medicine Immunology Translational Research Programme aims to understand the role of the immune system in health and diseases. The programme strives to enable the discovery and development of more effective immunotherapy, new treatment guidelines and diagnostic tests for patients with disease-specific problems such as autoimmune and airway diseases, cancer, chronic inflammation, infections and organ/tissue transplantation. These goals are to be achieved by fostering collaborative research and advancing latest technologies to probe immunological mechanisms, and enhancing infrastructure for clinical translation.

1. <https://www.myheart.org.sg/my-heart/heart-conditions/atherosclerosis/>.

# A Song a Day Keeps Dementia at Bay

Group singalong sessions are as good as health education programmes in helping to prevent cognitive decline in elderly people.



Photograph taken before implementation of COVID-19 safe distancing measures.

**E**lderly people at risk of developing dementia may benefit from choral singing as an alternative to attending health education programmes. While both aim to retard/prevent age-related cognitive decline, new research by NUS Medicine suggests that choral singing intervention is equally effective in delaying cognitive decline as a structured health education programme targeting known risk factors of dementia such as hypertension, obesity, smoking, depression, physical inactivity, diabetes, and social isolation.

**“Our study is the first randomised trial in the world that systematically assessed the effects of singing on cognitive decline in ageing and the potential effects on brain imaging, immune system and oxidative damage markers. Our findings from the very first randomised controlled trial on this topic suggest that choral singing is a potentially useful intervention for the promotion of cognitive health in ageing.”**

*A/Prof Feng Lei, Department of Psychological Medicine*

### **Cognitive decline among the elderly**

Cognitive function declines with increasing age. This universal phenomenon affects the majority of Singaporean elders. Impaired cognitive function presents a major obstacle

to healthy, functional, productive and successful ageing. With a rapidly-ageing population, effective interventions are critical to maintaining good cognitive function and preventing age-related cognitive decline.

## The intervention programmes: Choral singing vs health education programme

In a randomised controlled trial (RCT), Assistant Professor Feng Lei from the Department of Psychological Medicine at NUS Medicine worked with 93 participants who had an average age of 70. One group of these senior citizens was assigned to the choral singing intervention led by professional musicians, while a second group attended the health education programme conducted by family physicians, specialist clinicians and community nurses. This established programme comprised short talks as well as activities that emphasised memory work and the acquisition of certain skills.

For a period of two years from 2015 to 2017, the choral group sang weekly at the Yong Siew Toh Conservatory of Music, NUS. Each session was an hour long and participants were exposed to the musical, social, and physical aspects of choral singing. The focus during the sessions was to educate participants to understand the concept of sound, the mechanics of the singing voice, and differentiate good from bad singing.

Later in the programme, participants learnt to sing in different parts. The parts were taught aurally and slowly, helping each singer to understand how they represent different lines in the musical harmony at any point in a musical piece with two or more parts. Several performances were also included as part of the intervention programme, the purpose of which was to promote motivation and a sense of purpose, pride and accomplishment. The participants also performed at the Victoria Concert Hall for the 2019 Voices of Singapore Festival.

Over the same period of time, the health education programme was also held weekly at the Training and Research Academy in Jurong Point (TaRA@JP). The hour-long sessions consisted of short talks on health-related topics—diabetes, physical activities, healthy eating and depression. Participants also took part in activities that required memory work and the acquisition of certain skills, though none involved singing.

Comparing both intervention programmes, A/Prof Feng Lei and his team found common elements such as social interactions, a sense of belonging and the building of friendships over time.

## Choral singing as a promising candidate to reduce cognitive decline

Choral singing is a novel and promising candidate that has not yet been assessed by a well-designed clinical trial. Based on existing trials and studies, people engaging in lifelong music-making have been found to have better cognitive outcomes later in life. Both amateur and professional singers and musicians have brain features younger than their chronological age, suggesting that music-making has an age-decelerating effect. Singing may therefore be an engaging and effective way to prevent age-related cognitive decline.

To measure the results of the study, the primary outcome was the change in cognitive function during the intervention period. Additionally, secondary biological outcome variables were also measured, including brain magnetic resonance imaging (MRI) metrics, blood markers of immunosenescence and peripheral markers of oxidative damage.

## Both amateur and professional singers and musicians have brain features younger than their chronological age.

The study, which was published in the biomedical journal, *Aging*, suggests the possibility of choral singing being superior to health education in promoting cognitive health in older people. A definitive conclusion cannot however be drawn, given inadequate statistical power and inconsistent findings using different analytical approaches.

“Our study is the first randomised trial in the world that systematically assessed the effects of singing on cognitive decline in ageing and the potential effects on brain imaging, immune system and oxidative damage markers. Our findings from the very first RCT on this topic suggest that choral singing is a potentially useful intervention for the promotion of cognitive health in ageing. Choral singing is a safe and enjoyable activity, and is likely to be embraced by the community. Policymakers may consider promoting choral singing for healthy and active ageing of seniors in the community, when health authorities determine that the COVID-19 pandemic situation has been resolved. Choral singing is especially relevant for countries where existing resources are available,” said A/Prof Feng Lei.

“There is no cure for dementia, and ageing without dementia and disability is possible by adopting lifestyle behaviours which you enjoy and make you happy such as choral singing. Other alternatives include horticulture, strong social network, exercise with cognitive stimulation, brain healthy diet, having a purpose in life and making sure all your chronic diseases are under control,” added Associate Professor Reshma Merchant, from the NUS Medicine Department of Medicine and Head & Senior Consultant of the Division of Geriatric Medicine, National University Hospital.

# Love in the Living Years

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



**H**e lay in the hospital bed, wasted and aged beyond his 50-plus years by cancer and a lifetime of unspoken struggles, no longer able to speak, his complexion the greyish hue of imminent death. Initially labelled as a “loner” without a fixed abode, it was a surprise to discover that he did have a family. In fact, he was married and had children, but had parted ways with them years ago. It was only now, realising that he was not going to leave the hospital, that he began to express his yearning to see his estranged family.

The resourceful medical social worker got to work immediately and managed to contact the family, but by the time they came to the hospital, he was no longer conscious. His children did not want to share much of what happened, but they did write a note in English and Chinese for him. The English version went like this:

*Dear Father,*

*M, W and H came by to visit you yesterday. It's getting late and we are heading home now.*

*What's past is past. Let bygones be bygones. We have already forgiven you. You need not take it to heart.*

*Rest well and let the past go.*

*Your children.*

They stood by his bedside and read out the note, then put it into his pyjamas pocket. He died two days later. I would like to believe that his spirit heard and felt their words, and he was able to depart with a peaceful heart.

