MediCine

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The Centenarian:

100 YEARS OF NUS OBSTETRICS AND GYNAECOLOGY

Celebrating a Century of Clinical Service and Academic Excellence

MEETING OF MINDS IN SINGAPORE
Nobel laureates and youth discuss global issues
p.03

GOODBYE, AND HELLO!
The happy return of in-person events
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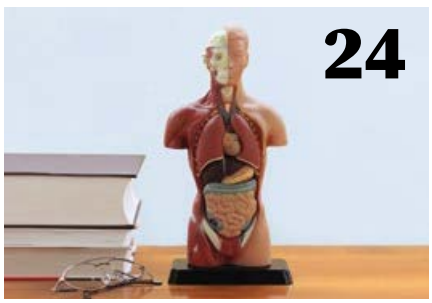

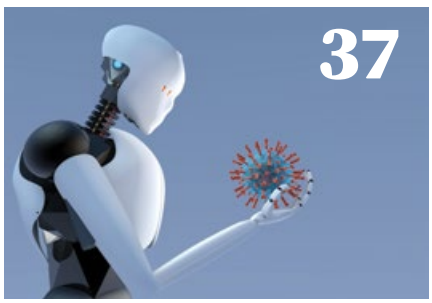

MediCine

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Dean's Message

Dear Reader,

Two months ago, on August 29, Singaporeans celebrated a second national day. That Monday, we took a deep, collective breath and removed the masks that had become part of our daily street and workwear. That long-awaited, anticipated move was emancipation—it represented a national cathartic, metaphorical jettisoning of the shackles that COVID-19 had placed on our individual and collective freedoms.

Unmasked, we sniffed the air cautiously, wary after more than two and a half years of hiding behind paper and cloth facial screens. Some stepped out gleefully, glad to be able to scan the faces of people around them as they took that step towards a long-awaited new normal. Others decided discretion still trumped valour and kept their masks firmly on, wary of a virus that does not seem to be quite vanquished. Their prudence found resonance in a September update from the WHO, which warned that the continuing rise in COVID-19 infections spelt a challenging autumn and winter for Europe. With international tourism reviving, what happens in the northern hemisphere will find its way around the world, including to Singapore.

Still, thanks to our high vaccination rates, pandemic preparations and an alert and competent healthcare system, Singapore should be able to ride out the next wave of infections when it comes. While we may not be fully living life in the new normal, life continues as normally as we can make it.

"Still, thanks to our high vaccination rates, pandemic preparations and an alert and competent healthcare system, Singapore should be able to ride out the next wave of infections when it comes. While we may not be fully living life in the new normal, life continues as normally as we can make it."

Here at NUS Medicine, the academic year rolled on, marked by milestone events like Commencement (where we were able to celebrate the graduating Class of 2022 in time-honoured style, live and in person), the White Coat Ceremony for the incoming Class of 2027 and the Medical Grand Challenge. This annual event brought combined student teams from Medicine, Arts and Social Sciences, Engineering, Science, Engineering, Business, and Law together to innovate solutions for unmet healthcare needs. Also making a return after an enforced two-year hiatus was the Public Health Screening (PHS) service. Held in Jurong in August, PHS was planned and conducted by NUS Medicine students, working in partnership with counterparts from Nursing, Social Work as well as volunteers and various agencies.

And for the very first time in September, the School hosted eight Nobel Prize laureates in a series of discussions on the challenges facing the world with students here and across the Asia-Pacific region. Organised in partnership with the Nobel Prize Outreach, an arm of the Nobel Prize Organisation, and the Asian Medical Students' Association, the discussions and one-day plenary that made up the Nobel Prize Dialogue Singapore was themed, 'The Future We Want Together'. The youth and Nobel Prize laureates, as well as local and international thought leaders, who come from disciplines that range from economics to climate science, shared, reviewed and crystallised ideas and suggestions that could help deal with the most critical problems facing the world today.

On the research front, a team led by Assistant Professor Minh Le from the Institute for Digital Medicine (WisDM) and Department of Pharmacology and Associate Professor Andrew Grimson from the Department of Molecular Biology and Genetics at Cornell University, have found that particles which are secreted by tumour cells, extracellular vesicles (EVs), displayed a high level of protein integrins αv and β1, in patients with locally advanced and metastatic breast cancer.

This finding holds promise for these protein integrins as non-invasive biomarkers in breast cancer detection. One woman is diagnosed with breast cancer every fourteen seconds somewhere across the globe—based on data showing that an approximate 2.3 million women worldwide were newly diagnosed with breast cancer in 2020.

In Singapore, it is the most common cancer among women, and will likely affect one in 13 women in their lifespan. Although advances in medicine today allow for treatments for early-stage and non-metastatic breast cancer, advanced stage and metastatic breast cancer are considered incurable with current treatment options, with very poor prognosis. The early detection of breast cancer metastasis is therefore paramount in the treatment of the condition.

In related news, another team of researchers at NUS Medicine has succeeded in using a plant-derived nutrient supplement to shrink breast cancer tumours in preclinical models. The team led by Assistant Professor Chester Drum, a Senior Consultant in the Department of Cardiology, National University Heart Centre, Singapore, used a novel nanotechnology to repurpose a nutritional component in plants to become a potent treatment for breast cancer.

As the nanotechnology converts the plant nutrient into chemotherapy only at the site of the tumour, the treatment is both potent and free from side effects at the same time. Although the study was performed in preclinical models using the new technology, human breast cancer cells were used as the target: these responded with a complete remission. The researchers hope to next apply the technology in clinical trials and for additional solid tumours which are difficult to treat or remove via standard surgery.

And to end my message on this continual happy note, I am pleased to inform you that the School has appointed Professor Julian Savalescu as director of the Centre for Biomedical Ethics. Prof Savalescu, an award-winning ethicist and moral philosopher, is trained in neuroscience, medicine, and philosophy, and was the Uehiro Chair in Practical Ethics at the University of Oxford from 2002, where he founded the Oxford Uehiro Centre for Practical Ethics in 2003. He is also co-director of the Wellcome Centre for Ethics and Humanities and is also Distinguished Visiting Professorial Fellow at Murdoch Children's Research Institute and Melbourne Law School, where he directs the Biomedical Ethics Research Group. Prof Savulescu, a Fellow of the Australian Academy of Health and Medical Sciences, was editor in chief of the Journal of Medical Ethics for a period of 12 years over two tenures, and founded the open access Journal of Practical Ethics.

Yours sincerely,

Yap Seng

Photo:
The panel comprising moderator and applied economist Joanne Yoong, with cultural change strategist Kuik Shiao-Yin, founder of Happiness Scientists Yeo Sha-En, senior policy analyst in the Global Education Monitoring (GEM) Report team at UNESCO Anna Cristina D'Addio, Master of Arts student Claudine Enduma from the University of the Philippines School of Urban and Regional Planning, and psychology student at National University of Singapore Goh Xin Ni, at the session on "The Pursuit of Happiness".

Meeting of Minds as Nobel Prize Laureates and Youth Discuss Global Well-being in Singapore

Rising global temperatures, global pandemics, war in Europe, intensifying geopolitical tensions in Asia and the Middle East, acute food shortages, systemic poverty, resource scarcity and gender inequality.

These are the endemic, globe-spanning issues that 60 students between 15 and 35 years old here and their Asia-Pacific counterparts, were invited to discuss with Nobel Prize laureates and international experts at the Nobel Prize Dialogue, held in Singapore on 13 September 2022.

Organised by the Nobel Prize Outreach and NUS Yong Loo Lin School of Medicine (NUS Medicine) in partnership with the Asian Medical Students' Association (AMSA) Singapore, the Nobel Prize Dialogue featured a series of discussions and a one-day plenary.

Themed, 'The Future We Want Together', it presented an opportunity for youth and Nobel Prize laureates, together with local and international thought leaders, to share, review and crystallise ideas and suggestions that could help deal with the most critical problems facing the world today.

Participating Nobel Prize laureates Serge Haroche, physics laureate 2012; Kailash Satyarthi, peace laureate 2014 and George Smoot, physics laureate 2006 flew in for the event, while Steven Chu, physics laureate 1997; Angus Deaton, economic sciences laureate 2015; Esther Duflo, economic sciences laureate 2019; May-Britt Moser, medicine laureate 2014; and Paul Romer, economic sciences laureate 2018 participated via video conferencing and pre-recorded sessions.

It is a time of great danger, but also a time of exhilarating opportunities. It is a time in history when science, technology, politics, global affairs and humanity are all telescoping into a focal point. You will find that all Nobel Laureates are not just about science or their domain expertise, but they come with values and a very broad worldview. Platforms like the Nobel Prize Dialogue are opportunities to share ideas, learn from one another, discover our common humanity, look for global solutions to global problems and find new networks of collaboration."

Dr Vivian Balakrishnan, Minister for Foreign Affairs, Singapore

Minister for Foreign Affairs, Singapore, Dr Vivian Balakrishnan giving his address at the Nobel Prize Dialogue 2022.

The opening ceremony for this first-ever Nobel Prize Dialogue held in Southeast Asia was graced by Singapore's Minister for Foreign Affairs, Dr Vivian Balakrishnan. The Dialogue was held at the Raffles City Convention Centre and also streamed to audiences online.

"It is a time of great danger, but also a time of exhilarating opportunities. It is a time in history when science, technology, politics, global affairs and humanity are all telescoping into a focal point. You will find that all Nobel Laureates are not just about science or their domain expertise, but they come with values and a very broad worldview. Platforms like the Nobel Prize Dialogue are opportunities to share ideas, learn from one another, discover our common humanity, look for global solutions to global problems and find new networks of collaboration." Dr Balakrishnan said in his address at the Nobel Prize Dialogue 2022.

The Dialogue spanned six broad areas in the context of ongoing global crises: Education, Climate Change, Health, Happiness as well as Economic and Digital Well-being—areas that garner the most concern from youths today. Faced with alarming potential concerns such as educational disruption and reduced career opportunities, increasing economic and social inequities, digital disruptions as well as mounting mental health concerns, the programme saw keen discussions among and between the audience and speakers.

A special session was also included in the event, delving into conflict prevention,

Mr George Smoot, 2006 physics laureate, and astropreneur, Ms Karin Nilsdotter, discussing the potential and possibilities of what outer space could mean for mankind in the future.

Students listening intently at the Nobel Prize Dialogue Singapore 2022.

management and resolution as well as the exploration and colonisation of space. Participants had fruitful and in-depth discussions on the way forward, to promote humanity's well-being.

"Students from all over the Asia-Pacific region have a leading role in the Dialogue. Our experience is that these kinds of inter-generational discussions are of great importance for the students, the laureates and the broader society," said Laura Sprechmann, Chief Executive Officer of the Nobel Prize Outreach, emphasising the pivotal role of students in solving global issues.

Professor Chong Yap Seng, Dean of NUS Medicine added, "Our youth is our future. How that future unfolds will to a very large extent be determined by the actions that we take today, to face the myriad crises and challenges that confront humankind. Climate change is an existential threat, as is disease. Poverty and conflict are phenomena that result from the pursuit of narrow, exclusivist interests that are further entrenched through the advent of technology."

"Young people must be involved in shaping the decisions and actions that are taken to confront and surmount these threats; their voices and views must be heard and respected and their involvement is paramount. That is the ultimate purpose of the Nobel Prize Dialogue Singapore, which we organised together with Nobel Prize Outreach."

Photo credit: NUS Yong Loo Lin School of Medicine.

Scan here to read news from the Nobel Prize Dialogue Singapore:

Scan here to watch the Nobel Prize Dialogue 2022:

Photo:
Graduating students eagerly await the start of the Commencement Ceremony for the Class of 2022 on 17 July.

Goodbye, and Hello!

2022 saw the happy return of in-person events, with Commencement ceremonies for both graduating Nursing and Medicine students taking place on 16 and 17 July respectively, after a two-year hiatus due to the COVID-19 pandemic. The School's traditional induction programmes included the White Coat Ceremony on 12 August and Welcome Dinner on 23 July, for newly admitted Medicine students.

Medicine Commencement Ceremony – Class of 2022

Left to right: Newly graduated doctors.

Parents and guests could finally witness graduating family members receive their scrolls.

Valedictorian Dr Benjamin Tan Kye Jyn (on screen) speaking at the Commencement Ceremony for the Class of 2022 at the Medicine Commencement Ceremony.

Balloons float down to the audience, signalling to graduands the end of the ceremony, and the beginning of another journey as newly minted doctors.

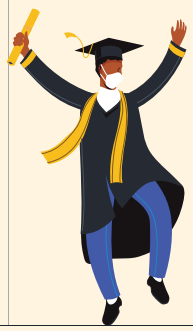
Nursing Commencement Ceremony – Class of 2022

Left to right:
Nursing graduands observing as the academic procession enters the hall.

Mr Benedict Choong Han Peng, Valedictorian for the Nursing Class of 2022, gives his speech.

Left to right:
A jubilant Nursing graduate.

Bright smiles all round as Nursing graduates pose for commemorative pictures after the ceremony.



White Coat Ceremony

Left and right: Incoming students of the Class of 2027 present their white coats to NUS Medicine faculty members, who then place the coats on the students' shoulders. This symbolises the students' taking on the mantle of their medical training, and the values of the medical profession.

The new medical students take the Hippocratic Oath, as a pledge of their commitment to the values of the medical profession.

Left to right: Prof Chong Yap Seng, Dean of NUS Medicine, presents a token of appreciation to alumnus Dr "Hakim" Wee Teck Young, Guest-of-Honour at the 2022 White Coat Ceremony.

Students smile and wave from their spots on stage as they pose for a picture.

NUS Medicine Welcome Dinner

Left to right:
The School's House Banners proceed into the hall.

Members of the NUS Medicine faculty in their academic robes.

Left to right:
Prof Lau Tang Ching, Vice-Dean for Education passes a candle to a student, signifying the passing of knowledge and wisdom on to new blood. Students also reflect on and write their aspirations and what becoming a doctor means to them.

Female students are presented with scarves, and male students with ties, customised for their Class of 2027.

Public Health Service 2022 Returns

BY BRIAN YEO, YEAR 3 MEDICINE STUDENT AND CO-DIRECTOR, EXECUTIVE COMMITTEE, PUBLIC HEALTH SERVICE, NUS MEDICINE

The Public Health Service (PHS) was initiated in 2004 by a small but passionate group of medical students. Over the years, with the hard work and dedication of many PHS students, the project has grown from a simple screening event with only four modalities, to one of the largest and most comprehensive student-led health screening initiatives in Singapore.

The phrase "Promoting Health, Spreading Awareness", effectively encapsulates our aims as a health service. First, we strive to promote the health of our community through a population-based approach, by employing both primary and secondary prevention strategies. This is reinforced by advocating the importance of taking charge of one's health, through health education initiatives. PHS has always remained cognisant of the importance of adopting strategies which align with evolving national healthcare policies, to better serve our community.

Our free health screening was held on 20 and 21 August 2022, at the Canopy @ J Link in Jurong East. Graced by Guest-of-Honour Ms Grace Fu, Minister for Sustainability and the Environment and Member of Parliament for Yuhua, the event catered to all Singaporeans and Permanent Residents aged 40 and above.

This year, our health screening covered a myriad of modalities, which included risk assessment and screening for various chronic conditions and cancers, such as metabolic syndrome, and common geriatrics conditions. PHS 2022 screened 1,025 participants, a new high for a screening held in Jurong East.

The PHS Student Organising Committee with Ms Grace Fu, Minister for Sustainability and the Environment (sixth from left, back row), Professor Chong Yap Seng, Dean, NUS Yong Loo Lin School of Medicine, Associate Professor Lau Tang Ching, Vice-Dean, Education, Associate Professor Marion Aw, Vice-Dean, Office for Students.

Student volunteers helping residents with the registration process.

Planning for this year's health screening event was a tedious, but rewarding experience. The COVID-19 pandemic had brought an abrupt halt to our work. When Co-Director Surabhi Riya Vig and I received confirmation to plan for our screening earlier this year, we picked up from where things left three years ago, before COVID-19 struck. The planning process was a team effort. While each subcommittee took charge of individual aspects of the screening, it was the collective effort from everyone that enabled a smooth screening.

Leading up to the health screening event, PHS organised various key pre-screening stints. Our pre-screening publicity activities were perhaps one of the most memorable. Over a few days in July and August, the PHS committee members travelled down to Jurong East to encourage residents to get screened. Besides promoting our screening in Jurong East Central, committee members also went door-to-door to talk to residents. It was invigorating to learn that many of the residents whom our seniors had served in 2019 remember us, and had been looking forward to our next event.

Moreover, it was especially humbling to get to know the residents we serve. Through interacting with residents, we learnt about some of the daily struggles they face and the concerns they had about their health. We also took the opportunity to distribute our newly designed Public Health Catalogues, which contain key preventive health information, aimed at improving the health literacy of our population.

Another key aspect of the planning process was liaising with various screening and exhibition partners and sponsors. Our partners and sponsors play a paramount role in ensuring the success of our screening plans. The majority of our modalities are run by external organisations, with their resources, knowledge and manpower to ensure continuity of care for our participants. PHS is grateful for the opportunity to rekindle our long-standing partnerships with our partners and sponsors, after a COVID-enforced hiatus.

Additionally, our seniors played an indispensable role in guiding us throughout our planning process. Sir Isaac Newton once said, "If I had seen further, it is by standing on the shoulders of giants". PHS is grateful to have an established family of dedicated alumni and mentors, who played a key part in crystallising our plans. Personally, it is heartening to know that our annual screening initiatives continue to be an avenue that brings our alumni together to serve our community.

We were exhilarated to see our planning efforts come to fruition; witnessing volunteers from various healthcare faculties, medical professions and organisations come together under one roof to serve our community. As with any event, spontaneous changes are to be expected. For instance, our committee made on-site changes to the floorplan in between screening days, after evaluating for the need of a better screening flow. I am heartened that our committee remained adaptable and empathetic throughout.

PHS aims to raise public health awareness and inculcate a sense of personal responsibility for one's own health. It was humbling to witness the turnout at the event and learn that screening participants were motivated and committed to keeping their health in check.

We appreciate the lessons learnt and experiences gained from organising the 2022 edition of PHS. Fundamentally, this empowered us to give back to the community. A good clinician must be able to empathise with and understand the patient, as well as their social circumstances.

"We are grateful for the opportunity to work together with our volunteers, partners and sponsors. We are also thankful for, the mentorship of our Project Advisor, Associate Professor Lim Fong Seng, as well as the guidance from Dean's Office staff and core faculty from the Office of Students (OfS)."

While screening for diseases is important, it is crucial that any abnormality detected is followed-up on. In the coming months, PHS will initiate a three-pronged follow-up initiative, to ensure that participants receive the medical attention they need.

Ultimately, PHS 2022 would not have been a success without the effort of everyone involved. We are grateful for the opportunity to work together with our volunteers, partners and sponsors. We are also thankful for the mentorship of our Project Advisor, Associate Professor Lim Fong Seng, as well as the guidance from Dean's Office staff and core faculty from the Office of Students.

In circle: Residents learning more about gastric cancer at the booth of one of PHS's partner organisations.

Bottom: PHS Alumni at their NUHS Community Health Post booth.

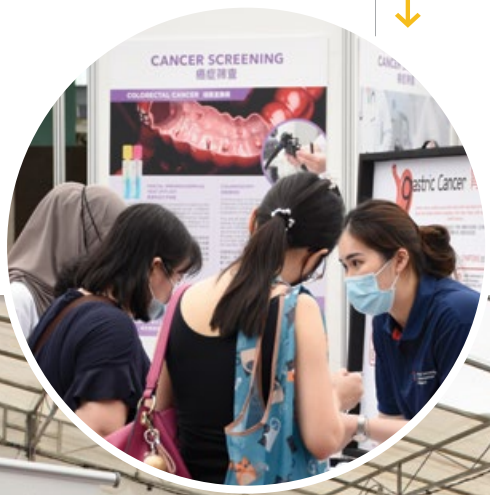


Photo:
A group photo of the teams which participated in the MGC 2022, with Professor Chong Yap Seng, Dean of NUS Medicine, Mr Shikharesh Das, Asia Managing Director of Ontogenix Pte. Ltd, Dr Voo Teck Chuan, Assistant Professor at the Centre for Biomedical Ethics, NUS Medicine, Mr Lee Jia Ming, Healthcare Leader of Amazon, Mr Adrian Chua, Vice President of Open Lab, ST Engineering Innosparks, and academic advisors.

Taking Medical Innovation to Greater Heights

A virtually-impaired person stimulator, Artificial Intelligence (AI)-powered eye screening, mobile applications to help individuals with physical and speech difficulties to communicate, a smart pill dispenser, and more: this myriad of novel innovations were devised by the students from the Yong Loo Lin School of Medicine at the National University of Singapore (NUS Medicine), for the Medical Grand Challenge (MGC) 2022.

The MGC is a student-led medical innovation competition launched in 2016 by NUS Medicine. Medical students at NUS are encouraged to form multidisciplinary teams with students from other faculties and schools to engineer innovative and out-of-the-box solutions to solve unmet healthcare needs. This year, 10 teams emerged in the Finale—including teams from schools within NUS, Nanyang Technological University and universities in Malaysia, Indonesia and Thailand, competing in the Nascent Category, and eight teams in the Open Category.

MGC 2022 is the fourth year that overseas teams have participated in the MGC. At past challenges challenges, participants from Indonesia, Malaysia and Thailand, as well as South Korea and Galway, Ireland, have added colour and diversity to the challenge with their own novel innovations, encouraging multidisciplinary collaboration.

This year, the Finale was attended by Guest-of-Honour, Mr Ong Ye Kung, Minister of Health. This final stage of a year-long challenge, was a platform that showcased the burning passion and creativity of the teams. The shortlisted teams presented their projects to a panel of judges, many of whom are influential business leaders in commercial healthcare. Projects were assessed on their business strategy, creativity, design quality and healthcare impact.

The pitching session was undoubtedly intense, as the teams put up impressive presentations. Team Kiddx bagged the top prize in the Nascent category with their video monitoring and analysis software for real-time monitoring and detection of early signs of Autism Spectrum Disorder (ASD) in the home setting.

In the Open category, Team STDetect swept the top award with a vending machine that facilitates access to Sexually Transmitted Disease (STD) testing kits, along with a mobile application for users to register their test kits and receive their testing results anonymously.

All the inventions were inspiring, as shown through the other awards that were presented at the Finale. They included the People's Choice Award for Fisoguide, an AI-powered tele-physiotherapy based treatment application for people with Musculoskeletal Disorders (MSD), the Sustainability Award for BiliMonitor, a consumer-grade jaundice meter device for home use, and the Social Responsibility Award for AI-powered eye screening for the detection of glaucoma.

This year, a total of 10 participating teams competed against one another in the Nascent category. They took turns to propose solutions which they prepared from scratch, after identifying a clinical problem or unmet healthcare need at the start of the competition. In the Open category, eight teams worked on projects initiated by industry experts known as "Tech Mentors". Alternatively, the teams could also choose to focus their energies on improving existing projects that were presented in previous competitions.

Throughout the year, the teams attended interdisciplinary boot camps and participated in consultation sessions with their tech mentors, who provide guidance and advise them on how best to improve their creations and build on their commercial viability.

Professor Chong Yap Seng, Dean of NUS Medicine, is confident of the value that the MGC brings to the students' learning experience. "The MGC hopes to be more than just another competitive venture or credential to beef up the students' portfolios. We hope that the multidisciplinary nature of the MGC will prompt students to analyse problems and create innovative solutions, from a multifaceted perspective. We need to expose our students to real-life problems, so that they will have the confidence to apply the hard and soft skills they've acquired in their schooling years to tackle trickier, and often complex challenges that the future brings," said Prof Chong.

Scan to read more here:

↑

Top:
Team STDetect, who won the top award in the Open category.

In circle:
Mr Ong Ye Kung, Minister of Health, graced the MGC 2022.

100 Years of NUS Obstetrics and Gynaecology

Celebrating a Century of Clinical Service and Academic Excellence

BY ASSOCIATE PROFESSOR MAHESH CHOOLANI, HEAD OF THE DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY AND ASSOCIATE PROFESSOR CITRA N MATTAR, CENTENARY CELEBRATION CONFERENCE ORGANISING COMMITTEE CHAIRPERSON

Past

The Department of Obstetrics and Gynaecology (O&G) was officially formed in 1922 with the mission of keeping mothers and babies safe from the common complications that plagued childbirth. The high incidence of maternal and infant mortality was related to poor hygiene and nutrition, and though the traditional midwives, or *bidans*, performed an important service for their communities, there was still an urgent need for specialised medical assistance to improve birth outcomes.

Thus, soon after Singapore's first medical school, the Straits and Federated Malay States Government Medical School, was founded by community leaders led by prominent businessman Tan Jiak Kim in 1905, and where medical students earned a Licentiate in Medicine and Surgery, the growing interest in improving maternity healthcare led to the official adoption of obstetrics and gynaecology as a unique discipline within the school.

The **Department of Midwifery and Gynaecology** was established at the medical school, then known as the King Edward VII College of Medicine, in 1922, with Professor Joseph Sandys English as its founding head of department. The University Unit was housed at the Kandang Kerbau Hospital from 1924. Its focus was training and producing lecturers and professors for the medical school, until it finally moved to the National University Hospital in 1985, where it continued its mission to educate, innovate and serve.

Professor JS English laid the foundations for professional maternity care, beginning with the education and training of doctors and midwives to meet the increasingly urgent need for evidence-based maternity healthcare.

Professor English passed the leadership to Professor Benjamin Henry Sheares who distinguished himself by becoming the first Singaporean Professor of O&G in 1951, soon after becoming a member at the Royal College of Obstetricians and Gynaecologists in 1948.

Professor Sheares led the University Unit of O&G through an explosion in population growth, which reached a world record of births in 1966 (39,835 childbirths). Under him, the unit focused on clinical training and education, developing specialist expertise and research.

A widely-admired surgeon, he would go on to invent the Sheares neovaginoplasty for the simple and safe construction of neovaginas in women with congenital absent or under-developed vaginas, that would gain him worldwide recognition. Even after Professor Sheares took office as President of Singapore, he kept his clinical skills current by conducting tutorials for postgraduate trainees and performing surgery with the team at the University Unit.

↑ Singapore's second president Benjamin Sheares (second from right) took over as the Department of Obstetrics & Gynaecology's Head in 1941. He is seen here at the University Unit of Kandang Kerbau Hospital, where the Department was located prior to its move to the National University Hospital in 1985.

Professor Sheares was succeeded by several distinguished academic clinicians under whose leadership the department's reputation for innovation and research grew on the world stage. He was succeeded by Professor Tow Siang Hwa and Professor Sittampalam Shanmugaratnam, the latter of whom assumed headship in 1970 and who remains the longest serving head of department.

An internationally renowned O&G practitioner, Professor Ratnam was very successful in improving clinical services and maintaining research funding and output throughout his tenure. His department produced the first overseas-trained subspecialist trainees in Singapore who returned with advanced skills in gynaecological oncology, fetal ultrasound and assisted reproduction.

He emphasised the importance of research as the means with which to build the most impactful healthcare practice, and his strength was in identifying and nurturing the next generation of clinical and research leaders to carry this legacy forward. With his influence and support, various department members produced scientific breakthroughs, innovative clinical procedures, deepened understanding of reproductive biology and endocrinology and brought new clinical services to Singapore and Asia.

This long list of accomplishments includes, but is not limited to, novel assisted reproductive techniques such as Gamete Intrafallopian Transfer (GIFT), intracytoplasmic sperm injection (ICSI), embryonic stem cell biology, understanding the roles of prostaglandins and human chorionic gonadotrophin in pregnancy and fertility regulation, male infertility and sexual health, safety and health outcomes in Asian women

following the use of hormonal contraception, female and male reproductive ageing, fetal monitoring and labour management.

While the medical field rapidly evolved, so too did the midwifery discipline, which was progressively incorporated into Nurse training. From 1976, responsibility for managing childbirth shifted from the midwife to the physician. Professor Ratnam was succeeded by internationally-renowned academics, including Professor Sir Sabaratnam Arulkumaran, a leading scholar in obstetric medicine, labour management and human rights to healthcare, Professor SC Ng and Professor PC Wong who are both internationally renowned in assisted fertility, Professor EL Yong who has left his mark in the fields of andrology and menopause, and Associate Professor Mahesh Choolani who has contributed to significant advances in prenatal diagnostics and ovarian cancer biomarkers.

The Obstetrics & Gynaecology Department delivered Asia's first gamete intrafallopian transfer (GIFT) baby in 1986 at the National University Hospital. Baby Jamie is carried by nurse Ng Ah Lek and (from left) its former Heads of Department Professor PC Wong (2001 – 2008), Professor SS Ratnam (1969 - 1995), Professor Ng Soon Chye (1997 – 2001) and Associate Professor Roy Joseph from the Department of Neonatology.

Professor Kuldip Singh, currently a senior consultant at the Obstetrics & Gynaecology Department, holds the first baby delivered by the Department after its move to the National University Hospital from the University Unit of Kandang Kerbau Hospital in 1985.

Asia's first successful in-vitro fertilisation baby, Samuel Lee, is carried by Professor SS Ratnam (third from right), the Head of Department (HOD) from 1969 to 1995. Also in the photo are Professor Ng Soon Chye (HOD, 1997 – 2001, second from right), Mrs Lee, the baby's mother (sixth from right), and Professor PC Wong (fifth from right, HOD 2001 – 2008).

Present

NUS O&G continues its groundbreaking research in diverse aspects of women's health, thanks to the many talented individuals who have dedicated themselves to the advancement of knowledge. This is evident in the number of prestigious research fellowships and awards, including Research Fellowships, Transition Awards and Clinician Scientist Awards conferred by the National Medical Research Council won by members of the department, most of whom are home-grown talents.

The innovative research resulting from this in recent years spans the breadth of the human life-cycle, from understanding the impact of preconception health on pregnancy outcomes, to advancing knowledge in fetal development, *in utero* therapies for congenital genetic diseases, and maternal and environmental impact on fetal and postnatal growth and health, using both preclinical animal models and longitudinal clinical cohorts, to a deeper knowledge of factors driving gynaecological malignancies, reproductive ageing and its effects on healthspan, to healthy postmenopausal longevity.

NUS O&G continues its groundbreaking research in diverse aspects of women's health, thanks to the many talented individuals who have dedicated themselves to the advancement of knowledge. This is evident in the number of prestigious research fellowships and awards, including Research Fellowships, Transition Awards and Clinician Scientist Awards conferred by the National Medical Research Council won by members of the department, most of whom are home-grown talents.

This knowledge has made possible the development of new impactful technologies at the department, including rapid prenatal screening tests for chromosomal anomalies, precision therapies for cancers and other illnesses afflicting women, novel therapeutics to support healthy menopause, and the application of artificial intelligence and machine learning to obstetric care and personalised cancer therapy through the efforts of its clinicians working in tandem with scientists.

The department's staff have been recognised for their outstanding efforts with National Day Awards for Public Administration, National Medical Excellence Awards for Outstanding Clinicians and Clinician Scientists, the Mochtar Riady Pinnacle Awards for their exemplary clinical leadership and excellence in service, research and education.

Former and current faculty have been office bearers in prominent international societies including the International Federation of O&G (or FIGO), the World Health Organization, the Asia and Oceania Federation of O&G, the Royal College of O&G in the UK, the Obstetrical & Gynecological Society of Singapore and the College of Clinician Scientists (Academy of Medicine Singapore), underlining the Department's regional and global influence.

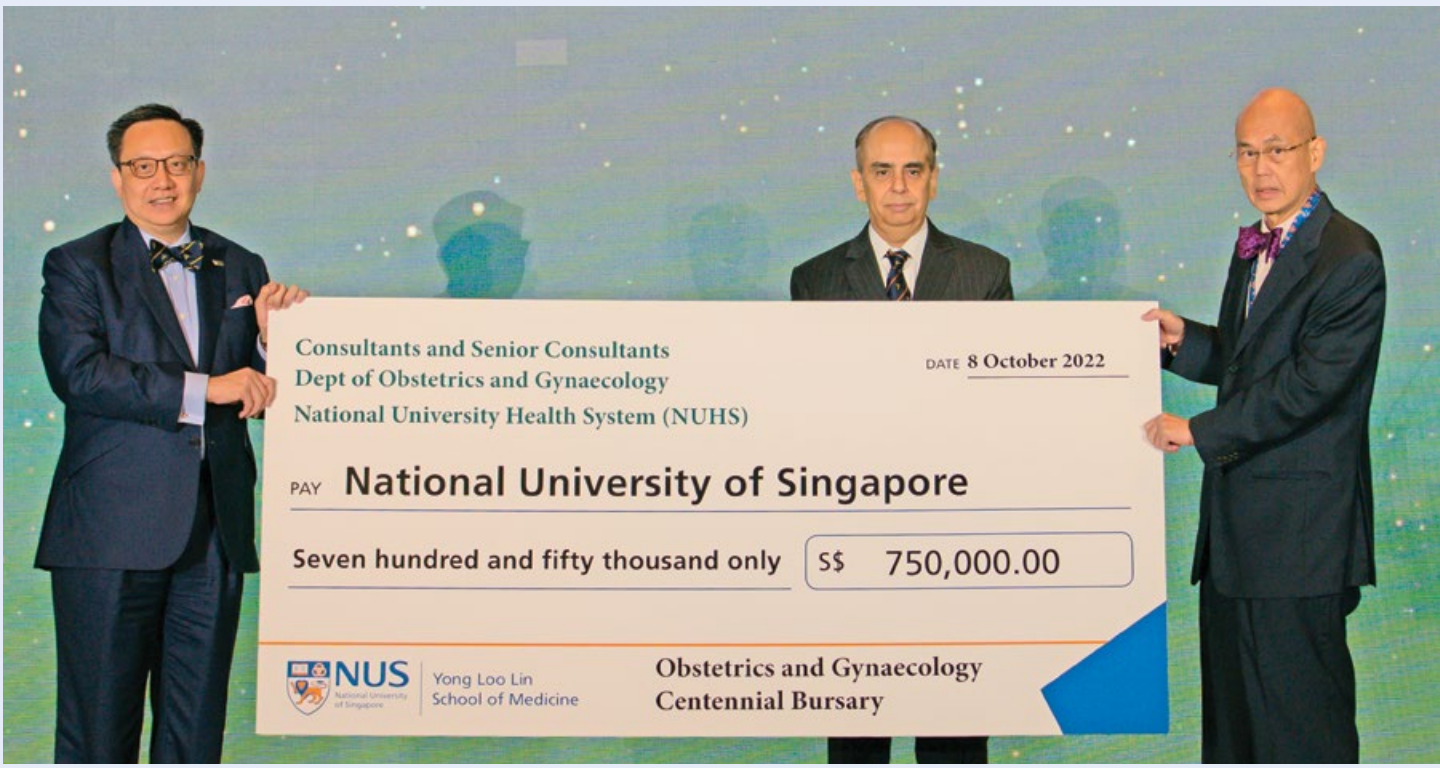
O&G Nursing has evolved in tandem, with nursing education taking great strides forward with an increasing number of O&G specialist nurses at NUH being advanced practice nurses, nurse clinicians and educators, and holding Masters of Nursing and PhDs.

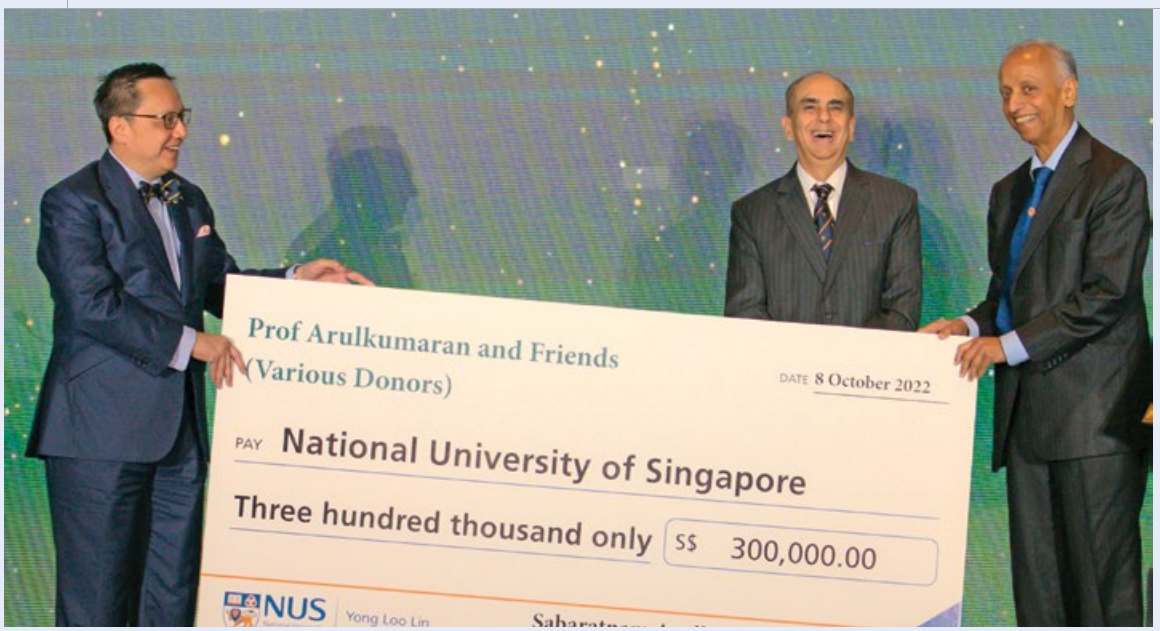
Future

The Department of O&G believes strongly in investing in the next generation of care providers by developing academic fortitude and leadership. This is no easy task, as the academic medicine journey is often long and challenging. The Department has funded book prizes, awards and visiting professorships and this Centenary year sees an exceptional output in generosity as the Department unveils three new scholarships, underlining its commitment to academic endeavours.

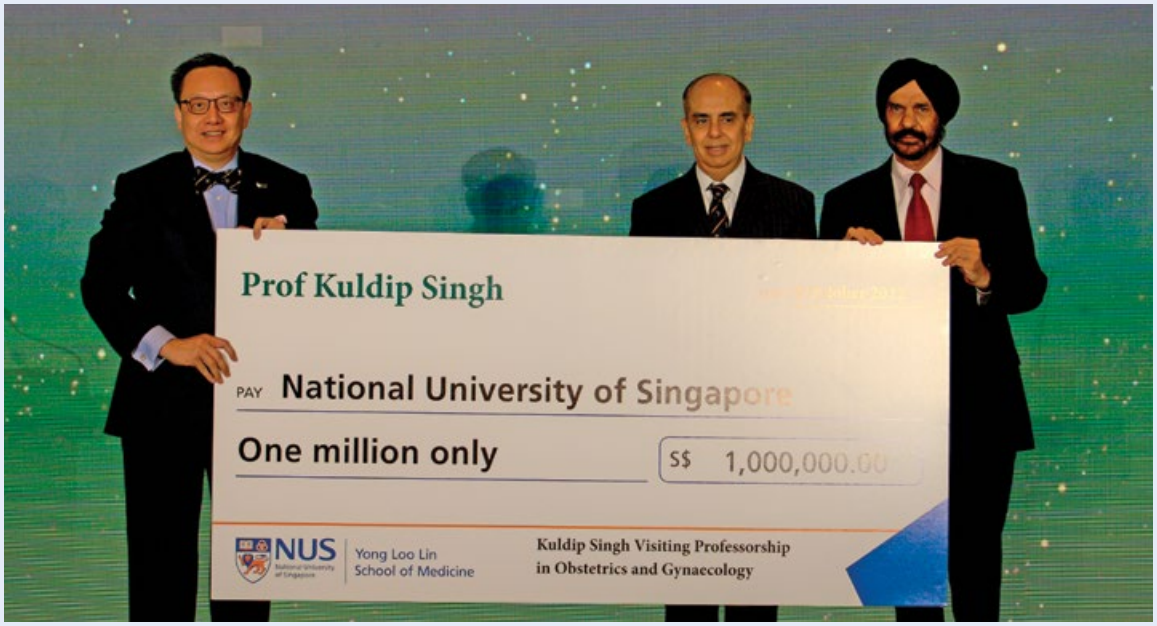
The **Obstetrics and Gynaecology Centennial Bursary** will be funded by the consultants and senior consultants of the Department, to provide financial support to less economically well-off undergraduate students.

Professor Wong Peng Cheang (right) from the Department of Obstetrics & Gynaecology at NUS Medicine, presenting the cheque of $750,000, on behalf of the contributions of 26 consultants and senior consultants in the department, to establish the O&G Centennial Medical Bursary.





Emeritus Professor Sir Sabaratnam Arulkumaran (right) presenting the cheque of $300,000 to establish the Sabaratnam Arulkumaran Scholarship that will go towards supporting young academic clinicians and scientists doing research work in the department.



Professor Kuldip Singh (right), senior consultant in the Department of Obstetrics & Gynaecology presenting the cheque of $1 million to establish the Kuldip Singh Visiting Professorship in Obstetrics and Gynaecology.

At the same time, the **Sabaratnam Arulkumaran Scholarship** has been created to support outstanding early-career research or clinical academics, particularly from low- and middle-income nations, to pursue a two-year research fellowship at NUS O&G. This will support academic progress and enhance collaboration and partnership between NUS, Singapore and her neighbouring institutions.

Further to the above, the **Kuldip Singh Visiting Professorship in Obstetrics and Gynaecology** will bring highly-regarded Professors in O&G to NUS to build research alliances and mentor young academics at the Department, promoting access to academic thought-leaders and unveiling opportunities to advance knowledge and practice.