The bonds between parent and child are as old as time, and they are not just biological, but psychosocial, emotional and spiritual. Not everyone has been a parent, but all of us have been children who have had to navigate our relationships with our parents or parental figures.

That will be the perspective I will focus on.

So here are some words of reflection to adult children everywhere, based on my observations of parent-child interactions over the years. You, the reader may of course make of them what you will:

**Just because your parent does not say “I Love You”, doesn't mean they do not love you, sometimes both of you aren't speaking the same language.**

In 1992 Gary Chapman wrote a book called “The Five Love Languages: How to Express Heartfelt Commitment to Your Mate” in which he described how individuals in a relationship can differ in the way they express care and concerns. He described the five “Love Languages” as:



Words of Affirmation



Physical Touch



Receiving Gifts



Quality Time



Acts of Service

While the book referred to romantic relationships, I find the love languages can be observed in any caring relationship. Furthermore, within families there are certain ways of doing things, a family culture. Then there are generational differences. All of which can lead to differences in communication styles and ample opportunities for misunderstanding. Such as “I work hard to give you all the opportunities I never had, doesn’t that show how much I love you?”

A patient’s wife once told me he had never once hugged or cuddled their children, never said “I love you”, but acknowledged that this man of few words was a devoted husband and father. And yet to us, the Palliative Care team, he described his wife as “Number One” and that she had given him three filial daughters. It is ironic that the words a dying person should most say to their family, they find it easier to express to a third party. I have come to realise that it is less about lack of affection and more about feeling awkward about relating to one’s family in an unfamiliar manner. Patients do say things to us that

they can’t say to their loved ones, and sometimes my role is to ensure that these expressions of love reach the people they are meant for.

### **A relationship is always a relationship**

Not all parent-child relationships are loving and supportive. I have met a number of people whose growing up years were marked by neglect, manipulation, abuse and/or abandonment. And when that parent was dying or had died—the parent who was absent for years, or who had inflicted verbal, emotional or physical violence on them—they were blindsided by the intensity of grief. Even if they had, in their minds, severed ties with this parent, the pain of loss was palpable. And this loss is often complicated, entangled with years of often unresolved (or partially resolved) parent-child and other issues.

A parent-child relationship is more than skin deep, deeper even than a shared genetic make-up. The death of a parent affects all your relationships, not only with the one who has died, but also with the living. Often, as an adult child, you not only have to deal with your own grief, but that of your surviving widowed parent. Everything has changed, yet to the outside world, much remains the same.

A lot of the work of bereavement is to “unpack” all those issues and remake those relationships into ones that carry us forward in a positive way.

### **It’s horrible to have to say goodbye, but at least you have the chance to say goodbye**

Ask people what they consider to be a good death, and a good

## **A parent-child relationship is more than skin deep, deeper even than a shared genetic make-up. The death of a parent affects all your relationships, not only with the one who has died, but also with the living.**

proportion would pick a sudden passing, for example, to go to sleep and not wake up. But for the ones left behind, there is no chance for a final goodbye.

In his book “The Long Ride from Singapore”, my friend and colleague Philip Lau writes about the sudden death of his father from a heart attack, and hearing the news whilst delivering a lecture thousands of miles away in South Africa, where he was training in trauma surgery.

“I remember my Armenian colleague Serguei Darchiev saying something about getting drunk and letting someone else make the arrangements to get me home. Then he drove me back to my rented lodgings and I just sat there. It was around sunset when some of the nurses and residents drove by with the plane tickets. They asked if I was alright and I shook my head. Not being alright was the only thing I was certain of. Then we just sat by the garden and watched the African sun go down, the first without Dad.”

The price of love is loss. Knowing your parent is dying is terribly painful, but it is also an opportunity to prioritise what is important, say what needs to be said, make meaningful memories, and to live every day with purpose. Until the time comes to send them off with a blessing, a contraction of “God Be With You” that we now know as Goodbye.

## *The Living Years by Mike and the Mechanics*

Songwriters: B.A. Robertson / Mike Rutherford

The Living Years lyrics© Peermusic Publishing, BMG Rights Management, Concord Music Publishing LLC

Every generation  
Blames the one before  
And all of their frustrations  
Come beating on your door

I know that I'm a prisoner  
To all my Father held so dear  
I know that I'm a hostage  
To all his hopes and fears  
I just wish I could have told  
him in the living years

Oh, crumpled bits of paper  
Filled with imperfect thought  
Stilted conversations  
I'm afraid that's all we've got

You say you just don't see it  
He says it's perfect sense  
You just can't get agreement  
In this present tense  
We all talk a different language  
Talking in defence

Say it loud (say it loud), say it clear  
(oh say it clear)  
You can listen as well as you hear  
It's too late (it's too late)  
when we die  
(oh when we die)  
To admit we don't see eye to eye

So we open up a quarrel  
Between the present and the past  
We only sacrifice the future  
It's the bitterness that lasts

So don't yield to the fortunes  
You sometimes see as fate  
It may have a new perspective  
On a different day  
And if you don't give up,  
and don't give in  
You may just be okay

So say it loud, say it clear  
(oh say it clear)  
You can listen as well as you hear  
Because it's too late, it's too late  
(it's too late) when we die  
(oh when we die)  
To admit we don't see eye to eye

I wasn't there that morning  
When my Father passed away  
I didn't get to tell him  
All the things I had to say

I think I caught his spirit  
Later that same year  
I'm sure I heard his echo  
In my baby's new born tears  
I just wish I could have told  
him in the living years

Say it loud, say it clear  
(oh say it clear)  
You can listen as well as  
you hear  
It's too late (it's too late)  
when we die (it's too late  
when we die)  
To admit we don't see  
eye to eye



# MedTech Will Change Our Lives. Are We Ready?



*BY PROFESSOR ROGER FOO, ZAYED BIN SULTAN AL NAHYAN PROFESSOR IN MEDICINE AND DIRECTOR, CARDIOVASCULAR DISEASE TRANSLATIONAL RESEARCH PROGRAMME, NUS MEDICINE, AND SENIOR CONSULTANT, DIVISION OF CARDIOLOGY, NATIONAL UNIVERSITY HEART CENTRE, NATIONAL UNIVERSITY HOSPITAL*

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Do you think our friends and family would like it if the temperature detector at entrances of shopping malls today also flash red and gives a beep if our blood sugar is high, or if it detects elevated blood pressure?

**D**iabetes, hypertension, lipids, or DHL, is a big issue for any well-developed society. It is one in which food is in high abundance, and present in quality that ranges from good to irresistibly good. It is also one in which a sedentary way of life is easy to slide into. Our forefathers have had to work hard at making a living, and much of that entailed labouring outdoors, or walking for miles to get the work done.