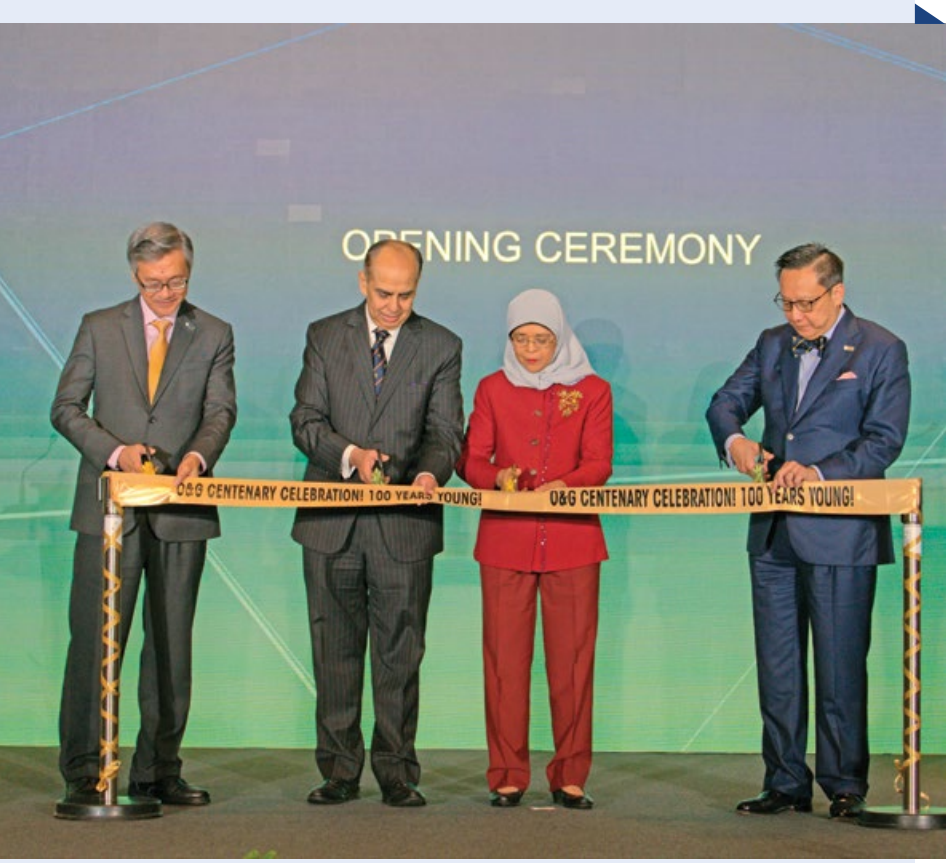
Exciting new collaborations are on the horizon, the newest of which is a partnership with the Semmelweis University in Budapest, commemorating Ignác Semmelweis, the Hungarian physician and researcher known as the "Savior of Mothers" for the way his teachings on hand hygiene greatly reduced maternal mortality in his era, and reflecting our shared dedication to maternal and women's health.

The O&G Centenary Celebration Conference on 8 and 9 October

showcased some of the Department's accomplishments and highlighted an exciting future in women's health, which has been made possible by an unrelenting dedication to clinical service by doctors, nurses and ancillary staff. The work is supported capably by a committed administration that gels the department and helps keep it focused on its deep commitment to educating and training medical undergraduates and postgraduate residents, and a top-down dedication to research and innovation taking a life-course approach.

The conference theme, **Women-Health-Life**, emphasised the mission to provide exemplary service, constantly seek new knowledge, embrace innovation to improve healthcare, and educate and guide future generations of specialists. While the discoveries and innovations of the Department in the recent past embraced fertility and reproductive biology, contemporaneous and future research is strongly geared towards genetic and genomic medicine, *in utero* and *ex utero* therapies, applied artificial intelligence and biomarker discovery to enhance personalised medicine, FemTech, and robotics and space technology—yes even in the space of Obstetrics and Gynaecology.

But at the centre of it all, driving our mission, stands the woman, and by natural extension her family and her community. Our patients have and will always remain our raison d'etre.



President of Singapore, Mdm Halimah Yacob cutting the ribbon at the O&G Centenary Celebration Conference.

New Giving Initiatives Celebrate 100 Years of NUS O&G

The Obstetrics and Gynaecology Centennial Bursary

- funded by department consultants and senior consultants
- to provide financial support to less economically well-off undergraduate students.

The Sabaratnam Arulkumaran Scholarship

- supports outstanding early-career research or clinical academics from low and middle income nations, to pursue a two-year research fellowship at NUS O&G
- supports academic progress and enhance collaboration and partnerships

The Kuldip Singh Visiting Professorship in Obstetrics and Gynaecology

- brings highly-regarded professors in O&G to NUS to build research alliances and mentor young academics at the Department
- promotes opportunities to advance knowledge and practice with academic thought-leaders.

The Teaching of Anatomy:

The First Hundred Years (1905-2005)

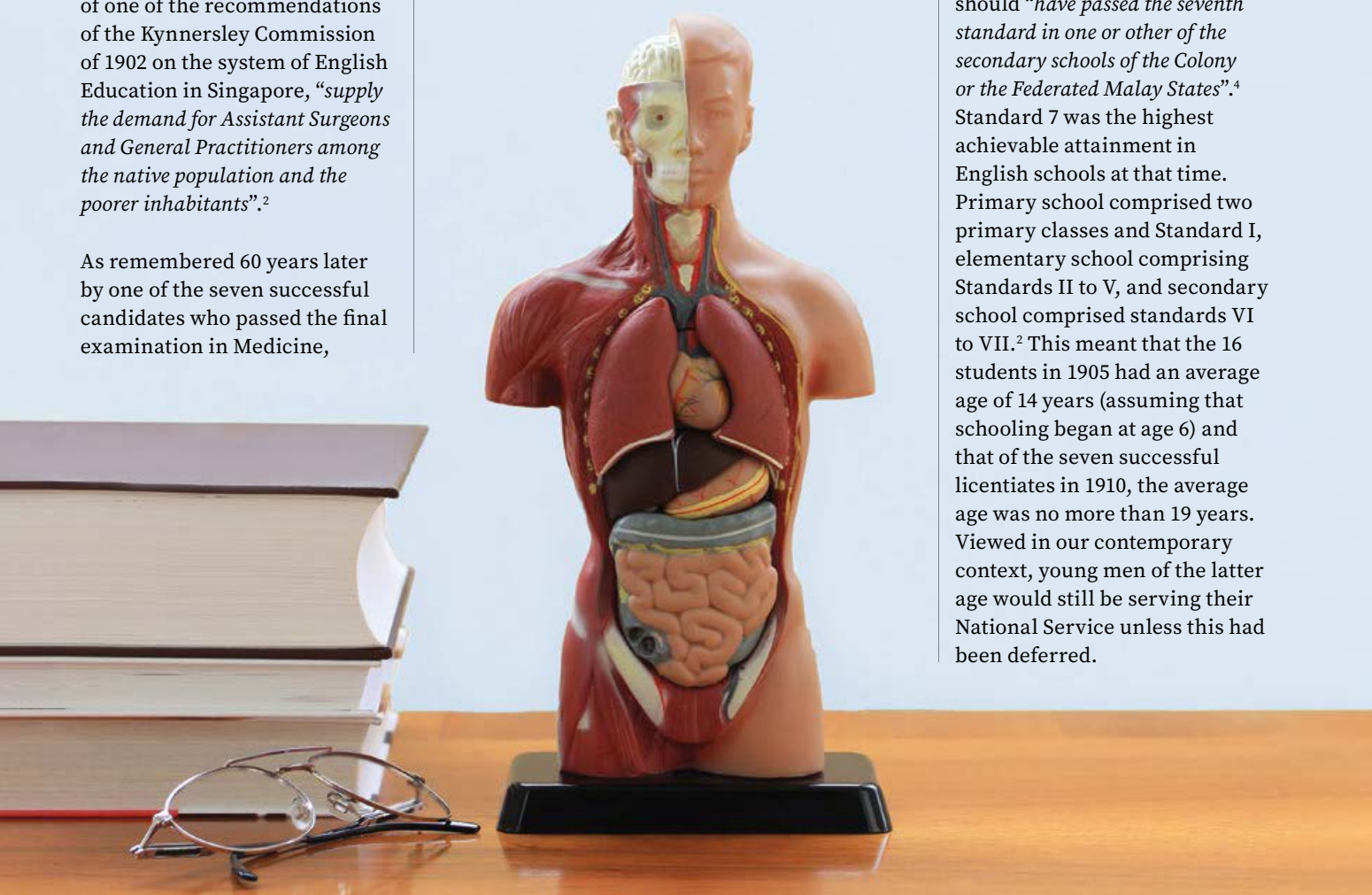
BY WC WONG, MBBS, PHD AND ASSOCIATE PROFESSOR SAMUEL SW TAY, DEPARTMENT OF ANATOMY, YONG LOO LIN SCHOOL OF MEDICINE

The remote past

When the Straits and Federated Malay States Government Medical School opened its doors on 3 July 1905 in what was to be the historical beginning of medical education in the region, 16 young persons presented themselves for the full five-year course that would lead, on successful completion, to their qualification as medical practitioners[1] and in the words of one of the recommendations of the Kynnersley Commission of 1902 on the system of English Education in Singapore, "*supply the demand for Assistant Surgeons and General Practitioners among the native population and the poorer inhabitants*".[2]

As remembered 60 years later by one of the seven successful candidates who passed the final examination in Medicine, Surgery and Midwifery in the shortest prescribed time in 1910, the late Dr Chen Su Lan, "*The Medical School was born without a flourish of trumpets*".[3] Indeed, as measured by the subsequent evolution of the medical school and the achievements of its graduates, the original educational and professional objectives must seem to contemporary eyes relatively modest and circumscribed.

For some who yearn nostalgically for those simpler times, one fact is worth pointing out. The Government, in its reply to the signatories of the memorandum of 1904 that petitioned for the establishment of a medical school stated that the candidates for admission should "*have passed the seventh standard in one or other of the secondary schools of the Colony or the Federated Malay States*".[4] Standard 7 was the highest achievable attainment in English schools at that time. Primary school comprised two primary classes and Standard I, elementary school comprising Standards II to V, and secondary school comprised standards VI to VII.[2] This meant that the 16 students in 1905 had an average age of 14 years (assuming that schooling began at age 6) and that of the seven successful licentiates in 1910, the average age was no more than 19 years. Viewed in our contemporary context, young men of the latter age would still be serving their National Service unless this had been deferred.



The early years

Dr RD Keith, the second principal of the School from 1909 to 1917, had written that the medical course was based largely on the programme prevailing in England, especially London and it consisted of an initial two years in the basic sciences followed by clinical clerkships in Medicine, Surgery and Midwifery during the next three years.[5] The main subjects in the first year were Chemistry, Botany and Physics. The study of elementary Anatomy and Physiology begun in this year extended into the second year.

Dr Chen Su Lan,[3] in his reminiscences, recalled that a month after the opening of the medical school, practical Anatomy began under the supervision of the first principal, Dr GD Freer. Two cadavers were available for study, a muscular young man and a young woman. How were the bodies preserved? Formalin was used as a fixative in the 1890s. In the US during the same period, various agents were used either alone or in different combinations in departments of Anatomy.[6] Among these agents were carbolic acid, glycerine, arsenic, chloral hydrate, zinc chloride, mercuric bi-chloride, alcohol, potassium carbonate, sodium bicarbonate, sodium chloride, methyl spirit, formalin, potassium nitrate and boric acid. The agents were injected directly into the subjects. In some instances, the subjects were preserved by cold storage. In this connection, one of the recommendations of the committee on Medical Education in 1869 of the General Medical Council of Great Britain was that Anatomy and dissections be conducted in the first and second winter sessions of the medical course because even at that time, bodies could only be preserved in winter.[7] Undoubtedly, Dr Freer and his part-time lecturers recruited from the Government Medical Service settled on a workable formula for preserving human subjects in Singapore's perennially warm and humid conditions. Appropriately, the large building used for dissections was situated far behind the main college buildings in the refurbished former lunatic asylum.[3] What were the physical conditions like? No extant description seems available. Was the building electrically lighted or were kerosene lamps still in use? Perhaps in sunny Singapore, natural light would have served. What about ventilation? Were electrically driven high ceiling fans a feature or did open windows suffice? There was nothing like the centrally air-conditioned comforts that are currently enjoyed.

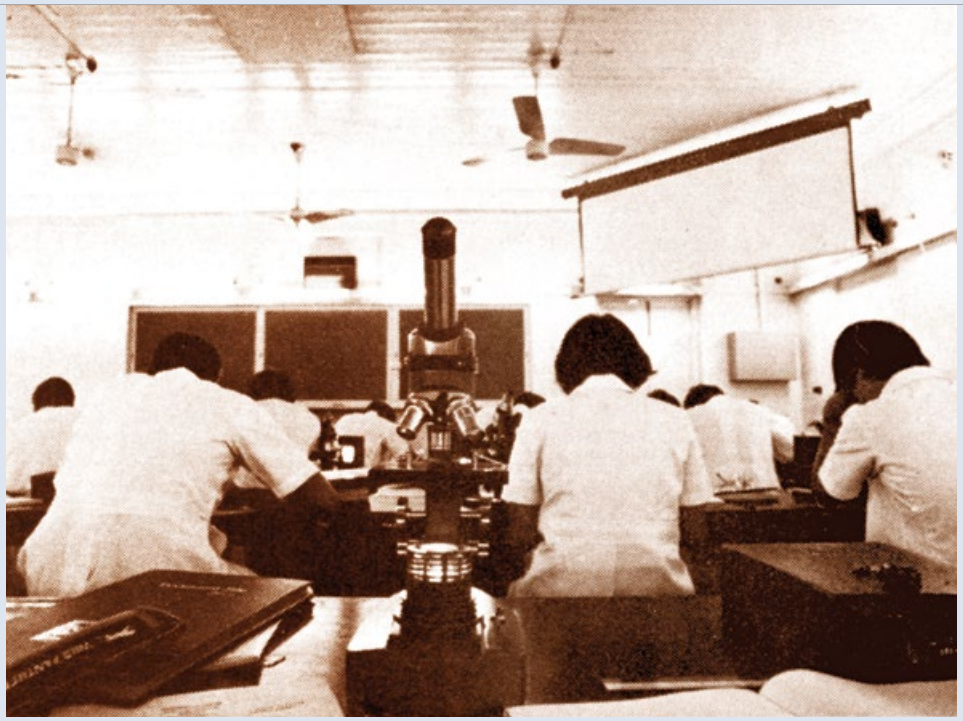
Of the curriculum itself, what precisely was subsumed under "Anatomy"? Dr Chen Su Lan[3] remembered that there were lectures in Osteology and that textbooks were lent to students. What were these textbooks? Of dissection guides, Professor DJ Cunningham's Manual of Practical Anatomy had been published in 1893. Did students also have access to Henry Gray's famous "Anatomy"? Was Histology taught under the aegis of Anatomy or was it part of the province of Physiology, as was the practice then in many medical schools in Britain? The fact that, according to Dr Chen Su Lan,[3] the microscopes which arrived in 1906 were housed in the Physiology building suggested that the second possibility was probably the case. Were Neuroanatomy and descriptive Embryology also taught then? We shall have to be content with these and other questions of those early years remaining unanswered.

↑ Majestic facade of the old Faculty of Medicine Building, a wonderful work of architecture to behold even today.

The recent past

As one approaches the recent past, one is on firmer ground, especially since the medical school's observance of its 50th, 60th and 75th anniversaries. A department as such was non-existent until the first Chair of Anatomy was established in 1922.[4] With this event and the provision of staff, the curriculum would have expanded to bring it in line with that of other medical schools in the British colonies, particularly those in London. By the time of the Faculty of Medicine's diamond jubilee, the Department of Anatomy had assumed responsibility for courses for second year medical, dental, science, and third year medical as well as postgraduate (surgically aspiring) students. Besides traditional gross Anatomy, lectures and practical classes were also conducted in Neuroanatomy, Histology and descriptive Embryology.

From the mid-1960s to the mid-1990s, the course of Anatomy for medical students spanned three semesters (in 1½ academic sessions) and was conducted in such a way that gross Anatomy, Embryology, Neuroanatomy and Histology were delivered in a coordinated fashion. Emphasis was given to the clinical application where appropriate, constantly drawing the students' attention to the professional relevance of the course. A regular feature of the course was the series of applied Anatomy lectures given by clinicians from both the public and private sectors. By the early 1980s, the gross Anatomy course was structured in such a way that at the commencement of each week, a pre-dissection lecture was given in which the week's dissection was reviewed and the important structures that would be encountered were indicated. When the students had completed their practical study, they were divided into small groups, where individual tutors reviewed the tutorial objectives that had been made available earlier. Besides its responsibility to medical students, the Anatomy department also took part in the teaching of dental, science, pharmacy and postgraduate students.



↑ Old Histology Laboratory in the Tan Teck Guan Building.

The late 20th and early 21st centuries

In the late 1990s and early 2000s, the NUS medical curriculum was further substantially revised to meet the challenges of the time in anticipation that medical practice would be characterised by the following:

a) The rapid expansion of biomedical knowledge.
b) Advances in medical technology based on a better understanding of molecular and cellular processes in the human body.
c) The rapid expansion of the Internet and related electronic media/resources.
d) Better-educated and well-informed patients.
e) Complex ethical issues that evolve in parallel with advances in medicine.[8,9]

In view of the above, a current medical student will need to have a thorough knowledge of basic medical sciences to support and strengthen future medical practice. A strong and factual foundation in Human Biology is essential for understanding human diseases. Various educational objectives were introduced recently, viz:

1) Basic science foundation for clinical practice.
2) Clinical competence.
3) Communication.
4) Appropriate attitudes.
5) Professional development.

In line with the above educational objectives, the core M1 curriculum was organised into three tracks, namely:

1) Structural and Cell Biology,
2) Human Structure and Development, and
3) Systems Biology.

In this track system, Human Anatomy classically fell into the Human Structure and Development Track. The original 1½-year Anatomy programme of the mid-1990s was tailored into a one-year programme with a drastic reduction in teaching/contact hours. The teaching of core anatomical knowledge has been further streamlined to synchronise with the teaching in Cell Biology and Systems Biology. In this way, knowledge learnt by a medical student can be integrated, with a better understanding of the structure and functions of the human body.

In the Human Structure and Development Track, knowledge of gross Anatomy was imparted via dissection of the human body and prosected specimens. Students were encouraged to dissect and discover by themselves, supervised by a tutor for three hours each week, followed by a two-hour tutorial. Prior to dissection, a one-hour pre-dissection talk was given by an academic staff member from the Anatomy Department. However, a progressive fall in the availability of cadavers as well as time constraints imposed on the curriculum forced a re-examination of the teaching methodology for gross Anatomy. Recognising the human cadaver to be the most appropriate learning material, the department implemented the use of prosected cadavers in 2003/2004. Expertly prepared by trained staff and studied under the direct supervision of staff members, this method ensures the use of cadavers by students in a most efficient and effective way, using a self-exploratory approach. Besides providing a high quality of material, prosections have the advantage of allowing students to review any part of Anatomy at any time, something not possible previously with dissection, which was necessarily a destructive process.

Besides the above three tracks, medical students must attend Special Study Modules (SSMs) over a period of three weeks where they can opt to study/research an area of specialty such as Neuroscience or Toxinology in the department. In the academic year 2004/2005, the SSM was renamed the Foundation in Research Skills (FRS).

The Undergraduate Research Opportunity Programme (UROP) was initiated to attract students to have a more sustained research experience from Year 1 to Year 4. In this programme, several students have also opted to continue their research under the supervision of the staff from the Anatomy Department.

With reference to problem-based learning (PBL), a total of 10 units were introduced and later fine-tuned to the current eight units per year. Staff members from the Anatomy Department have also actively contributed to the success of PBL as facilitators and case-writers.

↑

Top:
Staff members at the Sepoy Lines Campus (1980).

In circle:
Prosection class in progress in the new Anatomy Hall.

Staff members (past and present)

During the colonial and early post-colonial periods, the academic leadership of the department was in the hands of the expatriates, or in the contemporary phrase, foreign talents. Of the former professors and heads, one of the most fondly remembered was Professor JG Harrower (1922 to 1935), whose name has been memorialised in Harrower Hall. He has been described as an excellent teacher and research worker and he also identified himself with students and student life to a marked degree. Indeed, one of his former students, the late Professor AA Sandosham, singled him out in his memoirs for special mention as a preclinical professor who built up a strong department of Anatomy.[10] Professor AR Ellis (1948 to 1960) originally from New Zealand, was a colourful lecturer, especially in his chosen special interest, descriptive Embryology. He would, in his own words, approach the subject, "*from the simple to the complex*". Though not a researcher himself, he encouraged those who were interested to carry out research, particularly junior members of his staff. He did his utmost to provide the needed equipment for research, given the constraints of the time. Professor R Kanagasuntheram (1962 to 1979), originally from Ceylon (Sri Lanka) during his long tenure brought the stature and standing of the department to new heights. He was both a keen researcher and an enthusiastic teacher and endeared himself to generations of medical students, especially during his "special tutorials" held just prior to the professional examination. It was during his tenure that the first PhDs in Anatomy were instituted. Besides the three gentlemen mentioned above, attention may be drawn to others such as Dr JT Duncan and Col AJ Hull described as "brilliant teachers",[4] as well as Dr A Mohiuddin, originally from Pakistan and now settled in England.

Of the alumni of the National University of Singapore or one of its precursors—the local talents—not a few returned to make contributions of varying durations. Most of these returnees eventually pursued different careers, although some remained in Anatomy for a long time. The following list, arranged under the basic degree obtained, is nothing more than a token acknowledgement of appreciation. *Licentiate in Medicine and Surgery (LMS)*: V Thambipillai, AWS Thevathason; *Bachelor of Medicine and Bachelor of Surgery (MBBS)*: Chua Sui Kim, Arthur Lim Siew Ming, Lye Tong Khee, Loo Saw Kin, Wong Wai Chow, Benny Cheng Shao Lin, Quek Swee Peng, Tan Choon Kim, Sit Kwok Hung, Gurmit Singh s/o Sohan Singh, Rajendran Kanagasuntheram, Bay Boon Huat, Christopher Ang Beng Ti, George Yip Wai Cheong; *Bachelor of Dental Surgery (BDS)*: Leong Seng Kee, Vij Sitaram, Ong Wei Yi, Ng Yee Kong; *Bachelor of Science (BSc)*: Samuel Tay Sam Wah.