Today, we still have to work hard to make a living (often indoors), but we also now have to work hard at keeping fit and healthy. But there are always those who will not want to hear that they are not doing well at managing their own health. In recent weeks and months, the School's Engineering in Medicine events showcased much amazing technology: detectors and sensors that can monitor coughs, electrolytes, bugs, etc. If it is a quantifiable entity, we can (and will) find a way to pick it up.

We are hunting for the biomarkers to pick out conditions before they manifest or before severe disease sets in, when complications become harder to reverse. That is the objective of research in stratified medicine, being able to identify the at-risk group of people in any population, and channel resources to those targeted groups. But is the population a willing partner in our quest?

I am still seeing patients who are not coming back to the clinic after being told that their hypertension needs treatment. A taxi driver, who drove a colleague and I, said he would not come to the hospital because he was convinced it would be a one-way road to the end. A running topic of amusement is our typical Asian mother (or grandmother) who wants her son or daughter to study medicine, but refuses to see a doctor when she is ill. This may also apply to the father or grandfather, of course.

But the disconnect is there. There is a lot of ongoing public health effort. Our health education drive is at an all-time high. Very advanced and exciting technology are marching into our society presently. We learnt this week that Verve Therapeutics has succeeded at their non-human primate trial in which a CRISPR-enabled deletion of the *PCSK9* gene looks like it will result in lifelong ~50% reduction of LDL-cholesterol<sup>1</sup>. They expect to start first-in-man studies by 2022.

A “once and for all” therapy to lower cholesterol, which

is what CRISPR offers, means that this could be a public health opportunity to knock back heart attacks like no other preventative approach has ever achieved. We know this is possible because smallpox was successfully eradicated through public health measures, and screening for Thalassaemia has reduced major cases in Singapore significantly<sup>2</sup>.

Epidemic infections or fatal genetic diseases are not the same as metabolic diseases. It is naive to link them by analogy. The latter involve lifestyle choices, but all of these conditions cause severe mortality and morbidity. Barring the differences in technology (vaccines or genetic testing versus CRISPR), what can be achieved for a population is significant and potentially game-changing. Our campus, and Singapore, is abuzz with new medical technology (MedTech), AI and devices that will change how we can prevent or manage diseases. Exciting near-future

### MedTech Examples



**Oura Ring**  
monitors our sleep-wake cycles

**Fitbit**  
counts our steps

technological innovations are home monitors involving smartphone apps. These will help us to keep in touch with patients or offer advice on lifestyle choices. A part of the population is very excited to make this work.

Some of us have already bought the Oura Ring to monitor our sleep-wake cycles<sup>3</sup>, or a Fitbit to count our steps. We are also the ones who want to be in touch with our doctors to hear about our health or that our effort with managing our health is paying off. We will be the ones who will step quickly and excitedly into that queue at the shopping mall for the temperature-taking device that also tells us how our blood sugar or blood pressure are doing. Do we need to devise means by which to bring the stragglers and doubters along? A convergence of technologies that encourages and informs would be most helpful to those of us wanting to help improve the health of our nation.

## A “once and for all” therapy to lower cholesterol, which is what CRISPR offers, means that this could be a public health opportunity to knock back heart attacks like no other preventative approach has ever achieved.

1. <https://www.vervetx.com/press-releases/verve-therapeutics-presents-new-data-in-non-human-primates-validating-gene-editing-as-a-treatment-approach-for-coronary-heart-disease-at-the-isscr-2020-virtual-annual-meeting/>.
2. [https://www.slideshare.net/Thalassaemia\\_Intl\\_Fed/singapore-11884371](https://www.slideshare.net/Thalassaemia_Intl_Fed/singapore-11884371).
3. <https://ouraring.com/>.

# COVID-19 Has Given Singapore a Great Opportunity to Restructure Time Use and Sleep

BY PROFESSOR MICHAEL CHEE, DIRECTOR OF THE CENTRE FOR SLEEP AND COGNITION, NUS MEDICINE

**M**ost people today acknowledge that sleep, something we spend a quarter to a third of our lives on, is in need of improvement.

However, not unlike New Year resolutions to exercise more and/or eat more healthily, mental notes-to-self about sleep quickly fall aside on the ceaseless treadmill of news, work, social obligations and activities.

This year however, the annually recurring parade of sleep tips,



Less than  
**15%**  
of Singaporean  
students sleep  
**8 hours a day**

foods, hacks, beds, aromas and diagnostic tests, merits a relook.

The far-reaching impact of COVID-19 on everyone gives us reason to re-examine societal attitudes to sleep and act on them with the same resolve we collectively threw at the virus.

It makes much sense to pay attention to sleep because over time, it will have greater impact on health, well-being and the economy than COVID-19.

Societies that have done better in the pandemic paid attention

to scientific findings. Thoughtful governments like Singapore's anticipated the danger of COVID-19 and worked with the public to contain its damage.

Some politicians elsewhere dressed up the inconvenient truth, proposed untenable quick fixes and skirted the issue until it became simply too catastrophic to ignore.

We should take a leaf from our success at dealing with COVID-19 and transfer this to managing sleep, productivity and well-being.



Science says that we need to pay attention to sleep.

Secondary school students in Singapore report sleeping an average of 6.5 hours on weekday nights.

Empirical data collected here indicates that this quantity of nocturnal sleep is insufficient for optimal vigilance performance.

Eight hours a night suffices but fewer than 15% of Singaporean students achieve this.

Speed of processing and critically—mood—are also consistently affected by successive nights of inadequate sleep.

Visual information is more slowly captured, distractions are harder to suppress, and temporary information storage capacity is lower when we are sleep-deprived.

Adequate sleep is important for memory-encoding. Sleep-restricted students show improved memory when allowed to nap. Insufficient sleep blunts the willingness to deploy cognitive effort to perform tasks.

In sum, and contrary to popular thinking, higher cognitive performance can be achieved by setting aside time to obtain sufficient sleep.

While e-devices undoubtedly take up users' time, feeling the need to complete homework before going to sleep is a dominant reason



COVID-19 lockdowns reduced commute times by about

**110 minutes**

but sleep duration has only increased

**17 minutes**

why our students sleep later, and less.

Although sleep is sacrificed in the belief that it is for a better life, available data indicates that higher performing students sleep earlier (and more adequately).

Our analysis of a US-based data set indicates that students who better comply with both sleep and screen time recommendations achieve higher cognitive test scores.

Contemporary provisions made for employee wellness indicate recognition of the benefits of preventive measures.

However, just like improving diet and exercise, it is difficult to translate good intentions into behavioural change.