Staff members at the Kent Riadge Campus (2003).

Issues in the teaching of anatomy

In a provocative essay entitled "*Dilemmas in Medical Education*",[11] written almost a quarter of a century ago, Professor Wong Hock Boon critiqued many aspects of medical education then, including the teaching of Anatomy. Even earlier, Dr RD Keith,[5] the second principal of the medical school from 1909 to 1917, writing in 1911 on its medical course, among other comments, lamented the "old fetish" of minute descriptions of origins and insertions of muscles, remarking that inessential points should be cast aside, and more attention paid to clinical or regional anatomy, and relationships of important organs and structures. Yet, neither of these distinguished gentlemen once raised the heretical thought that Anatomy be deleted from the education of medical students and future doctors. Indeed, the answer to the question, "Why must or should Anatomy be part of the medical curriculum?" is a no- brainer. The issues in the teaching of Anatomy are not to be discovered in anatomy itself but in its what, when, how and who, i.e., what is to be taught, when should it be taught, how should it be taught and who is to teach it.

Defining how much Anatomy students should know is a perennial problem. How much is much, whether one is considering content or time allocated to teaching of Anatomy? How is a core Anatomy component for undergraduate medical education to be decided? Perhaps these questions have been misdirected in the sense that what input the teaching of Anatomy is expected to provide in the education and development of the future doctor must depend on the definition of the final product. In this regard, the Faculty of Medicine of the National University of Singapore implemented an exhaustive Curriculum Review in the academic year 1993/94.[12] The five-year course has been characterised in broad outlines in which Anatomy is taught in the Human Biology Block in Year 1. More importantly, the Faculty's stated aim is to produce doctors who "*will be equipped with both scientific and clinical knowledge and skills to function effectively as house officers and have the potential to undergo further training leading to careers in primary healthcare, specialised healthcare and/or other biomedical disciplines.*" Having obtained from the clinical practitioners a profile of an effective house officer, the teacher of Anatomy may then work backwards to select from the content of the subject those aspects that will contribute to this aim.

When should Anatomy be taught in the medical curriculum? In a significant sense, this is a *non sequitur* in our local university as the final model adopted is still very much an Abraham Flexner one,[13] i.e., the course is divided into pre- and para-clinical and clinical blocks. However, this is not the only approach. In his aforementioned essay,[11] Professor Wong Hock Boon advocated what has come to be known in medical educational circles as vertical integration. In such a model, an organ or a system is taught in its breadth in its normal and abnormal conditions and the manifestations of symptoms and signs in disease. Professor Wong was quick to acknowledge that "*such an exercise (in) integration is not easy to achieve, for if it were simple, there would have been no dilemma. Such an integration does not mean that only clinical teachers participate in teaching in the so-called 'preclinical' years, but 'preclinical teachers CONTINUE teaching the students also in the clinical years during clinical teaching rounds, seminars, and conferences. We need to integrate not only student teaching, but we need also to integrate preclinical and clinical teachers. There should not be a dichotomy but there should be a cross-fertilisation.*" To the best of the authors' knowledge, there has been no attempt at such an experiment in medical education in our local medical school.

↑ A demonstrator in action.

How should Anatomy be taught? Here, the concern is whole body Anatomy as there is less controversy in the teaching of the ancillary subjects of Histology, Embryology and Neuroanatomy that come within the compass of the whole Anatomy course. In this connection, for the local medical school, as far as the teaching of Anatomy is concerned, the 2003/2004 academic year has crossed a rubicon. A sacred cow in the teaching and learning of anatomy has been slaughtered. Dissection is no more a requisite. Teachers demonstrate and students learn on prosected material. Although such an approach has been adopted in other medical schools abroad, the assessment of its success locally can only be seen in the near future. Besides the traditional cadaveric Anatomy, other aids to understanding whole body Anatomy have been and continue to be valuable such as: living Anatomy (what may be seen and felt), cross-sectional Anatomy and imaging Anatomy.[14]

In today's world it is unrealistic to insist that only medically qualified teachers should do so. As a general rule, those who have learnt Anatomy (wholly or partially) may teach. For those who have scant experience in Anatomy, on-the-job learning prior to taking on formal teaching responsibility will be essential.

Finally, who should teach Anatomy? In today's world it is unrealistic to insist that only medically qualified teachers should do so. As a general rule, those who have learnt Anatomy (wholly or partially) may teach. For those who have scant experience in Anatomy, on-the-job learning prior to taking on formal teaching responsibility will be essential.

Acknowledgements
The authors are grateful to Professor Ling Eng Ang (Head, Department of Anatomy) for his support and critical comments on this article. Special thanks to Associate Professors Bay Boon Huat, K Rajendran and Dr George Yip for proofreading the manuscript. Last but not least, the authors are grateful to Mr Yick Tuck Yong for his expertise in capturing and compiling the photographs.

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Reflection: How a Classroom Feedback System Improves Student and Teacher Performance

BY DR VOLKER PATZEL, SENIOR LECTURER, DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY

I grew up in Germany and discovered my passion for science as a young child. At the age of 12, I made the decision to study chemistry, which I then did many years later. I specialised in biochemistry and went on to do a PhD in biomedical research.

It was then when I became fascinated by the idea that the technologies we develop in the laboratory could eventually benefit patients in the future.

After having co-founded a biomedical start-up, I realised that moving towards research work that could benefit patients requires an additional skill set, which was why I pursued an executive Master of Business Administration (MBA) as well. Doing an MBA as a scientist turned out to be a great personal gain, and retrospectively, I value the network of like-minded classmates and friends much more than the imparted knowledge.

The completion of my education and training kindled in me the desire to share my knowledge and to educate the younger generation.

At the end of 2009, I joined NUS which was, on one hand, a great opportunity to conduct independent research, and on the other, for building up my own teaching portfolio. Today, I am coordinating six modules, teaching both undergraduate and graduate students, as well as lifelong learners in biomedical sciences, bio-innovation and entrepreneurship.

When I started teaching at NUS, I realised that the education system differs from the one in my home country, as well as the way students and teachers interact with one another.

In Germany, students have no qualms in approaching me with questions, whereas in Asia, it is not common for students to do so. This made receiving sufficient classroom feedback very trying. Classroom feedback is an aspect I have always deemed essential, in order to facilitate self-regulation and assessment for both student and teacher performance. Effective intervention has to be done before students receive their examination results, and before gathering the end-of-semester feedback.

Indubitably, the lack of pro-activity from my students started to get to me, and I doubted myself as a teacher—until colleagues shared similar issues.

At that time, I joined the Professional Development Programme Teaching (PDP-T) at NUS, which introduced the concept of technology-supported student feedback systems to me. I greatly welcomed the idea of giving students the opportunity to provide anonymised feedback, and hence decided to implement a technology-supported student feedback system into my modules.

I hypothesised and hoped that a classroom feedback system would help promote assessment and self-assessment of student and teacher performance, to improve both the quality of teaching and my students' performance.

Initially, as a classroom response system, I selected clickers, and later switched to Poll Everywhere. I decided to set up a classroom feedback system that included three sessions of multiple-choice (MCQ) quizzes spread over the course of each module, with each session comprising two identical rounds of questions together with a lecture[1].

In the first round, students were asked to respond immediately, while in the second round, they were encouraged to first discuss their responses with their classmates. Both peer instruction and repeated testing had been reported to facilitate a deeper comprehension and actively build knowledge[2,3].

All in all, this setup provided the students with three different levels of feedback. First, the externally observable outcome of each MCQ session supplied the students with direct computerised quantitative feedback.

Second, the critical dialogue with peers prior to submitting the answers for each second round gave them dialogical external feedback. Finally, I could bring forth qualitative external feedback, through facilitated in-class analyses and discussions.

Furthermore, this three-stage classroom feedback system also helped me to gauge the students' level of understanding, as it identifies both areas of difficulty and confusion, as well as areas of interest. This feedback has enabled me to shape the sequel to the module, "Fostering Audience-paced Instruction", thereby indirectly providing the students with additional external feedback.

In total, I monitored three performance indicators, comprising the percentage of correct and false answers, the percentage of questions answered correctly by all students, and the difference in percentage of correct answers between rounds one and two of each session.

This three-stage classroom feedback system has been implemented in my modules since 2013, and I observe the same tendencies every year.

"I hypothesised and hoped that a classroom feedback system would help promote assessment and self-assessment of student and teacher performance, to improve both the quality of teaching and my students' performance."

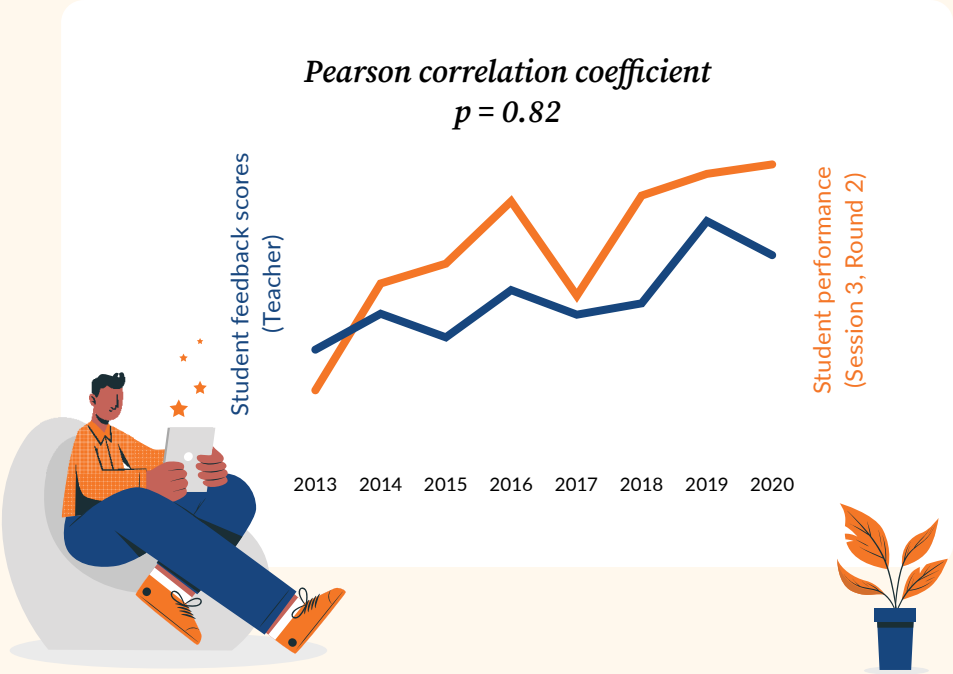
Firstly, the percentage of correct answers has always increased from the first to the second round of polling, indicating that the dialogical feedback from the peers together with the first-round computerised feedback triggered measurable learner self-regulation.

Secondly, the percentage of correct answers (first and second rounds) as well as the percentage of questions that were answered correctly by all students dropped from MCQ sessions 1 to 3, showing that classroom feedback from the students triggered measurable teacher self-regulation as I steadily raised the level of difficulty for my questions.

Most importantly, the percentage of correct answers at the end of the module rose steadily every year, with the exception of the 2017 batch. This indicates that student and teacher self-regulation sparked an improvement in students' learning and understanding. In other words, this technology-supported classroom feedback system has helped me to deliver the curriculum more efficiently, and be a better teacher.

As a whole, I also wanted to find out whether increased student performance would lead to greater student satisfaction, including better end of semester student feedback scores for me as a teacher. Not unexpectedly, I found a strong correlation (p=0.82) between the students' performance at the end of each module and the feedback scores I received (Figure).

Unlike graded continuous or final exams where questions have to be modified every year, the questions in my MCQ quizzes have largely been identical and no grading was performed. Hence, the results obtained using this feedback system are granting rather unbiased insights into the performance of students and teachers.



"This technology-supported three-stage classroom feedback system was very easy to implement and provided tremendous benefits to my students and myself. I would recommend the implementation of such a system to my colleagues at NUS, in Singapore and abroad."

Currently, I am investigating if the implementation of my classroom feedback system also improved the students' output during their exams. In addition, we analysed whether the COVID-19 pandemic and the switch between face-to-face (f2f) and online or hybrid teaching formats measurably impacted the students' performance.

In summary, this technology-supported three-stage classroom feedback system was very easy to implement and provided tremendous benefits to my students and myself. I would recommend the implementation of such a system to my colleagues at NUS, in Singapore and abroad.

[1] Patzel V. Implementation of a Technology-supported Three-stage Classroom Feedback System for Promotion of Self-regulation and Assessment of Student and Teacher Performance. *American Journal of Educational Research*. 3(4), 446-449, 2015.

[2] Crouch, C.H. and Mazur, E, Peer instruction: Ten years of experience and results, *American Journal of Physics*, *69*(9). 970-977. 2001.

[3] Smith, M.K, Wood, W.B, Adams, W.K, Wieman, C, Knight, J.K, Gulid, N. and Su, T.T, Why peer discussion improves student performance on in-class concept questions, Sciences, 323(5910). 122-124. 2009.

Nutritional Supplement Shrinks Breast Cancer Tumours with No Side Effects

Each year, over 2,000 women are diagnosed with breast cancer and more than 400 die from the disease, according to the Singapore Cancer Registry annual report in 2018. One in 13 women will get breast cancer in their lifetime.

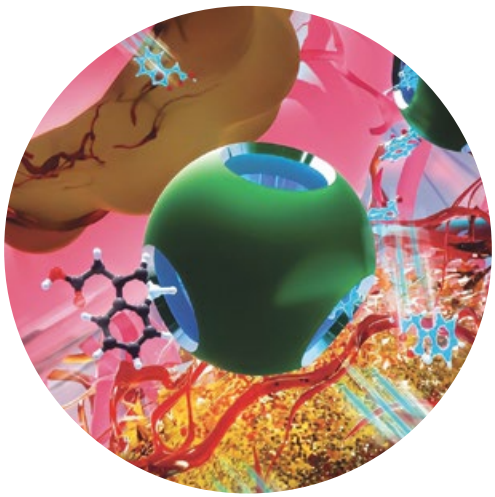
A diagnosis of breast cancer is traumatic and life altering for women and their loved ones. This potentially deadly disease is often treated by surgical removal of the breast cancer tumour followed by chemotherapy. Side effects associated with chemotherapy can be severe and tumour recurrence may result in a shortened lifespan for vulnerable women.

In an encouraging development, researchers from the Yong Loo Lin School of Medicine at the National University of Singapore (NUS Medicine) have succeeded in using a plant-derived nutrient supplement to shrink breast cancer tumours in preclinical models. The team at NUS Medicine used a novel nanotechnology to repurpose a nutritional component in plants to become a potent treatment for breast cancer.

As the nanotechnology converts the plant nutrient into chemotherapy only at the site of the tumour, the treatment is both potent and free from side effects. Although the study was performed in preclinical models using the new technology, human breast cancer cells were used as the target. These responded with a complete remission. The researchers hope to next apply the technology in clinical trials to additional solid tumours which are difficult to treat or are difficult to remove via standard surgery.

"The use of plant-based natural products transformed by a process called 'bioorthogonal catalysis' to shrink breast cancer tumours is groundbreaking technology," said Dr Chester Drum, Assistant Professor at NUS Medicine and Senior Consultant in the Department of Cardiology, National University Heart Centre, Singapore. In essence, a benign nutritional supplement, Indole-3-acetic Acid or IAA, was repurposed to become a potent treatment for breast cancer tumours. IAA is present in the everyday diet and thus has no side effects.

"In the new approach, following administration of the plant-derived molecule, an engineered nanotechnology converts the molecule into a potent chemotherapeutic only at the site of cancer, meaning that side effects in the rest of the body can be avoided," he said. Because the chemical conversion of natural product to chemotherapy is not normally present in the human body, it is called 'bioorthogonal catalysis'.



↑ *In circle:* ACS Nano Cover.

Although the study treated breast cancer tumours derived from human patients, preclinical models were used as the experimental cancer host as the technology is still too early to be used in hospital clinics. The researchers plan to next develop a simple gel which can be placed at the site of a tumour removal after surgery; the patient is only required to consume a nutritional supplement to prevent recurrence of the cancer.

Scan here to read the paper published in ACS Nano:

Proteins in Cell-based Particles Could Lead to Early Diagnosis and Treatment of Breast Cancer Metastasis

Non-invasive biomarkers secreted by tumour cells may signal locally advanced and metastatic breast cancer. These biomarkers could help develop new ways to assess, monitor and suppress this hallmark of cancer.

One woman is diagnosed with breast cancer every 14 seconds somewhere in the world: data indicates that approximately 2.3 million women worldwide were newly diagnosed with breast cancer in 2020.

In Singapore
1 IN 13
women will get breast cancer in their lifespan

In Singapore, it is the most common cancer among women and will likely affect one in 13 women in their lifespan. Although advances in medicine today allow for treatments for early-stage and non-metastatic breast cancer, advanced stage and metastatic breast cancer is considered incurable with current treatment options, and has very poor prognosis.

The early detection of breast cancer metastasis is therefore paramount in the treatment of the condition, and a team of researchers has discovered a non-invasive biomarker that could aid with earlier diagnosis.

Led by Assistant Professor Minh Le from the Institute for Digital Medicine (WisDM) and Department of Pharmacology at the Yong Loo Lin School of Medicine at the National University of Singapore (NUS Medicine), and Associate Professor Andrew Grimson from the Department of Molecular Biology and Genetics at Cornell University, the researchers found that particles which are secreted by tumour cells, extracellular vesicles (EVs), displayed a high level of protein integrins αv and β1, in patients with locally advanced and metastatic breast cancer.

Asst Prof Le said, "Metastasis is the chief concern for breast cancer patients. The study highlights the potential of integrins αv and β1 as a promising prognostic and therapeutic target for patients with metastatic breast cancer. Our research has opened several doors, and we hope that future work will help develop new ways to assess, monitor and suppress this hallmark of cancer."

The study highlights the potential of integrins αv and β1 as a promising prognostic and therapeutic target for patients with metastatic breast cancer. Our research has opened several doors, and we hope that future work will help develop new ways to assess, monitor and suppress this hallmark of cancer."

Asst Prof Le, WisDM and Department of Pharmacology at NUS Medicine

Published in the Journal of Extracellular Vesicles, the team used an ultra-sensitive protein identification tool to obtain a set of protein expression profiles from the EVs of different metastatic breast cancer cell lines. They discovered that, among many candidate proteins, integrins αv and β1 were consistently overexpressed in EVs of high metastatic background.

In addition, the team collaborated with Associate Professor Victor Lee, Senior Consultant, Department of Pathology, National University Hospital, and found a high level of integrin αv in samples from patients with stage III or IV breast cancer. He said, "Through the study, we discovered the potential of integrin αv as a new non-invasive biomarker for the early diagnosis of breast cancer metastasis."

Assoc Prof Grimson added, "The study has led to fundamental insights in the underlying mechanisms of breast cancer metastasis. In addition to its clinical relevance, the research contributes to recent advances in the EV field, in that there are functionally distinct subsets of EVs, which can now be more readily identified and studied to understand their functions and potential as therapeutic targets in the tumour environment."

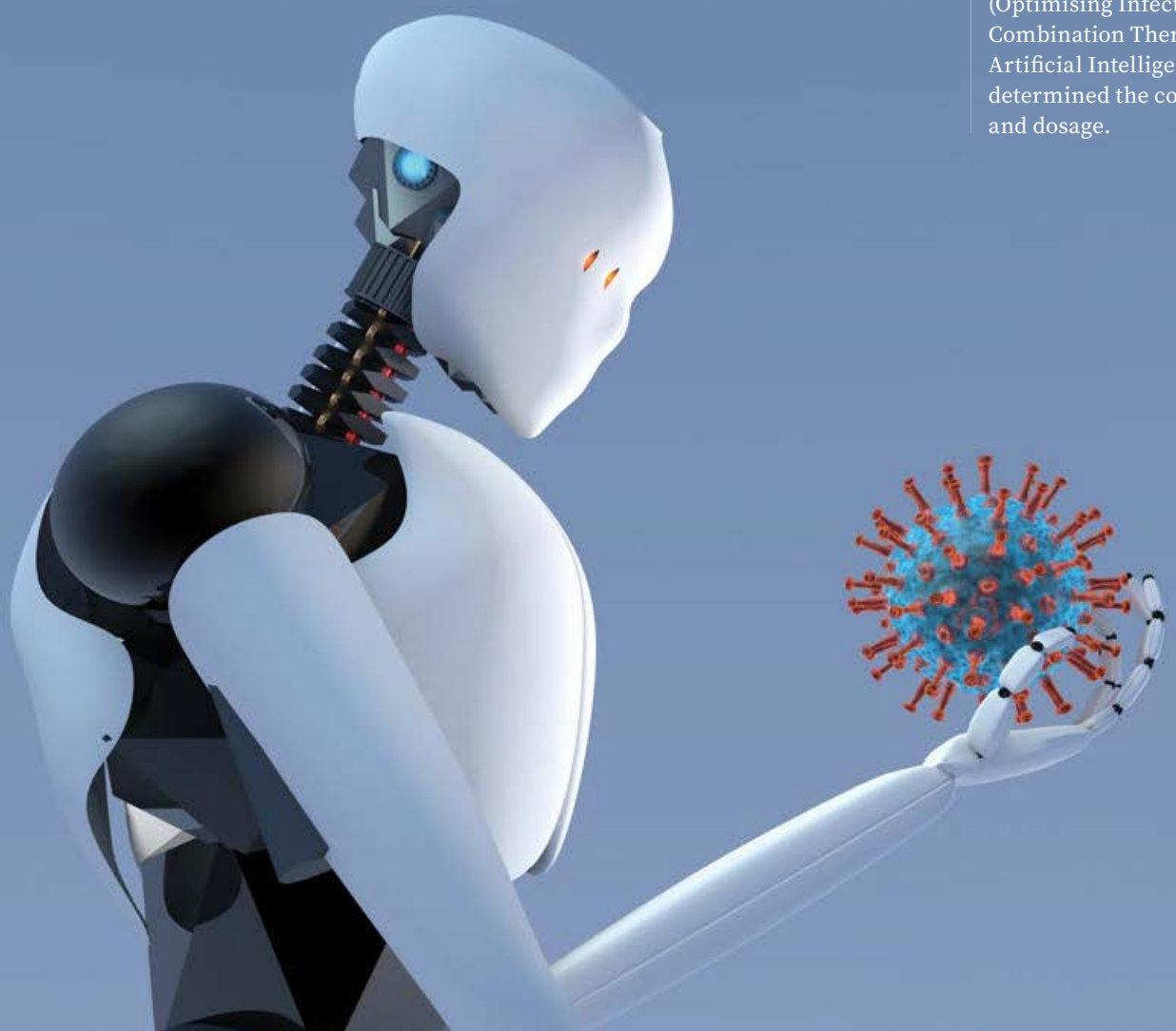
Scan here to read the journal article:

NUS Scientists Use AI Platform to Improve Effectiveness of COVID-19 Drugs against Omicron

Artificial Intelligence (AI) is breaking new ground in the realm of innovation for healthcare. Today, AI is used extensively in the medical sciences, ranging from diagnosing patients to end-to-end drug discovery and development. In an unprecedented time of COVID-19, the need for AI capabilities is critical, given the dangers that the mutating COVID-19 viruses pose.

One way to better combat COVID-19 infections is to enlist the help of AI in determining the optimal combination of antiviral drugs, as well as the correct dosage. A recent study into the combination of antiviral drugs Molnupiravir and Paxlovid with YH-53, a protease-inhibiting drug, found that the mix was effective against the Omicron variant of COVID-19 in lab settings. It was led by Professor Dean Ho, Director of the Institute for Digital Medicine at the NUS Yong Loo Lin School of Medicine (NUS Medicine), and a team of NUS scientists.

He found that in lab settings, antiviral drugs Molnupiravir and Paxlovid combined with the protease-inhibiting drug YH-53 were effective against the Omicron variant of the coronavirus. Using his AI platform, IDentif.AI (Optimising Infectious Disease Combination Therapy with Artificial Intelligence), his team determined the combination and dosage.



One is good
Currently, when administered within five days of symptoms appearing, Paxlovid is about 90% effective in preventing the need for hospitalisation or infection progression. Paxlovid comprises two drugs—Nirmatrelvir, an antiviral medicine that targets the Sars-CoV-2 virus' 3CL enzyme, which the coronavirus needs to replicate; and Ritonavir, a protease inhibitor which helps keep the antiviral active in the body at higher concentrations for a longer time to combat the virus.

On the other hand, Molnupiravir alone is approximately 30% effective. It works by targeting an enzyme that the virus needs to make copies of itself, by introducing errors into its genetic code.

Some patients in local and global contexts have had an infection relapse after a course of Paxlovid. This suggests the Sars-CoV-2 virus was not completely eradicated by the drug, nor by the infected person's immune defences.

Another researcher in the team, Associate Professor David Allen, Associate Vice-President of Health Innovation and Translation at NUS Medicine, stated that while each drug on its own has not shown diminished efficacy against the Omicron variant, some patients in local and global contexts have had an infection relapse after a course of Paxlovid. This suggests the Sars-CoV-2 virus was not completely eradicated by the drug, nor by the infected person's immune defences.

Caused by viral mutations, such drug resistance could undermine a drug's effectiveness when used to treat patients with COVID-19.

Two is better
Instead of relying on each individual drug with limited effectiveness, the research team explored the possibility of combining the drugs to potentially decrease the chances of Sars-CoV-2 viral resistance.

Prof Ho and the team then used IDentif.AI and explored

Given the diversity of different drug candidates that are being studied, and the need to evaluate different permutations of drug combinations and the respective doses, much of the data needed in order to optimise drug development simply does not exist. IDentif.AI is unique in that we obtain the data that we need through carefully designed experiments in order to arrive at a ranked list of actionable and optimised regimens."

Prof Dean Ho, Director of the Institute for Digital Medicine, NUS Medicine

different combinations and the most precise dosing needed, to amplify the effects of both Molnupiravir and Paxlovid against Omicron. Each drug combination was then validated against the Sars-CoV-2 virus in lab tests, before it was considered for further clinical evaluation. One of the combinations involved adding YH-53, a protease-inhibiting drug from Japan. Protease-inhibiting drugs prevent the coronavirus from replicating.

Thus far, the results have shown that both Paxlovid and Molnupiravir, when combined with YH-53, had dose-dependent synergy. Prof Ho clarifies that when used together at the right dosing, the drugs were jointly more effective against Omicron.

The team is also further exploring broader dose configurations for these combinations, to determine the most effective one against Omicron with minimal toxic effects. Through IDentif.AI, they reduced the number of experiments needed, obtaining results at a faster rate. Prof Ho attributes this to the difference between IDentif.AI and traditional AI, where pre-existing data to train algorithms and predict drug combinations are warranted.

"Given the diversity of different drug candidates that are being studied, and the need to evaluate different permutations of drug combinations and the respective doses, much of the data needed in order to optimise drug development simply does not exist. IDentif.AI is unique in that we obtain the data that we need through carefully designed experiments in order to arrive at a ranked list of actionable and optimised regimens," added Prof Ho, in a similar research study published in 2020, on the therapies against COVID-19. Out of 12 potential drug candidates, representing over 530,000 possible drug combinations, the study found that the optimal drug combination then was Remdesivir, Ritonavir, and Lopinavir.

The team found another effective combination involved trialing Molnupiravir with Favipiravir, an affordable influenza drug. The idea to experiment with Favipiravir came from numerous clinicians, as the drug is in relatively high supply in many countries to treat flu, and is both inexpensive and well tolerated.

When used alone, Favipiravir's efficacy showed mix results in clinical trials conducted in Russia and Japan. However, results were better when Faviporavir was mixed with Molnupiravir in lab tests. The results for this trial done by Prof Ho and his team corresponded with another study done in Paris, in November 2021. In that study, the results showed that both Molnupiravir and Favipiravir worked synergistically, though Favipiravir had to be given at "fairly high" doses, said Prof Ho.

At the same time, apart from investigating the drug combinations effective in fighting Omicron, Prof Ho and his team are also working on helping immunosuppressed patients. They are currently in discussions with clinicians in Singapore, to conduct a pilot for a drug combination to improve efficacy for the target group.

This stems from the greater danger COVID-19 infections pose for patients with weakened immune systems, as they may not be able to mount a strong defence against COVID-19 infections, even when they are fully vaccinated.

Further studies in the works by Prof Ho and his team include Phase III clinical trials for potential COVID-19 pill, Shionogi, that is also a protease inhibitor, as well as Plitidepsin, a cancer therapeutic that may be effective against the virus.

Scan here to read the journal article:

Nosing for Trouble

Investigating Long-term Loss of Smell and Taste in 27 Million COVID Patients Worldwide

There have been over 550 million confirmed COVID-19 cases since the start of the pandemic. Out of the abundance of symptoms that COVID patients have reported experiencing, the loss of taste and smell are the most common.

Prior to the pandemic, studies have revealed that patients with poorer smell function may suffer from depressive conditions, higher mortality, and a poorer quality of life in general. This condition has exacerbated since the dawn and development of COVID-19.

Globally, these two are ubiquitous symptoms among COVID-19 patients, amounting to an inordinate number of 50%. Yet little is known about their clinical course, or the number of patients who develop this persistent dysfunction. Hence, to address this gap in knowledge, a team of Singaporean and international researchers from the UK and the US spearheaded an investigation into the prognosis and persistence of smell and taste dysfunction in patients with COVID-19.

In this study titled "Prognosis and persistence of smell and taste dysfunction in patients with COVID-19: meta-analysis with parametric cure modelling of recovery curves" published by the British Medical Journal, the researchers found that an expected 5% of the global population may develop issues with their sense of smell and taste in the long run, after coming down with COVID-19.

The international collaborative research team is led by Associate Professor Toh Song Tar, Head of the Department of Otorhinolaryngology at the Singapore General Hospital (SGH), and Dr Benjamin Tan Kye Jyn, House Officer at the National University Hospital. Following their lead are the current and newly graduated medical students from the NUS Yong Loo Lin School of Medicine.

Their goal was to investigate and clarify in COVID-19 patients, the recovery rate of their smell and taste, the proportion of persistent dysfunction in smell and taste, as well as the prognostic factors associated in the recovery process.

As of July 2022, after recovering from COVID-19

15 MILLION

patients report long-lasting smell dysfunction

12 MILLION

patients report long-lasting taste dysfunction

30 days after initial infection, only

74%

of patients restore their sense of smell

79%

of patients restore their sense of taste

Based on 18 observational studies involving 3,699 patients from 12 countries, 4,180 records were wielded in the analysis by the research team. They utilised a mathematical technique known as cure modelling to estimate self-reported rates of smell and taste recovery. Thereafter, they sought to identify the key factors associated with the duration and likelihood of recovery.

The patients' recovery curves are consistent with the findings of recent studies, which suggest that recovery from smell and taste dysfunction mostly occurs early in the course of COVID-19. More importantly, the cure models are consistent with other studies that explored the point prevalence of persistent dysfunction at long follow-up durations of six months to one year.[1,2]

Millions have lost their sense of smell and taste

They discovered that 5.6% and 4.4% of patients worldwide might develop long-lasting self-reported smell and taste dysfunction after recovering from COVID-19 respectively, a number amounting to 15 million and 12 million patients, as of July 2022.

Another finding was that, at 30 days after initial infection, only 74% and 79% of patients had their sense of smell and taste restored respectively.

Upon analysis, female patients, as well as patients with a greater initial severity in their dysfunction, were less probable to recover their sense of smell and taste. Patients with nasal congestion were less likely to recover their sense of smell as well.

While most patients are expected to recover their sense of smell or taste within the first three months, a group of patients might develop long-lasting dysfunction. For example, smell dysfunction could predict the development of depression[3] and is potentially associated with neurodegenerative disorders. This requires close healthcare interventions like timely identification, personalised treatment, and long-term follow-ups.

Implications for healthcare professionals

The implications of this study hold great relevance, especially to general doctors and otolaryngologists, in their work to counsel and consult patients with smell and taste disorders post COVID-19. It has also highlighted the glaring far-reaching problems associated with taste and smell loss.

Adding heft to the ongoing discovery of long-COVID in patients, Prof Toh wants to draw medical attention to this group of patients.

"We hope that the results of this study will draw the attention of the medical fraternity worldwide to the long-term issues associated with taste and smell loss. Healthcare providers around the world should be cognisant of this, given the huge number of affected individuals who need support and help," said Prof Toh.

Yet, at the same time, the project symbolises a hopeful start to the unearthing of COVID-19 related dysfunctions, and the great potential to help patients.

"Seeing this research project through from start to finish has been incredibly fulfilling. We are grateful to have worked with an international consortium of leading experts in this field, including those who first discovered the link between COVID and loss of smell and taste. We hope that our findings will encourage patients and provide greater clarity on their recovery," added Dr Benjamin Tan, the first author of the paper, and recent graduate of NUS Medicine.

"We also hope that governments and healthcare professionals worldwide will start to realise the magnitude of this problem, as the global healthcare system is not yet equipped to manage this aspect of long COVID."

Scan here to read the journal article:

1 Boscolo-Rizzo P, Guida F, Polesel J, et al. Self-reported smell and taste recovery in coronavirus disease 2019 patients: a one-year prospective study. Eur Arch Otorhinolaryngol2022;279:515-20. doi:10.1007/s00405-021-06839-w pmid:33963433.

2 Boscolo-Rizzo P, Menegaldo A, Fabbris C, et al. Six-Month Psychophysical Evaluation of Olfactory Dysfunction in Patients with COVID-19. Chem Senses2021;46:bjab006. doi:10.1093/chemse/bjab006 pmid:33575808.

3 Eliyan Y, Wroblewski KE, McClintock MK, Pinto JM. Olfactory Dysfunction Predicts the Development of Depression in Older US Adults. Chem Senses2021;46:bjaa075. doi:10.1093/chemse/bjaa075 pmid:33197253.

Commentary: How Do We Justify Using Animals as Organ Donors for Humans?

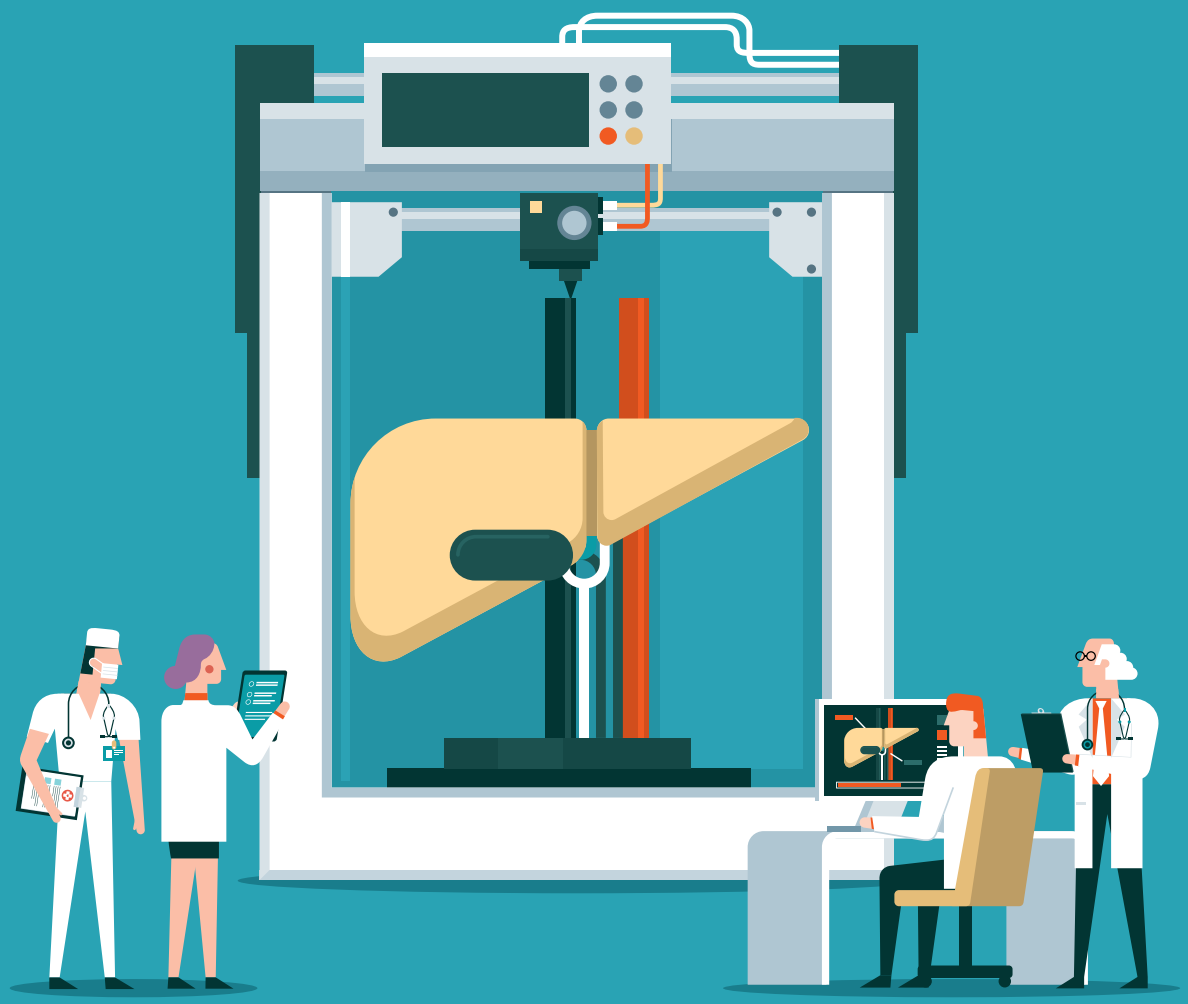
BY DR VOO TECK CHUAN, ASSISTANT PROFESSOR AND DR CHAN HUI YUN, RESEARCH FELLOW, AT THE NUS CENTRE FOR BIOMEDICAL ETHICS, YONG LOO LIN SCHOOL OF MEDICINE

If it is ever ethically justified to sacrifice animals to benefit humans, it would be to save an identifiable human life. But the interests of animals should be given appropriate weight in xenotransplantation decisions.

In January this year, David Bennett[1], a 57-year-old patient in the US, became the first person in the world to be transplanted with the heart of a genetically modified pig. He was certain to die from terminal heart disease and was not medically eligible to receive a human heart from a deceased donor or a mechanical heart pump.

The experimental treatment held important implications for transplant medicine, as it showed that it was feasible to transplant pig organs into humans.

Unfortunately, Bennett died two months later.[2] A virus called porcine cytomegalovirus was found in the pig heart, which is believed to have contributed to his death.



Historically, there have been many attempts at transplanting living non-human biological materials into human recipients for therapeutic purpose, otherwise known as xenotransplantation.

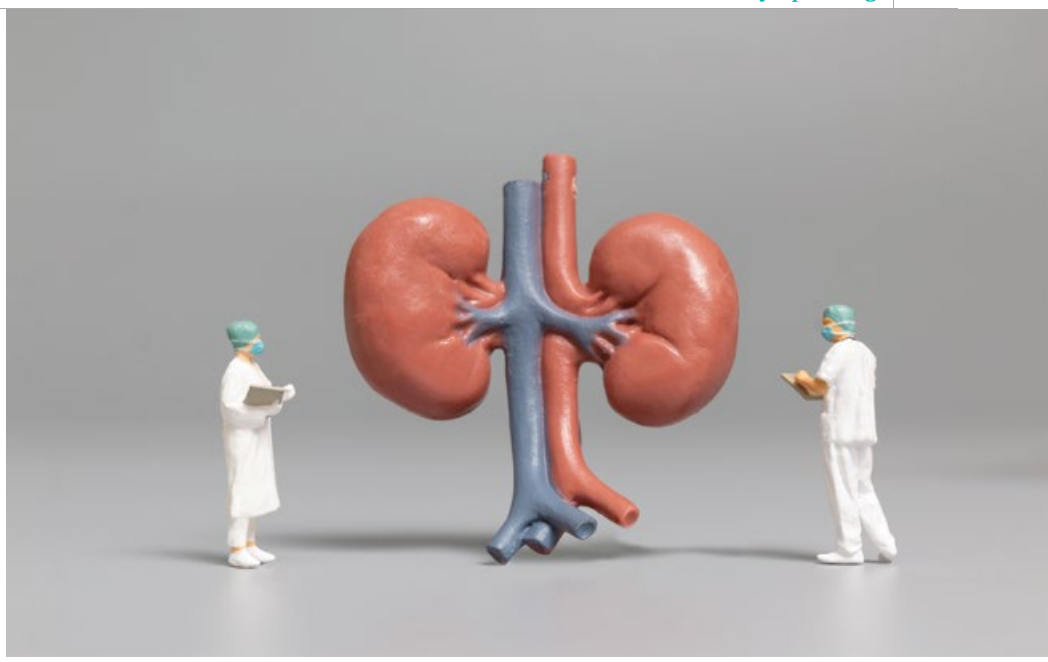
How animal organs made their way into humans

Experimental transplantation of solid organs such as hearts, kidneys and liver from a variety of animals into human patients started in the 1960s, prior to the institutionalisation of human organ donation systems. Most patients who received solid organ xenografts died days or weeks after because of immunological rejection or an infection complication.

Advances in science and technology could remove or reduce these barriers through xenotransplantation. To prevent rejection, animals purposed for xenotransplantation could be genetically modified by genome editing to have human-like immune systems. Viruses that commonly infect animals, such as porcine cytomegalovirus in pigs, could be prevented from infecting human recipients through pathogen-free breeding.

Pathogen-free breeding would not prevent all cross-species infection as some viruses are native in animal cells because of certain genes, which could pass on to human cells and mutate to cause conditions like cancer. But genome editing could "knock out" these virus genes and reduce the risk of transmission.

More than 100,000 in the US are waiting for a life-saving organ transplant, and about 17 people there die each day from this wait.



Xenotransplantation trials could be conducted in Singapore to study its safety, effectiveness, and public health risks, especially if suitable pigs could be sourced safely from overseas and there is sufficient data on its safety and efficacy in other countries to support these trials.

Will singapore see animal-to-human transplants?

Like other countries, Singapore faces a shortage of human kidneys and other transplant organs or tissue. The average waiting time for a kidney transplant is about 8.1 years in Singapore[3], followed by 3.2 years for a heart.

There were 541 deceased and living donor organ transplantations (kidney, liver, heart, cornea, lung and pancreas) in 2021[3], compared with 605 transplants for these organs in 2019 before the pandemic hit.

As of June 2022 (2022 not included in published article), there were 604 patients on the waiting list for a transplant.

Amid an ageing population, could Singapore consider animal-to-human organ transplants to address the shortage?