Transforming sleep is not unlike facing climate change.

Most people recognise it is a problem, but the collective will to shift accustomed lifestyles to make time for sleep is weak.

The disruption wrought by the pandemic has given us an opportunity to explore alternative ways of living and working.

COVID-19 lockdowns reduced commute times by about 110 minutes, affording the repurposing of that time for things we had less time for in the past.

For workers whose jobs were mostly not under threat during the lockdown, reduced commuting provided opportunities to allocate the time saved to family activities, exercise or sleep.

However, data indicates only a fractional increase in sleep duration of 17 minutes.

What are some of the pushbacks to changing mindsets?

The erosion of boundaries between work and personal time, the widespread expectation that one needs to be contactable and able to answer emails after office hours reduces time to recuperate mentally and physically.

Elite athletes know that improvement and maintenance of high performance require balancing workload and rest periods.

The metabolic benefits of intermittent fasting speak to the same idea—that physiological systems cannot be constantly put under load without consequences.

To these ends, some countries have already enacted “right to disconnect” laws restricting employee contact for work reasons after office hours.

There was a parliamentary debate in Singapore about such a law to mitigate burnout and health issues.

Commentaries in the media indicate that currently, many office workers and leaders are engaged in serial Zoom meetings well into the evening.

While these can be attributed to having to deal with business uncertainties and how to adapt, the disruption should also have provided opportunities to examine how to work more efficiently.

In the case of home-based learning, anecdotal reports suggest significant diversity in how students coped.

Weaker ones showed a need for learning habits to be strengthened through face-to-face interaction, while stronger ones zoomed along.

Schools seem to have responded by uniformly raising official school contact time across the board instead of allowing this to be more adaptive.

In the future, many more students everywhere will be relying on remote learning, so creative approaches beyond pedagogy to deal with problems as well as opportunities are required.

The pandemic uncovered significant weaknesses in the governance and social fabric of some Western societies.

While these societies command thought leadership and control of many key intellectual assets, the handling of COVID-19 has shown remarkable gaps in their ability to transform good ideas into outcomes.

Singapore’s ability to commit to a cause and then execute well should be extended into the realm of managing time use, work-life balance and sleep in a manner that allows its citizens to benefit.

New businesses and opportunities for thought leadership could arise from taking up this challenge.

The way that work is being restructured and education reconfigured provides a golden opportunity to transform how we value sleep, and incorporate good sleep habits into efforts that enable Singapore to emerge stronger from the pandemic.

**Singapore’s ability to commit to a cause and then execute well should be extended into the realm of managing time use, work-life balance and sleep in a manner that allows its citizens to benefit.**

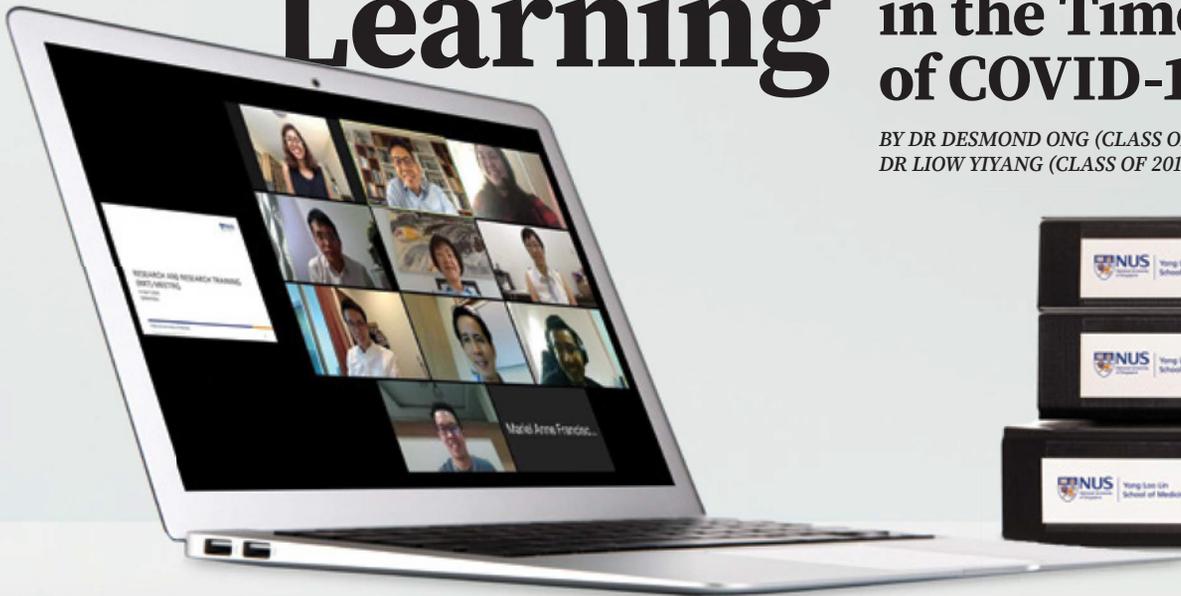
This article was first published on 15 March 2020 in The Straits Times, and has been reproduced here with kind permission.



PHOTO:  
A department  
research meeting  
attended by Yiyang  
and Desmond,  
conducted online over  
Zoom, in April 2020.

# Teaching and Learning in the Time of COVID-19

BY DR DESMOND ONG (CLASS OF 2002) AND  
DR LIOW YIYANG (CLASS OF 2015)



On the morning of 5 February 2020, we were brimming with excitement—fuelled with coffee and zest—at the Department of Family Medicine. Just weeks earlier, we had signed up to be the Department's first academic scholars, under the mentorship of Professor Doris Young, Dr Goh Lay Hoon, Dr Victor Loh and Dr Anne Yeo.

Returning to our alma mater to explore academia in our chosen field of specialisation was a once-in-a-lifetime opportunity for us. However, our excitement quickly turned to uncertainty as the COVID-19 pandemic spread globally. Little did we know, that morning would be the last time we would see each other in person for some time. It would be a memorable journey through what was an unprecedented year for everyone.

## Education

The first and most pressing

task was to help our undergraduate education team adapt to the challenges brought about by the pandemic. As Singapore entered the Circuit Breaker period, we had to ensure that our Phase III medical students continued to receive quality clinical training while maintaining safe distancing measures.

Much of the undergraduate curriculum had to be converted to online teaching. To supplement existing lectures and workshops, we each crafted a Collaborative Learning Case (CLC) on



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two common presenting complaints to teach our students clinical reasoning. These case-based interactive sessions were taught to classes of almost 80 students over Zoom and were well received. We also helped to conduct our hallmark Simulated Clinic Teachings (SCT) online, where students got to interact with simulated patients and learn communication, diagnostic and management approaches. It was important to us that our students formed a perspective on how Family Medicine (FM) was contributing to the pandemic mitigation efforts. Thus, we organised a “Primary Care Response to COVID-19” online forum where students had the opportunity to interact with primary care physicians working on the frontlines and even interviewed foreign workers who were housed at the Singapore Expo.

A big part of FM learning occurs in-person at our GP clinics and Polyclinics. We kept in constant communication with our tutors on the evolving changes and restrictions with on-site clinical teaching. Determined to ensure continued clinical training in a safe manner, we assisted our industrious GP tutors to livestream their consultations to students while our polyclinic tutors valiantly continued in-person teaching. Our tutors’ commitment to teaching during what was a trying time operationally for their respective clinics was nothing short of inspirational to us. Wanting to finish the posting on a light-hearted note, we came up with an educational ‘end-of-posting game’ to the

tune of the famous American gameshow “Who Wants to be a Millionaire?”. Students took turns to be grilled in very different ‘hot seats’ by our own Regis Philbin, Desmond! Nobody went home a millionaire, but everyone thoroughly enjoyed themselves.

The pandemic did not just bring about challenges but also opportunities to take stock, try new methods and improve curriculum. Both of us worked on freshening up the FM Academic Project, which involves our Phase III students collecting observational data during their clinical attachments around important themes such as Rational Prescribing and Preventive Health. They are guided to present and discuss these observations in a meaningful manner at the end of their posting. Having reviewed the feedback received in recent years, we worked to improve the curriculum by adding new topics, introducing qualitative components and digitalising data entry. Video-based learning has been widely embraced by educators since the onset of the pandemic. Along with the incredibly resourceful NUS EduTech team and generous healthcare professionals from Jurong Polyclinic, we filmed a short video introducing primary care and its people to our young Phase I students. Learning how to teach effectively through video was an educational experience for ourselves. These curricular changes and additions were positively received by students and faculty alike.

As budding medical educators, the past year has been one of tremendous learning and growth. There was a silver lining to the pandemic—we forged strong ties with our undergraduate education team, which we believe will be fundamental to our joint efforts in delivering quality education in years to come. Together with our team members, we were honoured and grateful to have our efforts in medical education recognised by the School through the NUS Fortitude Award in October 2020.

### Research

Under the guidance of our mentors, we started research projects in the domains of Healthcare Data Analytics and Child and Maternal Wellness. Both have been awarded competitive funding.

Desmond's research study focuses on using quality care indicators for the detection and management of chronic kidney disease (CKD) in primary care. It will extract retrospective secondary data for analysis, using a set of quality care indicators to assess the state of detection and management of CKD in National University Polyclinics (NUP) over the past three years. Through the analysis of the data, a risk prediction model will also be developed, to identify patients at higher risk of disease progression. This is also an international study, with overseas collaborators conducting similar studies, and results will be shared for comparison and analysis. The study has been awarded the NUHS Primary Care Physician

Research Development Seed Grant and data analysis has started. At a research forum jointly organised by NUP and DFM, Desmond shared about the study with an audience that included various primary healthcare stakeholders. There was much excitement about its potential findings and implications on how we can manage CKD in primary care.

Yiyang's qualitative research on Primary Care Physicians' (PCPs) perspectives on Postnatal Mental Health Problems (PMHPs) is timely given the recent announcement of the Ministry of Health's intention to develop and implement a five-year Child and Maternal Health and Well-being strategy and action plan. PMHPs are prevalent and PCPs are well-placed to identify and manage them in the community. However, little research has explored their views and experiences. Findings from

the study may highlight barriers to care, training needs and inform policy development. The study has also received seed funding from NUHS and is ongoing. Besides starting this project, Yiyang contributed to several publications in the Singapore Medical Journal, Hong Kong Medical Journal and Primary Care Diabetes.

Besides doing research, both of us also had the opportunity to participate in the teaching of research, having co-facilitated the NUHS FM Residency research workshops. We guided residents in taking their first steps into research, including developing a research question and conducting a literature review. It was inspiring to see young family physicians-to-be interested in research and coming up with exciting ideas. The series of workshops cumulated with the residents

Desmond and Yiyang with Dr Victor Loh during a teaching session in March 2021.



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presenting their research proposals to faculty and fellow residents in December 2020. Lastly, Desmond mentored NUP Fellowship in FM (Advanced Specialty Training) trainees in starting their own research projects, ensuring the next generation of FM leaders would have strong grounding in research principles.

### **Development and training**

In the past year, we were given many opportunities to develop our knowledge and skills in research and education. We attended research workshops that introduced us to research methodology as well as basic and intermediate statistics. The Scholarship of Teaching and Learning (SoTL) and Research in Medical Education (RIME) courses piqued our interest in health professions education and pedagogical research.

We were also given the incredible honour of joining the Asia Pacific Academic Primary Care Group, which includes leaders and mentors from various academic FM institutions. We attended their biannual meetings as scholars and shared in the discussion and discourse of ideas and innovations to further FM.



Desmond filming for a teaching video on Motivational Interviewing in August 2020.

(Filming was done in strict compliance with existing COVID-19 safe distancing requirements.)



Looking back, we have come a long way since that first morning in February last year. Thankfully, we have stepped back into the office, with safe-distancing measures observed of course! Through the long days and countless Zoom sessions, our experience would not have been as rich if not for the mentors from our department who walked the journey with us.

Entering our second year, we look to build on the foundations laid and to go

from strength to strength. Curriculum development and completing our research projects are priorities. We also hope to form new collaborations with local and international research partners. Finally, just as our mentors have done for us, guiding the two new scholars who recently joined our department is a responsibility we relish. It certainly feels like the journey has just begun and we are privileged to be part of a programme that heralds a bright future for academic FM in Singapore.

**PHOTO:**  
In December 2019, the author encouraged her dad to have a vacation in the Philippines to catch up with relatives. He enjoyed himself and promised the family that they would go back every year from then on. (Photo courtesy of Paula Say)



# I Am a Nursing Student. This Is How I Cared for My Dying Dad

BY PAULA NAZARENE EVANGELISTA SAY

As a third-year nursing student, I relished my peers' stories on caring for patients on their deathbed in the hospital. Little did I know that the first death I'd witness would be my dad's, in our very own living room.

**I**n January 2018, my dad was diagnosed with early stage nasopharyngeal cancer (NPC), which is cancer of the upper throat. He was 54 then.

I had just turned 19 and was awaiting my A-Level results.