Xenotransplantation trials could be conducted in Singapore to study its safety, effectiveness, and public health risks, especially if suitable pigs could be sourced safely from overseas and there is sufficient data on its safety and efficacy in other countries to support these trials.

If xenotransplantation were to be conducted locally as clinical trials, there is a need to look at the permissibility and feasibility of xenotransplantation procedures under existing laws.

In Singapore, the average waiting time for a kidney transplant is about

8.1 YEARS

followed by

3.2 YEARS

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As of June 2022, there were

604

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This would mean reviewing current law, regulations and guidelines governing clinical trials or biomedical research and use of animals for scientific purposes, and guidance from the Health Sciences Authority of Singapore, which classifies "xeno-based products as "higher risk" therapeutic products.

Other international standards should also be considered in deciding the appropriate limits. The World Health Organization states that member states should allow xenotransplantation only when effective national regulatory control and surveillance mechanisms are in place.

Any xenotransplantation trial in Singapore would need to be approved by an institutional review board, which provides ethical oversight of research activities by weighing their risks and benefits and reviewing informed consent forms and processes for potential patient participants. Other ethics committees such as transplant ethics committees would likely also provide ethical oversight.

As xenotransplantation raises a unique set of ethical considerations and concerns, it may be beneficial to establish a separate, new interdisciplinary committee consisting of transplantation and veterinary professionals and those who have been involved in transplantation ethics, animal research ethics, as well as clinical and research ethics review.

Possible for xenotransplantation to become standard treatment?

By using genetically modified animals to ensure immunological acceptance and improving virological safety measures, xenotransplantation could help address the increasing severe shortage of donated human organs, and ethical issues like how to fairly exclude patients from waiting lists or fairly allocate the limited human organs among those waiting.

Besides patients with end-stage organ failure, transplantation of animal cells and tissues could help other patients, such as those with burn wounds, corneal blindness, and neurological disorders, where human biological materials are not available.

But xenotransplantation also raises many scientific and clinical questions that must be answered before it becomes standard treatment similar to human-to-human organ transplant.

How long can a person live with the heart of an animal? Would an animal organ function as well as a human organ? What is the best mix of animal genetic modification and immunosuppressive drugs to ensure short- and long-term graft acceptance, given a recipient's condition? What type and which breed of animal is most suitable for providing transplant organs for humans?

Domestic pigs are currently the animal of choice for kidney or heart xenotransplantation because their hearts and kidneys are similar in size and function to us.

Recently, in separate experiments, transplant surgeons in the US successfully transplanted genetically modified pig kidneys and hearts in brain-dead patients[4] on life support (with their or their family's prior consent) to monitor graft rejection, survival and function. These experiments are an intermediate step to collect data on the clinical safety and efficacy of pig-to-human organ transplant without risking the life of a patient.

Trials have to involve patients that are alive

Ultimately, transplant surgeons have to conduct clinical trials on living human patients as they are the only way to prove the safety and effectiveness of xenotransplantation.

These trials raise various questions of their own: Do we limit participation to critically ill patients who cannot wait for a human donor? Post-xenotransplantation, do participants need to undergo lifelong virus monitoring, which could include the need to provide tissue sample for laboratory analysis?

Xenotransplantation is an area of controversy. Despite the uncertainties, it invites us to think about the way we relate to animals and use them for our benefit. Animal rights activists and ethicists have opposed xenotransplantation as another form of animal abuse.

Bioethicists have argued for the need for lifelong monitoring based on the need to prevent harm to others. Animal viruses integrated into animal genomes could stay latent for many years before they cause disease (and become detectable), and they could subsequently transmit to the close contacts of xenograft recipients and the wider human population.

Participants in xenotransplantation trials could be unlike participants in other types of clinical trials, as they may have to waive their right to withdraw from research (or at least from monitoring as a public health safety measure), which is a central tenet in research ethics.

Is xenotransplantation a form of animal abuse?

Xenotransplantation is an area of controversy. Despite the uncertainties, it invites us to think about the way we relate to animals and use them for our benefit. Animal rights activists and ethicists have opposed xenotransplantation as another form of animal abuse.

If it is ever ethically justified to sacrifice animals to benefit humans, it would be to save an identifiable human life. The interests of animals, which could feel pain and suffering like us, should be given appropriate weight in xenotransplantation decisions.

Consideration should be given to whether human recipients who are unlikely to survive for a meaningful period of time even with a xenograft or who are unlikely to comply with post-transplant advice and care, should be excluded from xenotransplantation trials so as to prevent the unnecessary sacrifice of animals.

Public engagement would be vital to help health policy makers understand the public acceptability and limits of xenotransplantation in a society.

A version of this article was first published on channelnewsasia.com.

Scan here to read the article:

[1] https://www.channelnewsasia.com/business/son-calls-fathers-pig-heart-transplant-miracle-science-2434451.

[2] https://www.channelnewsasia.com/world/first-person-receive-pig-heart-transplant-dies-after-2-months-2552651.

[3] https://www.liveon.gov.sg/docs/info_booklets/LiveOn_stats.pdf.

[4] https://www.channelnewsasia.com/world/two-pig-heart-transplants-succeed-brain-dead-recipients-2805636.

Ethical Considerations in Remote Consent-taking and Remote Data Gathering

BY DR VICTOR COLE, SENIOR RESEARCH FELLOW, CENTRE FOR BIOMEDICAL ETHICS (CBME), NUS MEDICINE

The COVID-19 pandemic brought about an urgent examination of the practicalities of conducting clinical research in the midst of a public health emergency. In particular, the use of newly emergent technologies such as Zoom videoconferencing to facilitate remote interaction between researchers and research participants drew much attention.

While moving at speed to adopt such methods of working remotely, the taking of consent and the gathering of data from research sites has necessitated urgent ethical deliberation. The possibility of retaining the use of such methods beyond the exigencies of events such as pandemics has also come very much to the fore, not least because of the cost savings and efficiencies they may bring about.

The possibility of retaining certain remote research methods after the primary reason for adopting them has retreated motivated a half-day online workshop on the ethics of remote consent taking and remote data gathering, conducted by staff from the NUS Centre for Biomedical Ethics (CBmE) in July this year. This event was run under the 'Science, Health and Policy-relevant Ethics in Singapore' (SHAPES) initiative hosted by CBmE and supported by the Ministry of Health's National Medical Research Council. It attracted 99 participants, primarily from the research and ethical oversight fields.

Invited speakers included Ms Sumitra Sachidanandan, Regulatory Consultant from the Health Sciences Authority, and biomedical researchers, Dr Austin Ang Chin Siang from the Centre for Population Health Sciences, Nanyang Technological University, and Dr Aaron Tan from the National Cancer Centre Singapore. Panel discussions involving these technical specialists and ethicists from CBmE preceded detailed case study discussions. In this article, I outline some of the issues that the workshop participants grappled with.

Remote consent-taking

In the context of a pandemic situation, a key ethical consideration in moving to a remote consent-taking model is the minimisation of the risk of infection to study participants and research team members. Beyond general risk at the population level, there may also be increased levels of risk and thus vulnerability among individual sufferers of particular medical conditions, such as Multiple Sclerosis, should they be exposed to infectious diseases such as COVID-19. This further motivates consideration of remote consent-taking methods. This is a consideration based upon the principle of beneficence.

However, any risks associated with in-person consent need to be weighed against other risks associated with remote consent taking. In order for a potential research participant to exercise their autonomy in reasonably assessing the potential benefits and drawbacks of participating, there has to be sufficient possibility of interaction with the consent taker for them to be able to seek clarification and understand the nature of the risks they might be exposed to. This may be considered particularly pertinent in higher risk studies, though there is no clear line that can be drawn between studies which require in-person consent and those that do not on the basis of a perceived level of risk inherent to the study itself.

> **"In order for a potential research participant to exercise their autonomy in reasonably assessing the potential benefits and drawbacks of participating, there has to be sufficient possibility of interaction with the consent taker for them to be able to seek clarification and understand the nature of the risks they might be exposed to."**

It should also be noted that there is no certainty that remote consent-taking would result in a reduction of the potential for interaction, given that some individuals may feel more at ease sharing their concerns and seeking additional information when physically distanced from the consent taker. There are thus nuances of study design and study population that need to be attended to in making risk-based judgements affecting the choice of consent-taking method.

A further motivation to act beneficently toward research participants in adopting remote consent-taking approaches might derive more simply from the reduction of inconvenience; for example, in relation to the need to travel to the research site in order to provide consent. Making further provision for the potential research participant to make a choice between consenting remotely or in person may be seen as most fully honouring the principle of autonomy, though this would have to be considered in light not only of safety risks but also of additional costs that making provision for both would likely impose.

Another concern arising from using video recording in consent-taking relates to potential violations of privacy, both through data breach where unauthorised parties might gain access to recordings, and through capturing images of non-consenting parties who just happen to be in the background of the images recorded. This is particularly possible in a home setting.

As important as the need to avoid capturing unwitting parties in video recordings is the need to ensure that the consent given is witnessed by an impartial party. The Health Sciences Authority's Guidance on Electronic Consent[1] requires the presence of such a witness for all new trial participants if the e-consent is taken remotely.

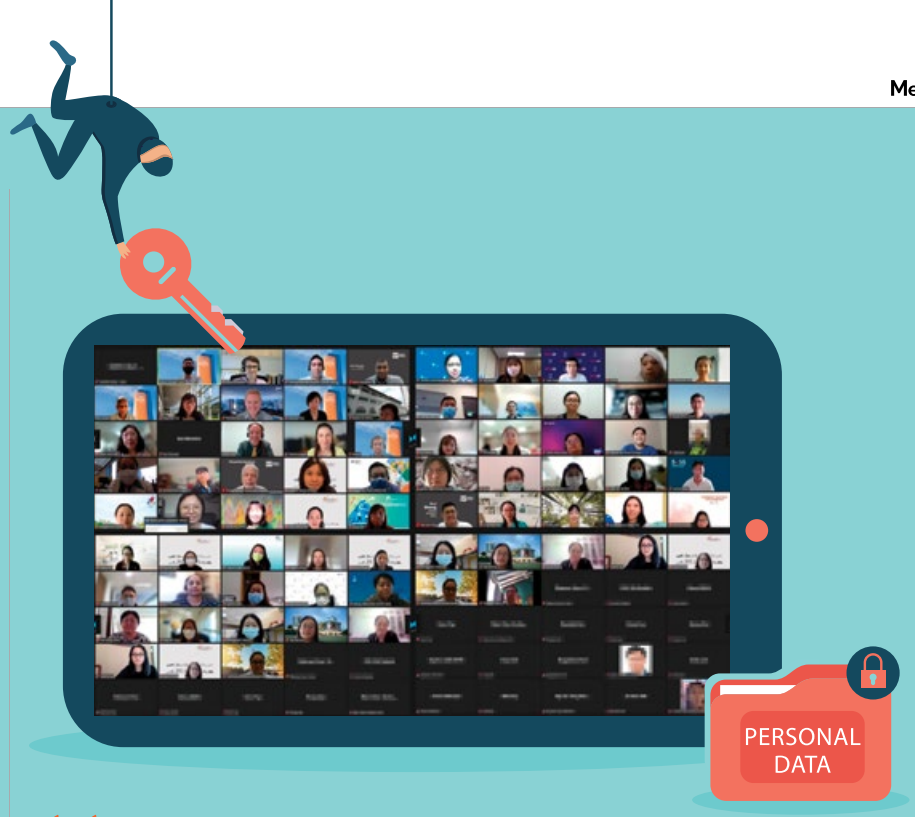
A justice consideration arises in deciding whether to move to remote consent-taking where potential participants might be excluded by virtue of a lack of access to the technological means by which the consent is obtained, or by having insufficient technological competence in managing such means where they are available.

Additionally, those with visual or auditory impairments might be disadvantaged, depending on the extent to which the remote consent-taking requires the use of those faculties.

Conversely, the use of remote consent-taking tools might make it easier for some disadvantaged groups to participate in the research than would otherwise have been the case; for example, those with physical impairments that restrict their mobility.

Other considerations in remote consent-taking, such as the ability of the consent taker to verify the identity of the consent giver have ethical significance for the integrity of the study and its ultimate potential for producing public benefit, though these are essentially practical concerns rather than ethical ones relating to whether consent should be obtained remotely as opposed to in-person.

Additional benefits to remote consent-taking include its potential for enhancing audit and documentation processes, though these would not be reasons by themselves to adopt such an approach. Ultimately, the decision to move to remote consent-taking is a multifactorial one in which the interests of the would-be study participants would be paramount.



"In making the decision of whether or not to adopt a decentralised model for clinical trials, the minimisation of burdens to study participants (including the reduction of risks) has to be weighed against the downsides, which may include impacts on the quality of data generated and thus the social value of the study outcomes."

Remote data gathering

Many of the ethical concerns that arise in relation to remote consent-taking appear again when considering whether to adopt remote data gathering methods. Having information conveyed electronically to the study team by research participants themselves increases the risk of data breaches, and a loss of privacy should those communications be intercepted by hackers or otherwise misappropriated.

Whether activities that research participants may be engaged in need to be recorded in the first place also needs to be considered. If the study outcomes are not dependent on a video recording being available for analysis, then there is no clear case for recording despite the benefits that might arise from enhancing the potential for audit and review. Once again, the inadvertent capture of unwitting persons in the background of recordings may be considered an additional privacy risk.

Study participants' self-submission of data via remote means has the potential for undermining data reliability and thus the social value the research is ultimately intended to produce. Data which participants find particularly sensitive, such as weight, may be more likely to be misreported than those that have little or no bearing on self-image.

Again, the specifics of the study need to be considered in terms of what the risks to data quality are. The arrangements for safety monitoring are important considerations in any clinical trial, though serious adverse events would typically be self-reported anyway and would not be expected to align with scheduled study visits.

Payments to study participants to compensate them for expenses and inconvenience incurred would very likely need to be reduced for remote studies compared to those conducted on site, given the lack of need for travel. However, changing to remote monitoring mid-trial because of an intervening factor such as the COVID-19 pandemic creates some complication for how compensation is reasonably calculated.

In making the decision of whether or not to adopt a decentralised model for clinical trials, the minimisation of burdens to study participants (including the reduction of risks) has to be weighed against the downsides, which may include impacts on the quality of data generated and thus the social value of the study outcomes. Fundamentally, of course, no study should proceed on a remote basis if doing so has predictably deleterious consequences for the well-being of the participants. With that said, a variety of benefits can accrue from the adoption of a decentralised model in terms of recruitment, representation, cost and convenience, such that close attention to the various ethical considerations raised above is merited.

The author wishes to acknowledge Assistant Professor Owen Schaefer and Mr Markus Labude, who developed the workshop materials on which this article is based.

A further iteration of SHAPES' online workshop "New Research Practices in the Wake of COVID-19: Remote Consent and Remote Data Gathering" will be offered in March or April 2023.

Scan here to read more about SHAPES:

[1] Reference document: https://www.hsa.gov.sg/docs/default-source/hprg-io-ctb/hsa_ctb_guidance_e-consent_6nov2020.pdf.

To Heal, Sometimes; To Comfort, Always

Encounters with Patients

BY DR JONATHAN TAN, ADJUNCT LECTURER, DIVISION OF FAMILY MEDICINE, NUS MEDICINE

Being a Family Physician can be exciting and rewarding. Given our broad knowledge and skills, we are able to see and treat a wide spectrum of conditions within our capabilities.

From the newborn baby to the frail elderly, from providing reassurance to managing chronic diseases, we strive to provide patient- and family-centred care through our work in multiple healthcare settings. I have been blessed with opportunities, having worked in private General Practice and home care / hospice settings.

I would like to humbly share some stories with you to highlight the diverse role of the family physician in real life. The first two cases are in the setting of the private General Practice and the third case is in the setting of the home care / hospice.

The first case was Jane*, a 14-year-old girl I have seen a couple of times at the General Practice clinic. Most of her visits were for common ailments such as viral gastroenteritis and the common cold. I also knew her siblings, parents and grandparents as they consulted me when they were unwell. One day, Jane came in with her mother and presented central chest pain that had troubled her for two days. She mentioned that she took the COVID-19 vaccine two weeks ago and her mother was very worried that her chest pain could be due to the vaccination.

At this point, I realised that there were two important things which I had to do. Firstly, it was to exclude sinister causes of chest pain, such as myocarditis. Secondly, it was equally important to manage Jane and her mother's fears and concerns. Being familiar with Jane and her family's medical conditions, we were able to exclude certain family risk factors of heart disease quickly. I also knew that Jane was active, did hip hop dancing, and took part in competitions frequently. As such, it could have resulted in her chest pain. After taking a thorough history and performing an examination and a basic electrocardiogram (ECG), I was reassured that her chest pain was musculoskeletal in nature.

Now the hard part was to reassure Jane and her mother that it was nothing sinister. Fortunately, through the years of knowing Jane and her family, there was already an established degree of trust between us. This definitely made the process easier. Besides spending time in explaining the process of arriving at the diagnosis to them in layman terms, it was important that I spend time in validating and addressing their fears and concerns. After a few days of rest and analgesia, Jane's symptoms eventually resolved.

The next case was Mr Lee*, a 60-year-old gentleman who attended the General Practice clinic for the first time. He complained of severe epigastric pain that lasted an entire day, and which he felt was due to gastritis. All he wanted was some antacids and gastric medications which he had taken in the past and worked well. His past medical history included Type 2 Diabetes Mellitus, hypertension and hyperlipidaemia, for which he was prescribed medication through a polyclinic. He denied any other gastrointestinal symptoms such as vomiting, blood in stools or fever. Even though he did not complain of any other symptoms besides epigastric pain, he appeared really uncomfortable and was perspiring. Surprisingly, there was also minimal tenderness over his abdomen despite his complaints of severe epigastric pain.

An important and serious diagnosis that could not be missed triggered an alarm inside my head. I had to make sure that this was not a heart attack, as patients with diabetes sometimes have atypical presentation of heart symptoms. I had to counsel Mr Lee to do an ECG to ensure that we did not miss a serious diagnosis. This was not an easy task as Mr Lee was adamant that he was experiencing nothing more than his usual gastritis, since he did not complain of any cardiac symptoms. In addition, it was also harder for him to trust a doctor whom he was consulting for the first time. By showing him that I was genuinely concerned about his health and wellness, it helped him realise that we were not just trying to earn more money by making him do an ECG test. The communication and counselling skills that I picked up in my family medicine education definitely helped with this process.

Subsequently, he finally agreed. The ECG showed an inferior ST elevation myocardial infarction. He was sent to the hospital immediately for treatment. Also importantly, with Mr Lee's permission, we updated his son over the phone of his condition and the need for further management in the hospital.

The third case was Mr Ali*, an 80-year-old gentleman whom I saw at his own home. He was referred by his cardiologist for end stage heart failure with recurrent admissions for fluid overload and breathlessness.

Dr Jonathan Tan working during a home visit.

After ringing the doorbell a couple of times, his daughter (which was his only caregiver) opened the door. Before I could say a word, she hurriedly stepped outside to give me a long summary of her father's deteriorating medical condition and his strong-headed personality. He would deny symptoms such as breathlessness and would insist that he was well. Also, he hated going to hospital and thus, was angry with his daughter for sending him there. From the discussion with the daughter, I could see that a lot of work was needed to be done for both the patient as well as the caregiver.

Having been armed with some background knowledge, I followed his caregiver into his room. I noticed Mr Ali, a cachectic elderly gentleman, sitting up in bed and taking deep breaths with the help of the nasal prongs attached to an oxygen concentrator. He did not look pleased on seeing me. I was probably an 'intruder' entering his personal space. Then I noticed a fish tank full of fishes beside his bed.

Instead of jumping into his myriad of medical conditions and assessing his breathlessness, I decided to talk to him about his fishes and his vast knowledge of their care instead—a hobby which I failed miserably at. We also talked about superficial topics like what he ate for breakfast to more personal topics like his occupation as a healthcare assistant in the past and his dislike for staying in hospital. Soon, the frown on his face disappeared. Instead of simply 'treating' the illness, it was equally important to 'treat' Mr Ali as a person—recognising his unique qualities, understanding his experiences and goals and by according him due dignity. This helped with gaining trust and building rapport with patients.

"Knowing one's capabilities and limitations as a family physician is important. As no doctor is an island, we should never be hesitant to seek help from fellow healthcare professionals if needed. As no patient is an island, we should also not forget the intertwined relationships between the patient and their family—and support them as best as we can."

Through discussion with Mr Ali and his family, goals of care were established—to manage his symptoms and prevent him from further hospitalisation. All he wanted was to be comfortable at home with his family till his demise. To tackle this, simple non-pharmacological methods were taught. This included a fan blowing across the face, breaking up activities into small manageable tasks and using accessory muscles through an appropriate sitting posture. Even though we knew that one of the causes of his breathlessness was due to fluid overload on the lungs and limbs, this was difficult to manage as pharmacological treatment was limited because of low blood pressure linked to his advanced heart failure. Hence, instead of treating the fluid overload by medications such as diuretics, we shifted to 'treating' his symptom of breathlessness with the use of opioids instead. An open, honest discussion with Mr Ali and family was necessary to manage their expectations as certain symptoms such as the swelling in his legs due to fluid overload would be more persistent.