My family was in disbelief, but the doctor gave us high hopes: "NPC is one of the most curable cancers. At this stage, 95% of people are cured, so don't worry!"

By May 2018, things seemed to be going well with my dad's

condition. Scans showed that the tumours had almost been completely obliterated by the treatment.

My dad and I both returned to work—he as a civil engineering manager and me as a clinic assistant before I started university—and life continued as usual. We went for weekly chemotherapy sessions together, and were hopeful.

In August, several weeks before I started nursing studies at NUS, scans showed

new small tumours in my dad's other organs.

In other words, the cancer had spread, and getting rid of it was close to impossible.

His oncologist, ever so gentle, left us with these words: "Mr Say, the past few months we treated you with the intention of cure. Now, I'm afraid that will have to change."

### **Nursing: A blessing in disguise**

Over the next two years, my family—especially my dad—went through a lot.

I happily became a private nurse for my dad, complementing the emotional support that my mum and my siblings lovingly gave him.

I used the knowledge I gained in school to do physical assessments, observe his signs and symptoms, and explain each medication, procedures, and treatment plan to him.

I especially enjoyed giving him injections and doing wound dressings for his surgery sites. He allowed me to learn from him, through his condition.

The author says that from her nursing classes and hospital placements, she learnt skills such as injection techniques and wound care, which her dad needed. (Photo courtesy of Paula Say)



## **I used the knowledge I gained in school to do physical assessments, observe his signs and symptoms, and explain each medication, procedures, and treatment plan to him.**

Being a nursing undergraduate allowed me to provide the best possible care for my dad as a daughter and as a future healthcare professional. Everything worked together for good.

### **The death talk**

Our family migrated to Singapore from the Philippines in 2008. I have a younger brother and older sister.

Filipinos love to sing. One night in August last year, upon my dad's request, we sang karaoke at home.

The night ended with him serenading my mum with their favourite love song, Kahit Maputi na ang Buhok Ko, a number about growing old together, while still madly in love.

Little did we know that that would be the last time he'd be able to sing.

The next morning, he had a septic shock—a severe drop in blood pressure and an extremely fast, serious, and ruthless silent killer—and we had to rush him to the hospital.

With all my classes thankfully held online, I stayed in the hospital 24/7.

"Always be your patient's advocate," nursing school drilled. So I did.

I became my dad's voice and gave suggestions to the medical team based on my nursing knowledge and observations.

Even though I was a student, the doctors listened and spoke to me as an equal, accepting some suggestions I raised. Those gestures validated my knowledge, competence, and increased my confidence as a future healthcare professional.

About halfway through that hospital stay, his oncologist took me aside.

"I think it's time to talk to your dad about his final wishes," she said. "Knowing you, your dad and your family, I thought it was best it came from you."

In the hospital, I always knew exactly how to make my patients feel better. It was my forte.

But my dad and I had never had "the death talk" before. How do you break to someone he's dying, and dying fast, let alone your own father?

I sat by my dad's hospital bed. For the first time in two years, I wasn't bursting with confidence.

For the first time in two years, I was fearful, holding back tears as I personally grappled with the fact that this could be it.

“We’re entering a new chapter of your care, daddy. I don’t think we have a very long time left.”

He wouldn’t even have the chance to see me graduate, I thought.

“I can feel it, Paula,” he croaked. “Explain the situation to your mum and your siblings. Take care of your mum, especially.”

And I did. That night, I left the hospital for the first time in two weeks, and talked to my siblings about how we could best support our parents, and each other.

The next day, I spoke to my mum with a heavy heart. It felt like walking on eggshells: Any wrong word could break her heart. She cried and cried, but she understood.

We understood.

### Going home

Amidst the emotional turmoil, my dad made it clear that he wished to go home.

He was mostly bedbound at this point, and had difficulty moving due to the excessive water retention in his body.

To prepare for home, the hospital nurses and I taught my mum and my siblings how to change his diapers, do bed sponging, and carry out other basic nursing care and techniques.

I then spent the next week or so juggling between the demands of university and single-handedly setting up a home hospital in our living room from scratch.

Again, nursing studies came in handy—how else would one know that a Christmas tree adaptor is needed for the oxygen concentrator?

## Nursing studies came in handy—how else would one know that a Christmas tree adaptor is needed for the oxygen concentrator?

My confidence quickly turned into nerves as the day neared. Bringing him home meant that I’d be the sole “medical personnel” around, and if anything happened, the responsibility would be on me alone.

But I was determined to fulfil my dad’s wish to be home with family.

We finally brought him home, after five weeks in the hospital. He didn’t look good, and was drifting in and out of consciousness.

The doctors warned that he could pass on a few hours upon reaching home.

“Oh, I’m home already!” my dad exclaimed, mildly confused, realising that he was home only three hours after the fact.

It was also one of his last few intelligible phrases, as he continued to rapidly deteriorate over the next few days.

The doctors trusted me with his medical care at home—medications, injections, procedures and so on—emphasising on the most important things to look out for in end-of-life care.

My mum and my siblings helped with basic nursing care, while I focused on his medical care.

We all slept in the living room beside the hospital bed. My brother took the “night shift”, and would wake me up in the middle of the night to give emergency medications or adjust the oxygen machine.

### His last breath

Three days after we brought him home, our worst fears materialised. He was unresponsive for several hours, and no amount of talking or shaking could rouse him.

I’d never seen a patient die during hospital postings before, and nursing school had not taught me the physical signs of the dying process.

But some googling confirmed that my dad was ticking off the boxes by the hour.

Putting on my nurse persona, I went on auto-pilot, closely monitoring his vital signs.

Gently, I told my family that today might be the day, and to prepare our hearts and minds for the worst.

Her father’s death left a hole in the author’s heart, but she gained a lot by journeying with him through his battle with cancer, she says. (Photo courtesy of Paula Say)



We then called up a few close friends and video-called relatives in the Philippines too. What followed was a few hours of people crying, thanking him, and saying goodbye.

By 3 pm, I asked to end all video calls, so that we could be with my dad as a family.

As what he would have wanted, we sang his favourite Christian worship songs—Healeth Thee, God You're So Good and Goodness of God. For two-and-a-half years, despite his pain and suffering, he chose to worship and remind us of God's goodness in our lives.

We sang in worship, prayed for peace and comfort, and cried our hearts out.

By 3.30 pm, I knew he was crashing—the pauses between his breaths got longer and longer. His hands were getting cold and clammy.

As a nurse, I am trained to spring into action whenever something looks wrong.

As a healthcare provider, I am trained to never give up—to save lives.

As a daughter, it pained me to know that the “right thing” to do was to watch my own father die, before my very eyes.

One by one, my machines failed to register his vital signs. His pulse became weak and scarcely palpable.

At 3.36 pm on 11 September 2020, my dad took his last breath, only five days after we brought him home. Calmly, and peacefully, he finally went Home.

Still on auto-pilot, using my stethoscope, I checked for heart, lung sounds, and other signs of



Paula Say at her father's funeral in September 2020. (Photo courtesy of Paula Say)



life. Perhaps, that was my way of getting closure.

My family watched with bated breaths.

“Daddy’s gone,” I said, specifically to my mum. I knew she wanted to believe otherwise.

Swinging my stethoscope over my neck, I stood at the foot of the bed “to give the family time to grieve”.

Standing there, amidst the wailing and crying, I realised that I was, in fact, part of the family—and should be grieving too.

Taking care of my dad at home, providing end-of-life care, gave us an avenue to tangibly exhibit our love and care for him.

Be it my sister’s massages, my mum and my brother changing his diapers, or me titrating his oxygen when he was breathless—I know that my dad appreciated

those simple yet love-filled acts of service in his last few days.

Even at his deathbed, he allowed me to learn from him and through him, by being the first patient I ever saw pass on.

His death left a hole in my heart. But I gained a huge chunk in my two-and-a-half years' journey with him on his battle against cancer.

Piece by piece, that huge chunk is what I’ll give each and every of my patients in the future.

Daddy, I love you. You’ve fought a good fight.

Though you wouldn’t get to see me graduate, or get married, or see some grandkids that you so dearly wanted, I know you’d be proud of me.

I’ll be your miracle.

See you at Home.



### About the Author:

Paula Nazarene Evangelista Say is a third-year student at the National University of Singapore’s Alice Lee Centre for Nursing Studies. This article first appeared in TODAY.

Paula runs @nursesays, a public healthcare education channel on Facebook, Instagram and Youtube.



# Pressing on – Medical Education in Trying Times

The COVID-19 pandemic lent even greater urgency to the School's mission to train future doctors. Despite the many challenges and disruptions caused by the pandemic, we were able to complete the academic year and graduate the Class of 2020, who were immediately put to work alongside fellow healthcare professionals. Unusual times require novel and unorthodox solutions, and the NUS Medicine Fortitude Award recognises our teachers and educators who made tremendous effort to teach and contribute to the education and training of our medical students during those frenetic months of the pandemic. We feature a few of these award recipients, who share their thoughts and hopes for medical education in the age of COVID-19.





**Adjunct Associate Professor  
Nicola Ngiam**

*Senior Consultant, Division of Paediatric Critical Care, Khoo Teck Puat-National University Children's Medical Institute, National University Health System*

*Director, Standardised Patient Programme, Centre for Healthcare Simulation, National University of Singapore*

*Adjunct Associate Professor, Department of Paediatrics, NUS Yong Loo Lin School of Medicine*

**"Being able to fill the gaps in medical education in a time of dire need was a fulfilling experience. Hearing the positive feedback from faculty and students as well as the SPs was rewarding."**

The COVID-19 pandemic rampaged through Singapore at the start of 2020 and has spared no one. Every individual on our tiny red dot has been affected in one way or another and medical education was no exemption. The risks of viral transmission had immediate consequences for our high stakes undergraduate medical and surgical examinations in March 2020. The subsequent impact of restrictions on real patient exposure was then felt in the planning for the new academic year that began as early as June 2020.

Simulated patient (or SP in short, refers to volunteers who have been trained to mimic symptoms of illness) methodology provided an intuitive alternative to real patient exposure for our students, both in assessment as well as in formative sessions. With some creativity and a lot of teamwork, the School managed to run a modified

clinical examination that was entirely SP based, combined with elements of hybrid simulation, pre-recorded auscultatory findings, moulage and simulation of abnormal signs, for our graduating medical students. SP cases were also developed rapidly and virtual platforms harnessed to optimise learning for students, when the academic year started in the face of reduced patient contact. Faculty worked with the NUS standardised patient programme on case development and planning of logistics and administrative details. Student feedback was encouraging, reflecting the benefit that they experienced from these SP encounters. They also valued the feedback on communication skills that they received from the SPs, which they would not have received in real patient encounters.

Being able to fill the gaps in medical education in a time of dire need was a fulfilling experience. Hearing the positive feedback from faculty and students as well as the SPs was rewarding. The adaptive nature and resilience of the various teams in medical education managing this experience was inspiring. No one knows what the future will bring, but I am confident that the lessons learnt from this pandemic has made us stronger and better able to deal with the next challenge we face.





**Dr Benjamin Goh Yen Seow**

*Consultant, Department of Urology, National University Hospital*

*Kidney Transplant Surgeon, National University Centre for Organ Transplant*

*Director Undergraduate Medical Education, Department of Surgery, NUS Medicine*

*Assistant Professor, Department of Surgery, NUS Yong Loo Lin School of Medicine*

COVID-19 is a test of undergraduate education during Volatile, Uncertain, Complex and Ambiguous (VUCA) times. A prominent challenge was having surgical tutors across Singapore be aligned in coming up with relevant content and pedagogy to deliver these online while enabling virtual student learning that was impactful.

The concept of change management really helped in these times, by:

- 1) Paying attention to the old ways of teaching coming to an end and the emotions that come with this closure for both tutors and students;
- 2) Being willing to explore the void between what was and what could be, to allow for creative and novel ways to deliver quality medical education;
- 3) Launching off in a strategic and meaningful way to teach surgery despite theatres and procedure rooms being deemed high risk and hence out of bounds to students.

I also learnt that leading during a time of crisis was different from leading during periods of peace

and business as usual. While we seek to innovate and be creative in the latter, the COVID-19 situation required stability and coherent leadership for clinical educators to stay the course, avoid burnout and be in service to patients and students.

The most satisfying aspect of my work is hearing graduates say that they manage patients differently with better outcomes as a result of their time with the Department of Surgery/Urology.

My wish would be for more graduates and clinicians from the healthcare system to come back and contribute to undergraduate medical education.

I had the pleasure of being taught by Associate Professor Kenneth Mak, Director of Medical Services at the Ministry of Health, years ago for my postgraduate surgical exam. When asked, he mentioned the way to thank him was to pay it forward and continue teaching our juniors and students.

We contribute by giving more than we take from a system. Only when individuals give will the system thrive and flourish.