Besides managing Mr Ali's symptoms, it was necessary to manage the psychosocial issues which came along with it. Caregiver stress, limited physical care support and financial constraints were some of these issues. Hence, relevant allied healthcare professionals such as nursing, occupational therapists and medical social workers were brought in to help with some of these issues. Together with timely collaboration with other healthcare services, it helped provide the necessary patient- and family-centred care we all strive for.

Knowing one's capabilities and limitations as a family physician is important. As no doctor is an island, we should never be hesitant to seek help from fellow healthcare professionals if needed. As no patient is an island, we should also not forget the intertwined relationships between the patient and their family—and support them as best as we can.

* Names changed to protect confidentiality

Nudging Patients to Health

GPS Make a Life-saving, Transformational Difference to Lives of Patients

BY DR KENNETH TAN (CLASS OF 2011), ADJUNCT LECTURER, DEPARTMENT OF MEDICINE, DIVISION OF FAMILY MEDICINE, NUS MEDICINE

The life of a private GP is intertwined with the life of the neighbourhood. Each day, GPs attend to the healthcare needs of the community, talking to patients whom we know well and helping them with their medical needs.

On some days, for GP tutors in NUS Medicine, medical students from Phase I, III or IV may join our clinics and observe as we go about our tasks.

Students might see us help reduce the transmission of COVID-19 by performing ART and PCR tests to identify the sick, and issue medical certificates to help them socially distance at home. Students may see us manage an injury so that patients can return to work or sports activities more quickly. Sometimes, the injury may not be physical in nature, but psychological. Overwork and stress may trigger anxiety and depression and students see us provide care and directing these patients to appropriate help.

Patients check with us if they are due for their COVID-19 vaccinations, or come to us for a discussion on whether they should get the COVID-19 booster. Occasionally, a patient might share their grief when a family member passes suddenly and unexpectedly due to a COVID-19 infection.

We might notice a pattern of herpangina cases in the neighbourhood, and counsel parents on practising contact precautions to minimise spread in the family. For a patient with more severe gastroenteritis, we may provide intravenous hydration and appropriate treatment to keep them out of the hospitals. GPs are an essential part of the health of the community, and a good GP practises to the best of his ability, referring cases appropriately.

I would like to share a story about a patient and how our therapeutic relationship made a difference and an impact on me.

Dr Kenneth Tan hosting Phase I students Ms Crystal Tan and Mr Clarence Lee in his clinic as part of Patient-Based Practice (PBP)-Community.

This patient first came to see me a few years ago when he was 17 years of age. He had just moved into the estate and had a prolonged cough for which he wanted an antibiotic prescription. I noted that he was overweight, had an elevated blood pressure, and had quite severe acne vulgaris on his chest, back and face.

I performed a routine consultation and spoke to his mother and him about treatment for his acne, overweight and elevated blood pressure. She agreed for some blood tests to be taken for hypertension screening, but I remember his mother was initially reluctant to start treatment for her son's acne. My patient convinced his mother that he wanted to start treatment for his skin problem. I also spoke to him about the importance of diet and regular exercise to manage obesity.

I started him on a course of topical and oral treatments, and over the period of a few months, his acne improved. What struck me the most, was his steady weight loss of two to three kilograms at every review. I asked him what motivated him to exercise regularly and eat well.

He shared that he was afraid to exercise in the past as he was worried exercise might worsen his acne. He was also self-conscious about his extensive acne as he had to take off his shirt in front of his peers if he took part in Physical Education classes. With control of his acne, his self-esteem improved and he felt more confident to participate in sports. He found a group of friends in school he could exercise with. His continued weight loss with the new lifestyle also motivated him to continue.

"We address the unmet healthcare needs in our communities by having our ears to the ground. Some people in the community may not be aware that they have a medical condition. Some patients may not be aware that their conditions can be treated. Some patients may not be aware of the services that are available for them at the GP setting and in the community. If private GPs are supported, we can address the unmet healthcare needs in primary care, provide timely access and reduce health inequality."

I followed up with him over the next two years and noted that his hypertension had also gradually normalised without any anti-hypertensives.

Today, he is serving his National Service as a naval diver, one of the most physically and mentally demanding combat vocations in the SAF. His is a transformational journey which amazes me. His story highlights the unique value of the private GP, and the power of a supportive community of friends and family to drive difficult lifestyle changes.

Private GPs provide access to healthcare for patients of all ages and from all backgrounds. To stay in business, we have to provide bread-and-butter services that the community needs. For patients whose healthcare needs may not have been met by the public healthcare system, we are also an avenue for help.

We address the unmet healthcare needs in our communities by having our ears to the ground. Some people in the community may not be aware that they have a medical condition. Some patients may not be aware that their conditions can be treated. Some patients may not be aware of the services that are available for them at the GP setting and in the community. If private GPs are supported, we can address the unmet healthcare needs in primary care, provide timely access and reduce health inequality.

We provide longitudinal care. In our daily practice, we are able to follow up with patients and see the effect of medical interventions and decisions on the patient's life course. We gently nudge our patients to health.

Recognising and Managing Sepsis through Virtual Reality Training

Fever or body chills. An accelerated heart rate. Dizziness. Hyperventilation or shortness of breath.

These are some of the symptoms of sepsis, a life-threatening condition that kills five million people a year, worldwide. It is caused by a bacterial infection that usually starts in the lungs, urinary tract, skin or gastrointestinal tract.

Sepsis sets in when the body develops an extreme response to an infection, damaging its own tissues and causing organs to function poorly or abnormally. If undetected and treated late, the infection may lead to severe sepsis and septic shock, increasing the death rate by up to 50%.

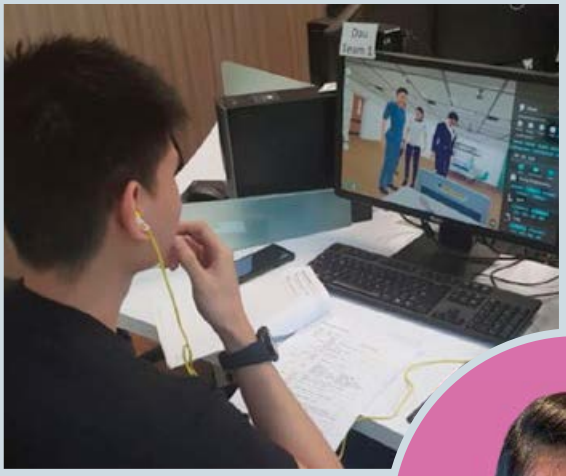
While Singapore does not have a national sepsis registry to consolidate or track the numbers, care and outcomes for sepsis, 2020 data from the Singapore Ministry of Health indicates that sepsis has become prevalent.

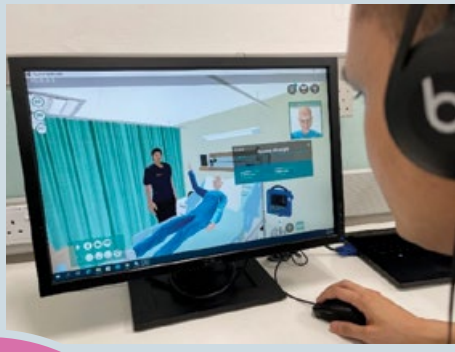
It is estimated that close to 5,000 deaths were attributed to sepsis from pneumonia and urinary tract infections in 2019. This is an approximate 13% increase from cases reported in 2012.

In the healthcare system, nurses play a pivotal role in the early recognition and management of sepsis. Nurses are uniquely positioned to make the first crucial assessment in detecting sepsis and implementing intervention to prevent deterioration.

With an eye on their professional, continuing education, Research Fellow Dr Chua Wei Ling from the Alice Lee Centre of Nursing Studies, National University of Singapore, conducted several studies on the recognition and management of sepsis, to better equip nurses with the necessary skills.

Impact of sepsis education for healthcare professionals and students on learning and patient outcomes: a systematic review, published in the 2022 Journal of Hospital Infection, found that interventions delivered through an active learning approach, such as game-based learning, generally produced greater gains than didactic teaching. It led to the development of the Sepsis Interprofessional Education (IPE) programme for NUS undergraduate medical and nursing studies, which adopts a blended learning approach involving virtual telesimulation.





Top left and right: Nursing students using a virtual reality sepsis screening tool.

In circle: Research Fellow Dr Chua Wei Ling from the Alice Lee Centre of Nursing Studies, National University of Singapore.

Another study, *The effect of a sepsis interprofessional education using virtual telesimulation on sepsis team care in clinical practice: A mixed-methods study*, highlighted how medical and nursing students demonstrated a significant improvement in sepsis knowledge and team communication skills, post-intervention.

Students fostered a better understanding and appreciation of each other's interprofessional role in sepsis care, and efforts are underway to complement virtual telesimulation with a mannequin-based simulation to enhance the long-term retention of sepsis knowledge and clinical skills performance.

Dr Chua says: "Mannequin-based simulation develops clinical skills performance in a realistic situation and consolidates sepsis care learning through face-to-face interactions and the opportunity for hands-on practice on clinical procedural skills."

More recently, in collaboration with a team of nurses and doctors from the National University Hospital in Singapore, Dr Chua recently led a study to examine nurses' knowledge and confidence in recognising and managing patients with sepsis.

Sepsis screening tools and sepsis bundles were identified to be useful in helping nurses recognise the onset of sepsis more quickly, and the study called for a stronger foundation in sepsis education and training programmes for nurses. It also stressed the need for systems to be put in place to improve nurses' knowledge and enhance their sepsis care, along with a revamp of the hospital's workplace sepsis training package for nurses.

Close to
5,000
deaths were attributed to sepsis from pneumonia and urinary tract infections in 2019

Dr Chua says: "Incidences of sepsis will continue to rise with the interplay of multiple factors including an ageing population with more predisposing comorbidities, the use of immunosuppressive therapy, and the emergence of multi-drug antimicrobial resistance.

"With sepsis being a life-threatening medical emergency when the body has an extreme response to an infection, individuals with a weakened immune system, the elderly or infants, and those with underlying medical conditions such as heart or lung conditions, cancer, diabetes, liver or kidney diseases are at higher risk of developing it."

Dr Chua's efforts have culminated in an upcoming collaboration with the Emergency Department at Singapore's Ng Teng Fong General Hospital, which she attributes to "a group of like-minded clinicians and academics who have invested interests in improving the care of patients with sepsis and supporting nurses in their roles in this aspect".

"Incidences of sepsis will continue to rise with the interplay of multiple factors including an ageing population with more predisposing comorbidities, the use of immunosuppressive therapy, and the emergence of multi-drug antimicrobial resistance."

She explains: "At the Emergency Department, triage nurses are often the first point of contact patients have with the healthcare system. In the inpatient settings, nurses are able to identify hospital-onset sepsis at its earliest possible time because they have the most patient contact hours among other healthcare professionals and they are the ones responsible for routine bedside monitoring of patients.

"We conducted an exploratory study to explore their level of sepsis knowledge, and confidence in recognising and managing patients with sepsis, as well as identify support needs of nurses in this area. This will help inform the design and learning content of our sepsis training programme for nurses."

Efforts are underway to enhance the current IPE programme to achieve greater outcomes.

Currently, manual input is needed from multiple users (medical and Nursing students) to simultaneously log into the virtual platform to assume various avatar roles. Dr Chua is currently working with her mentor, A/Prof Liaw Sok Ying, to develop a doctor-player avatar or agent controlled by computer algorithms.

This would replace the existing doctor avatar controlled by humans in real-time with a computer-controlled version, so that nurses can practice in the virtual world without the actual presence of a doctor. It would also create interprofessional team-based learning opportunities for Nursing students and nurses across academic and healthcare institutions.

"We have recently completed the pilot-testing of this single-player (nurse-player) virtual reality simulation for Nursing students' training and will soon be testing this on a larger group of students. We are also in talks with our collaborator from Ng Teng Fong General Hospital to adapt this single-player virtual reality simulation for sepsis training for their Emergency Department nurses. We hope to eventually scale up this sepsis training for nurses in other clinical settings."

The new approach will also do away with Nursing students needing to pair up with medical students to form interprofessional teams for doctor-nurse training and improve the scalability of the programme that is currently constrained by unequal medical-nursing cohort sizes.

"We have recently completed the pilot-testing of this single-player (nurse-player) virtual reality simulation for Nursing students' training and will soon be testing this on a larger group of students," shares Dr Chua.

"We are also in talks with our collaborator from Ng Teng Fong General Hospital to adapt this single-player virtual reality simulation for sepsis training for their Emergency Department nurses. We hope to eventually scale up this sepsis training for nurses in other clinical settings."

Dr Chua suggests that even more can be done to support nurses in the care of sepsis patients and that digital technology can be leveraged to break new ground in ongoing educational efforts.

For instance, education and training through the use of mnemonics to guide nurses through the identification, assessment and initial management of patients with sepsis, and use of multimedia instructional materials including simulation and multimedia video can be considered.

Nurse-driven sepsis screening algorithms and sepsis care protocols or bundles can also be developed to facilitate the timely recognition and management of patients with sepsis.

"Nursing academics and researchers can work hand-in-hand with nurse educators and clinicians in designing interventions to support frontline nurses in their role in recognising and responding to sepsis.

"They are also responsible to ensure that sepsis education content reflects the latest evidence-based knowledge and best practices."

This article was first published in the August issue of VITALS, an NUS Nursing publication.

Scan here to read VITALS (August) issue:

Balancing Studies and Caregiver Duties: How a Nursing Student Coped

The pandemic has undoubtedly been a tough time for everyone, but for final-year NUS Nursing undergraduate T Kavitha Rose, it was made all the more challenging after her mother suffered a stroke when she was in the first year of her course.

A cruel stroke

The 31-year-old had to quit her job to become a full-time caregiver, while coping with the rigours of her Bachelor of Science (Nursing Practice) part-time degree programme.

Kavitha's mother suffered a subarachnoid haemorrhage—bleeding in the space that surrounds the brain—and had to undergo an emergency operation.

Kavitha was at home when it happened. Her mother had gone out for lunch with some friends that afternoon.

"My cousin called and told me that my mum had fainted. She was experiencing weakness on her left side of the body and was on the way to the hospital via ambulance," she recalled.

Kavitha was soon informed by paramedics that her mother was being taken to Tan Tock Seng Hospital. Her husband drove her down and upon reaching the Accident and Emergency ward, she learnt more about the extent

Final-year NUS Nursing undergraduate T Kavitha Rose, who balanced her hectic Bachelor of Science (Nursing Practice) part-time degree programme and her caregiving duties.

of her mother's condition—a CT scan had revealed a blood clot in the brain.

"I felt numb and speechless upon hearing this, as I couldn't believe that this was happening," Kavitha said.

Road to recovery

What followed in the aftermath of the episode was a long journey to recovery for her mother, during which Kavitha faced a great deal of difficulty adjusting to a new and unexpected lifestyle.

After the operation, her mother remained sedated for almost a week in the Intensive Care Unit. Upon regaining consciousness, she was still very weak and had to be fed through a tube. She could not speak and her mobility was hindered, Kavitha shared. She remained in a High Dependency ward for another week, before being transferred to a normal ward.

She was subsequently moved to Thye Hua Kwan Hospital in Ang Mo Kio for a month to undergo rehabilitation, learning relevant physical exercises from a physiotherapist and occupational therapist to regain her strength.

Kavitha too had to undergo caregiver training, as she was responsible for taking care of her mother daily. She is an only child and her mother lives with her and her husband, after her father succumbed to a heart attack when she was 16. As Singapore was in the grip of the COVID-19 pandemic, it was difficult to employ a domestic helper to care for her mother.

The unexpected situation forced Kavitha to change her daily routine significantly, going to her mother's side after her office hours to keep her company.

"During this time, I had two to three evening lectures online weekly, so I would usually attend them while in the hospital at my mum's bedside. This routine went on for about two months," said Kavitha.

Upon her mother's discharge from Thye Hua Kwan Hospital, Kavitha resigned from her job to look after her full-time.

Almost two years on, her mother's health is now stable, although she still has slight paralysis on the left side of the body and requires some assistance for her basic self-care tasks, such as bathing and having her meals.

A degree of determination

"As for the pursuit of my part-time degree, I also had a hard time catching up on lectures, and I almost wanted to give up," she shared, adding that she only managed to pull through that challenging first year with the help of her classmates and lecturers.

"Without their help, guidance, understanding and support, I would not have been able to make it through. I was very touched and grateful for their generous help during that difficult time of my life."

"As for the pursuit of my part-time degree, I also had a hard time catching up on lectures, and I almost wanted to give up. Without their help, guidance, understanding and support, I would not have been able to make it through. I was very touched and grateful for their generous help during that difficult time of my life."

Kavitha with her classmates and lecturer.

I realise that I like to care for and communicate with patients, so I would like to be a care manager one day to help patients coordinate their medical treatment, including administering assessments, developing care plans, and monitoring their medication compliance."

Kavitha has since found a new full-time job as a research coordinator, where she plans research studies and manages and analyses data findings. She spends three to four days per week attending classes virtually and is in the third and final year of her part-time degree programme.

On days with classes, she runs on a very tight schedule. Her office hours are from 8am to 5.30pm, while her online lessons begin at 6pm. This means she only has a 30-minute window to get home.

"Most of the time I am still on my way home from work, and I listen to the lectures on my headphones. It gets difficult to concentrate due to the distractions while taking the MRT and crossing the road to get back home," she shared.

She has also missed some classes due to urgent work commitments on some days. And no thanks to the pandemic, it is also tougher to complete group assignments, as students cannot meet physically all the time and most of their meetings have to be done virtually.

Kavitha previously worked as a registered nurse in KK Women's and Children's Hospital, and intends to return to the field again after graduating in July next year.

"I realise that I like to care for and communicate with patients, so I would like to be a care manager one day to help patients coordinate their medical treatment, including administering assessments, developing care plans, and monitoring their medication compliance," she said.

"I also want to build good relationships and rapport with my patients, and serve as an advocate and champion of their health."

This article was first published in the August issue of VITALS, an NUS Nursing publication.

Scan here to read VITALS (August) issue:

Dying at Home – Is It for Everyone?

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

In June 2022, Health Minister Ong Ye Kung announced plans to boost support for Palliative Care, and to reduce the percentage of Singaporeans dying in hospital from the current 61% to 51% by 2027[1]. Based on current figures, this would mean more than 2,000 people dying at home instead of hospitals every year.

Minister Ong cited a Lien Foundation Survey on Singaporeans' attitudes towards death and dying[2] which did indeed find that 76% of respondents said they would wish to die at home.

However, the people surveyed were the general public, many of whom would have been healthy and independent. Studies have shown that as people get older and sicker, they start to change their minds about where they wish to be cared for and spend their remaining days. In my own hospital, when we looked at the people who had done a type of Advance Care Plan for those with advanced illness (whom we expect might die within a year), only about half wanted to die at home (or in their nursing homes). In fact, 15 to 20% actually would prefer to die in hospital.

15% TO 20%
of people with advanced illness would prefer to die in hospital

Clearly, people who have had some experience of chronic and serious illness make different choices than those who are healthy and well. There are many reasons why the percentage of home deaths in this country has been fairly constant around 22 to 25% for many years, but chief amongst them is that it is difficult to care for a seriously ill and dying person at home. The challenges are practical and emotional, and may not be easy to overcome.

Social, cultural and spiritual influences

Beliefs about dying at home vary not only between countries and societies, but also within a country. To give an example about how social mores play a part—in urbanised Hong Kong where people commonly live in small apartments, dying at home can be logistically very challenging. In Vietnam by contrast, dying at home is generally desired, so much so that many palliative care units see very few patients dying in their wards, because families would prefer to rush them home, even if this meant hours of travelling. Or in rural Australia, where some indigenous communities would want their dying family member to "finish up in country".

What about Singapore?

Dr Tan Woan Shin and colleagues published an analysis of deaths between 2012 to 2015, to try and identify factors associated with home death. The article is accessible via the PLoS ONE website[3] but in summary, a higher likelihood of dying at home was associated with older people. They were generally female, Malay and had a documented preference to die at home.

Realistically though, demographic changes make home deaths very challenging. In Singapore's ageing society, where more and more people are living in one or two-person households—frequently one elderly and one domestic helper—it can be difficult to manage a home death unless other family members are able to step in.

In addition, the way we die in the 21st century is different from our grandparents' day. These days, many of us will die of an acute exacerbation of a chronic progressive illness. This means that we could turn ill quite suddenly, and it may not be easy to tell the difference—at least in the initial hours and days of the acute episode—between being sick, very sick, and dying. It is a little easier to tell in a disease like cancer, where the deterioration is gradual and observable. This is not the case for many chronic illnesses: a patient might have had a few episodes in the hospital, and even if the doctor predicts that the next exacerbation might be the final, fatal one, one never knows. So the default response is to go back to hospital for another round of treatment and when it becomes clear that death is imminent, it might be too late to get the patient home.

Is dying at home even the "best" or "right" thing?

Dr Richard Leiter, writing in the New York Times[4] posed this provocative question "Is Dying at Home Overrated?"

"I am concerned about the unacknowledged caregiving burden for families and friends. In addition, many people with advanced disease experience escalating symptoms, like pain or shortness of breath, that even the best hospices have difficulty managing in the home. In these situations, I am caught between the passionate rhetoric of my field, the spoken and unspoken wishes of my patients, and my clinical judgment. The patient in front of me always takes precedence, but my cognitive dissonance is difficult to escape."

His observations and reflections resonate with many palliative care professionals. In fact, I would say that for some patients, going home to die is a very unwise choice; if the person has no competent caregiver, suffers from severe symptoms, or has a catastrophic bleed... not only might they suffer terribly during those last days, their caregivers

might be traumatised for a long time. But the orthodoxy of the "Good Death" can be difficult to shake off.