**"The most satisfying aspect of my work is hearing graduates say that they manage patients differently with better outcomes as a result of their time with the Department of Surgery/Urology."**





### **Dr Derrick Lian**

*Consultant, Department of Pathology,  
National University Hospital*

*Assistant Professor, Department of  
Pathology, NUS Yong Loo Lin School  
of Medicine*

Moving from face-to-face to online teaching has been challenging, but it is not unique to medical educators; I found it useful to look to educators in other disciplines and levels of education for their innovative approaches to handling this unanticipated sudden change. For example, some school teachers used several devices with cameras for their online classes, and others have used apps to layer their camera feed onto the slide presentation for enhanced engagement.

I have already clocked more than 80 hours of online teaching, and I am finding every session enjoyable with satisfactory student engagement levels. While we don't get to see the students in person, online teaching comes with benefits such

**"Moving forward, I hope to continue to use my personal experiences to help my fellow educators overcome their challenges in migrating to online teaching."**

as convenience, ability to record sessions, and ease of attending colleague's teaching sessions.

Recently, I facilitated a face-to-face workshop, and I found it heartwarming to have students whom I had previously taught online seek me out, just to say hello. Moving forward, I hope to continue to use my personal experiences to help my fellow educators overcome their challenges in migrating to online teaching.



### **Dr Ling Zheng Jye**

*Medical Informatics Assistant  
Director, Academic Informatics  
Office, National University Health  
System*

*Adjunct Assistant Professor,  
Department of Medicine, NUS Yong  
Loo Lin School of Medicine*

During COVID-19, most preventive health work in the community was stopped. My innovative CareHub colleagues decided to switch over to telemedicine to replace their home visits. Meanwhile, colleagues in health screening took the opportunity to create workflows for online enrolment into a reminder service for health screening, under the My Health Map programme that aims to keep the residents of western Singapore healthy. Despite being unable to conduct on-site, physical events, the challenge was converted to multiple opportunities to make our community health services more resilient and also meet our residents where they are.

Engaging with colleagues and students always opens my eyes to new perspectives and solutions to problems. Working with them on their assignments is an annual highlight, as they review and summarise the literature. I have greatly benefitted from teaching them, as they keep me updated on changes, which are grounded in existing evidence. I am

very grateful for the chances to work with great colleagues and students here at the NUHS. Knowing that we can come up with solutions together to make life better is a great part of my job satisfaction.

I hope that we can develop more self-paced learning for healthcare informatics, so that learners can internalise the information and skills better. Teaching healthcare informatics is a young field, so there is much work to be done. In addition, I still want to develop a chatbot that can double up as a simulated patient for clinical undergraduates and postgraduates!

**"I am very grateful for the chances to work with great colleagues and students here at the NUHS. Knowing that we can come up with solutions together to make life better is a great part of my job satisfaction."**

**Dr Inthrani Raja Indran**

*Senior Lecturer, Department of Pharmacology, NUS Yong Loo Lin School of Medicine*

*Education Director (Medicine and Dentistry), Department of Pharmacology*

The year 2020 was deeply insightful for me. As the full wrath of COVID-19 descended upon us in late February last year, it became clear that we needed to rapidly adapt to ensure continuity. During that period, I was inspired by colleagues from across NUS. Despite their heightened workloads, the information and educational technology teams patiently answered every single email and call and worked to digitally equip the staff and students for the long road ahead. They demonstrated absolute professionalism. On the ground, despite the physical separation, we found ourselves working together in new ways to ensure that this pandemic would not lower our standards.

While I saw strength on one hand, COVID-19 also shed light on the disparities that exist in our community. From unstable internet connections, to uncondusive working environments and dealing with isolation—these are just a few of the many harsh realities that DORSCON Orange exposed in our community. Over the past year, COVID-19 has given me privileged access into the

**"As an educator, I hope that my students' journeys in health education do not just train their minds to deliver the right treatment, but instead have also enabled them to do so bearing in mind the differences in access that different individuals have, in order to create a more equitable healthcare system."**

homes and lives of colleagues and students. It showed me that it is a privilege to have a clear one-metre-by-half-metre working space, a stable internet connection and a relatively conducive working environment.

Pre-pandemic, I used to mindlessly transverse physical spaces like the corridors and coffee haunts, oblivious to how they quietly disarmed social isolation with a buffet of conversations from intellectual discourse to mindless banter, providing us with numerous channels to unwind, recharge and upkeep our mental health. The circuit breaker changed the face of human interactions. This pandemic has been an awakening for me, to be mindful of the different needs that exist in our community so as to ensure greater inclusiveness.

As an educator, I hope that my students' journeys in health education do not just train their minds to deliver the right treatment, but instead have also enabled them to do so bearing in mind the differences in access that different individuals have, in order to create a more equitable healthcare system.



**Ms Shikha Kumari**

Senior Assistant Director, Value Driven Outcome Office (VDO), National University Health System  
Adjunct Instructor, Department of Medicine, NUS Yong Loo Lin School of Medicine

**"With data collection and literacy advancing throughout the pandemic, I hope to instil within students not only the ability to read and interpret data, but a sense of how critical a data-driven approach is to recovery."**

COVID-19 has been a difficult time for all of us, but the one fact that kept me going was the fearless commitment of doctors and nurses to help patients. Circuit breaker left many families isolated, including mine, but reading about frontline healthcare workers who stepped up to keep everyone safe kept me strong and positive throughout this time. Amidst the challenging environment, we have to focus on the positive, and I practised this by developing a sense of appreciation and gratitude for our selfless workers.

At work, what keeps me going is the opportunity to improve and find betterment in healthcare outcomes. We collect a lot of data in our organisation, but to be able to use that data and increase value for our patients and stakeholders is of utmost

importance to me. Our team tracks the performance of various projects over time and works with clinicians to monitor improvements in value, either through better quality or rationalised cost savings.

We also work on projects in combination with the Ministry of Health to transform healthcare to better accommodate the needs of patients, given the country's demographic challenges. Overall, it is these opportunities where I am involved to further enhance the value delivered to our patients and stakeholders that makes my work rewarding.

In terms of healthcare education, I would like to highlight the importance of data analytics given the pandemic we are in. The use of numbers, charts and analytics to inform the public and assist in government decision-making has played a fundamental role in mitigating the threats presented by COVID-19. With data collection and literacy advancing throughout the pandemic, I hope to instil within students not only the ability to read and interpret data, but a sense of how critical a data-driven approach is to recovery.



# Inspiring Health For All



Yong Loo Lin  
School of Medicine

**NUS Yong Loo Lin  
School of Medicine**  
1E Kent Ridge Road  
NUHS Tower Block, Level 11  
Singapore 119228

**Tel** 6772 3737  
**Fax** 6778 5743  
**Email** [medmedia@nus.edu.sg](mailto:medmedia@nus.edu.sg)  
**Web** [medicine.nus.edu.sg](http://medicine.nus.edu.sg)



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