The "Terminal Discharge"

Hospitalised patients in their final days and their families who express a strong wish for a home death may arrange for a Terminal Discharge. This term refers specifically to patients who are expected to die within hours to a few days. It entails a speedy transfer of the patient from hospital to home and it is a resource-intensive exercise because time is of the essence to get everything in place, including community supports like hospice home care, where available. It can be potentially quite expensive for families if equipment or specialised care is required at short notice, ranging from a few hundred to more than a thousand dollars.

We need to talk about it

So dying at home is not for everyone; for some it does not matter at all, for others it is absolutely essential. And for some people, it will just simply be a preference that will be out of their reach. If you or your loved one do envisage dying at home, it is important that plans are made in advance so that when the time comes, and it could come suddenly, you and your family would have made the necessary preparations. Prepared not only practically, but also psychologically, emotionally, and spiritually, to step up and "finish up" in the place of your choosing.

"So dying at home is not for everyone; for some it does not matter at all, for others it is absolutely essential. And for some people, it will just simply be a preference that will be out of their reach. If you or your loved one do envisage dying at home, it is important that plans are made in advance so that when the time comes, and it could come suddenly, you and your family would have made the necessary preparations."

Coming Home

by Mary Oliver

When we are driving in the dark,
on the long road to Provincetown,
when we are weary,
when the buildings and the scrub pines lose their familiar look,
I imagine us rising from the speeding car.
I imagine us seeing everything from another place—
the top of one of the pale dunes, or the deep and nameless
fields of the sea.
And what we see is a world that cannot cherish us,
but which we cherish.
And what we see is our life moving like that
along the dark edges of everything,
headlights sweeping the blackness,
believing in a thousand fragile and unprovable things.
Looking out for sorrow,
slowing down for happiness,
making all the right turns
right down to the thumping barriers to the sea,
the swirling waves,
the narrow streets, the houses,
the past, the future,
the doorway that belongs
to you and me.

[1] MOH to boost palliative care at home, better support caregivers, 2 June 2022. https://www.straitstimes.com/singapore/health/boost-for-palliative-care-fewer-people-to-die-in-hospitals-by-2027-ong-ye-kung.

[2] Lien Foundation Survey on Death Attitudes (General Population). http://lienfoundation.org/sites/default/files/Gen%20Pop%20Findings%20Report%20-%20Full%20REPORT%20%28Website%29_0.pdf.

[3] Individual, clinical and system factors associated with the place of death: A linked national database study, 18 April 2019. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0215566.

[4] Is dying at home overrated? https://www.nytimes.com/2019/09/03/well/live/is-dying-at-home-overrated.html.

Going Further –
NUS Nursing Alumni in the Military

It all started at Pearl Harbour. When she was in junior college, Nur Fadilah Jubir saw the 2001 film that told the story of Japan's attack on the American naval fleet in Hawaii in 1941.

Photo:
Fadilah is a Senior Military Medical Expert and platoon commander in the Singapore Armed Forces (SAF) Medical Response Force.

Amid the film's spectacular pyrotechnics and gripping historical plot, it was the quiet but impactful role of a supporting character that caught her attention.

"I was inspired by how the army nurses in the movie tended to the scores of wounded with grit, strength and tenacity in a chaotic, mass casualty environment," said Fadilah, who graduated from NUS Nursing in 2015 and embarked on her career as a military nurse with the Singapore Armed Forces (SAF).

An earlier stint with the SAF Volunteer Corps (SAFVC) was a deciding factor in a decision to pursue a nursing vocation in the military. The SAFVC enables Singaporean women, first-generation permanent residents and new citizens to serve alongside national servicemen and professional soldiers in roles that support the SAF's operations and training.

"Working with SAF professionals, full-time national servicemen and other volunteers during my time in the SAFVC helped me to realise that I enjoy being in a military environment, as there is a strong sense of camaraderie as well as plentiful opportunities to hone our leadership skills," explained Fadilah, 31. Trained to work in emergency care, she is a Senior Military Medical Expert and platoon commander in the SAF Medical Response Force.

In her role, Fadilah plans, manages and leads the training of the Medical Response Force troopers in her unit, ensuring that they remain competent and ready to provide medical help in response to chemical, biological and radiological threats.

While she initially had concerns over whether she would be able to adapt to medical processes in the military, the

clinical knowledge and skills she obtained from her time in NUS Nursing, along with the subsequent working experience in the hospitals provided her with a strong foundation. "It eased my understanding of medical processes in the Army, and allows me to be an asset."

Fadilah was deployed for COVID-19 operations support with her team of medics at public health institutions here during the peak of the COVID-19 outbreak. Another career highlight—Fadilah represented the Medical Corp Formation as a flag ensign for this year's SAF Day Parade on 1 July, and reprised the role on Marina Bay's Floating Platform at the National Day Parade on 9 August.

Mom's the inspiration

Her fellow Senior Military Medical Expert and NUS Nursing alumnus, Olive Lim, 32, found her calling through her mother.

"I always knew I wanted to work in the healthcare industry. I believe this was mainly because my mum was a nurse and she shared many of her experiences with me," said Olive, who graduated from NUS Nursing in 2011.

In fact, her mind was so set on nursing that NUS Nursing was the only undergraduate course she applied for. "It was all or nothing," she recalled.

Olive is a medical trainer at the SAF Medical Training Institute, where she teaches both military and medical knowledge and skills to National Service (NS) medical units, training them to be deployed for operations when needed.

"It is most fulfilling when the NS medical units that I trained display high levels of competencies in their planning and execution, during military exercises and operations," said Olive.

"It was very challenging because of all the uncertainties, but we forged on and delivered a spectacular celebration which displayed our nation's resilience in the time of crisis."

Olive Lim, Senior Military Medical Expert, NUS Nursing Alumnus

She cited the example of the national fight against COVID-19 at the height of the pandemic, when some NS medical units were deployed to provide care in the Community Care Facilities (CCF) and participate in home vaccination operations.

A career highlight was being part of the national response to the initial outbreak of the COVID-19 pandemic, when the authorities were still grappling with how to deal with the new and dangerous virus.

"When COVID-19 infections led to the first wave of the outbreak in the foreign workers' dormitories, I was in charge of setting up a conveyance team that planned the transfer of patients who were tested positive from the dormitories to the CCFs to allow them to recover and limit the spread," said Olive.

She had to scramble to create a sustainable workflow and standard operating procedures for the medical teams. Despite it being very hectic and tiring, Olive said she found the task purposeful.

Olive was also appointed the Medical Organising Secretary for Singapore's National Day Parade 2021, the first full parade held in the midst of a pandemic. Her team had to make sure that safe management measures were followed, and develop testing strategies for the working parties, participants and spectators, to ensure a safe event.

"It was very challenging because of all the uncertainties, but we forged on and delivered a spectacular celebration which displayed our nation's resilience in the time of crisis," she recalled. Military life has its own challenges. For Olive, it is juggling between work and family, especially since she recently gave birth to a baby boy. "There would be times during military exercises and operations where I have to work long hours," she said. "But I am very fortunate to have a very supportive family."

This article was first published in the August issue of VITALS, an NUS Nursing publication.

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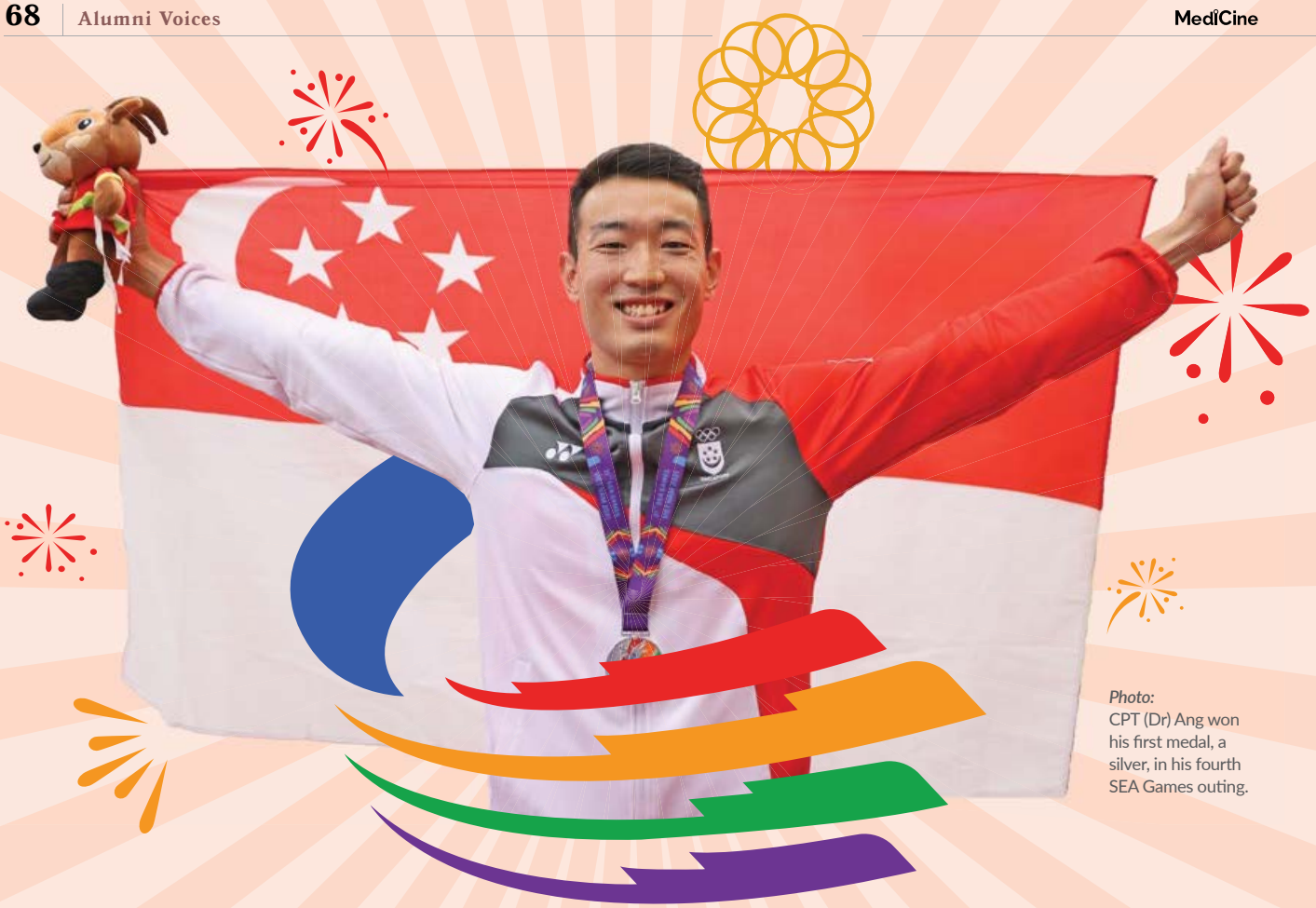


Photo: CPT (Dr) Ang won his first medal, a silver, in his fourth SEA Games outing.

Commando, Doctor and National Hurdler

BY KOH ENG BENG

This 27-year-old commando medical officer did Singapore proud by winning a silver medal in 110m hurdles at the 31st Southeast Asian (SEA) Games in Vietnam in May—this was Singapore's first medal at the event since 1989.

Here's five things you need to know about Captain (CPT) (Dr) Ang Chen Xiang, a full-time national serviceman.

1. He's broken the national record nine times

Taking part in his fourth SEA Games, the national hurdler clocked 13.94s to win the silver medal. And in the process, he broke the national record for the ninth time in his athletic career.

Earlier in January this year, he had clocked 13.97s at the Singapore National Track & Field Championships 2022—going under 14s for the first time.

2. He started young

He was only 12 years old when his dad taught him and his younger brother (now his coach) how to hurdle.

"My dad made two hurdles using the legs of an old study table, and that's how he taught us the basics of hurdling," recalled CPT (Dr) Ang.

3. He is a commando doctor

In 2013, CPT (Dr) Ang enlisted for National Service (NS) and entered Basic Military Training, just like every Singaporean son.

Two-and-a-half months into his Officer Cadet training, he disrupted his NS to start his medical studies at National University of Singapore.

In January 2021, he resumed his NS and went through the Medical Officer Conversion Course. His next stop? Commando Training Institute.

There, he went through training like the Basic Airborne Course, the Commando Officer Conversion Course as well as the gruelling X72—the Commandos' signature 72km route march that takes as many hours to complete.

"As medical officers, we're expected to insert and move alongside fellow Commandos. So we have to go through the necessary training to become a Commando too," he said.

Besides providing medical support in the field, CPT (Dr) Ang also runs the medical centre in Pasir Ris Camp. The camp is home to various schools such as the Commando Training Institute.

He described his role there as a general practitioner who takes care of the trainees' health and medical needs.

4. His focus is on improving himself

His sports training philosophy is simple: just focus on improving his timing.

CPT (Dr) Ang explained: "My goal has always been my timing because that's something I can control. When I improve my training and abilities, my timing will improve.

"But in terms of positions and winning medals at competitions, you can't really control that—if other hurdlers improve more than you, you can't control that."

↑ CPT (Dr) Ang (left) attending to a serviceman at the medical centre in Pasir Ris camp.

When asked how he managed to do well for the SEA Games while juggling NS, he said there was an element of luck.

"I was very lucky that the SEA Games was postponed from November last year (due to COVID-19). If it had not been postponed, I'd have been out smack (in the middle of) outfield," said CPT (Dr) Ang.

For most of last year, he was undergoing medical officer cadet and commando training.

"Once I completed my necessary Army training, I was then able to squeeze in track training while juggling work as a medical officer," he said, adding that the Ministry of Defence also granted off days for him to go for overseas competitions.

He also thanked fellow medical officers from both 1st Commando Battalion (1 CDO) and Military Medicine Institute for covering his duties when he was away for competitions. "I'm especially grateful to my colleagues for the teamwork and support through my NS."

5. He wants to continue to do Singapore proud

CPT (Dr) Ang started work at the National University Hospital after completing his full-time NS in June 2022. He continued with his track training, and aims to compete in the 2023 SEA Games and the next Asian Games.

Asked what's his key takeaway from serving his NS as a commando, he said: "The mental fortitude built during commando training is something I value highly. It taught me that even when you think your tank is empty, you really still can dig deeper and go further."

Photos by Amos Chew & courtesy of Sport Singapore/Jeremy Lee & 1 CDO.

Scan here to read the original article published in PIONEER:

Scan here to catch CPT (Dr) Ang in action at the recent SEA Games:

Afghanistan on His Mind and in His Heart

Home after nearly two decades working as a volunteer in Afghanistan, Dr Wee Teck Young (Class of 1987) was the guest speaker at this year's White Coat Ceremony, held in August to welcome new students who form the Class of 2027.

War is an extension of politics by other means, it has been said. Descriptions and explanations of military conflict between nations in our times however tend to be cast in starkly simplistic terms as a struggle between good and evil, the just versus the unjust, right against wrong, asymmetrically weaker forces struggling against an overwhelmingly superior enemy.

"I'm afraid that the world has a templated view—of war being a binary affair, the victors

Photo:
Dr Wee Teck Young (Class of 1987), a volunteer working in Afghanistan for two decades.

and the losers, the just and unjust," says Dr Wee Teck Young, general practitioner-turned-humanitarian and Guest Speaker for the 2022 White Coat Ceremony of the Yong Loo Lin School of Medicine.

Nearly twenty years ago, the Medicine Class of 1987 alumnus sold his GP practice and moved to Quetta in Pakistan, to become a volunteer. His work with Afghan refugees subsequently led him to spend 16 years in Bamiyan and Kabul, Afghanistan, first as a public healthcare worker, then as a humanitarian worker before transitioning into what he says was a "peace-builder". There, the Singaporean doctor who the locals dubbed Hakim, i.e. Afghan for "doctor", conducted education and health programmes, and supported young Afghan volunteers to establish a non-governmental organisation centred on building a green, equal and non-violent world without war.

The pandemic that swept through the world two years ago forced a return to Singapore, where he watched in helpless dismay as the Taliban returned to power with the withdrawal of the US and NATO troops from the country in 2021. Literally overnight, the relative peace, economic and social progress that the Afghan people had known for two decades after the ouster of the Taliban and the establishment of a civilian government vanished. Those who could, fled the country. Most Afghans had to reorder their lives under a regime that the UN human rights chief Michelle Bachelet recently said practised systematic oppression and actively excludes women and girls from public life in Afghanistan. Domestic violence and harassment have grown under the Taliban rule, as have attacks against female human rights defenders, journalists. Lawyers and women can no longer find employment, while secondary schooling for more than a million girls was ended, and an increasing number of restrictions on movement and dressing plunged Afghan women into a deep depression.

His original aim of using his medical training to aid Afghans eventually led him to work with some Afghan youths to found a non-governmental organisation centred on building a green, equal and non-violent world without war.

Unfortunately, Dr Young notes, Afghans, who live predominantly in rural areas and have agricultural livelihoods often become human collateral in the West's war on terror in the country. Many Afghan farmers have learnt to listen for the hum of drones overhead as warnings to stay away from harm. But since farming is their livelihood, they often continue tending to their fields, even as fighting rages around them.

A turning point arrived for Dr Young when Little Farmer, the nephew of his ex-volunteer, came and told him that his father had been killed by a "computer" (drone). He was at a loss for words.

Nearly twenty years ago, the Medicine Class of 1987 alumnus sold his GP practice and moved to Quetta in Pakistan, to become a volunteer. His work with Afghan refugees subsequently led him to spend 16 years in Bamiyan and Kabul, Afghanistan, first as a public healthcare worker, then as a humanitarian worker before transitioning into what he says was a "peace-builder".

Dr Wee standing in front of the Tahir Foundation Building.

He had no answers for them, on how they could and would seek justice. "They had no recourse to justice. How does Little Farmer and his mother grieve and have proper closure?"

This experience, together with many stories of death, loss and grief that Afghans shared with him over the years challenged his own assumptions about justice and its apparent binary nature with which the world viewed the conflict in Afghanistan. It also made him think hard about the meaning and application of justice in Medicine.

Expanding on the topic, he shares that it is human nature for medical students to view patients with certain illnesses and diseases through a certain prism, and conclude that their plight is karma, i.e. retributive justice for past acts. They should suspend all moral judgment, he asserts.

"Instead, we can listen intentionally and get off the 'fast train', by trying our best to empathise with our patients, ask questions intentionally, and be fully present with them."

"I think that it is a right of every person to have access to healthcare. When medical students realise that they are projecting their biases and prejudices on patients, it's important for them to put these aside and be empathetic."

On Afghanistan: the people, their realities, and his fondest memories

The years that he spent in Afghanistan, working with the locals, helped him to appreciate their simple, honest approach to life. "Afghan people are wonderful like most people. They also have a certain 'rawness'—an authenticity, free from distractions that don't concern survival and meeting basic needs."

He recalls fondly the kindness and camaraderie of Afghan friends, with whom some of his fondest memories were woven at the dinner table.

Mealtimes are times spent in good spirit, as Afghans sit on the floor, gather round the table and share simple meals that may include chicken—when it is available. "I still miss my life in Afghanistan." He keeps in touch with some of his Afghan colleagues. However, not all of them are well and some have become refugees in other parts of the world. And much as he would like to, going back and resuming his work in Afghanistan there does not seem possible for the immediate future.

Moving forward

"I'll be exploring how to share the precious lessons I had learnt on emotional health, with Singaporeans as well as with refugees in this region or other places. If possible, I hope to contribute to wider conversations on personal and public ways to nurture emotional healthcare and practices for our interconnected well-being."

On this topic, he also elaborates on his personal experience. "This is not a regret, but rather, my retrospective evaluation that, amidst the stresses and trauma of war, it would have been useful for me to have spent more time working intentionally on my personal emotional health so as to be holistically healthier and present for others."

NUS Lifelong Learning Festival 2022

Over 2,500 participants attended NUS' inaugural Lifelong Learning Festival (LLF) 2022, held on 19 July at the Shaw Foundation Alumni House on Kent Ridge campus. Part of the ongoing SkillsFuture Singapore Festival aimed at promoting and supporting lifelong learning, the NUS LLF was organised by the NUS School of Continuing and Lifelong Education (SCALE).

In a nod to the hybrid nature of the workplace, the NUS LLF included both in-person and online sessions with over 30 experts, industry leaders and academics sharing at the various masterclasses, panel discussions and presentations.

The masterclasses were grouped based on the key growth areas identified in the Skills Demand for the Future Economy report released by SkillsFuture Singapore. Based on Singapore's economic priorities in the coming years, the growth areas include the digital economy, the green economy and the care economy.

NUS Yong Loo Lin School of Medicine (NUS Medicine) led discussions on the knowledge and skills needed for the Care Economy through its masterclass presentation at NUS LLF. Titled, "Developing Future-Ready Healthcare Professionals", the session shared about the challenges of the ever-evolving and changing healthcare landscape and how we can collectively develop future-ready healthcare professionals.

Our speakers for the masterclass included Associate Professor Chong Choon Seng, Assistant Dean (Enterprise); Associate Professor Zhou Wentao, Director of Education (CET); and Associate Professor Lau Tang Ching, Vice-Dean (Education). Their presentations were followed by insightful exchanges during the panel discussion. The NUS Medicine speakers also took the opportunity to share about the various CET events and courses offered by the School.

Scan here to view the live recording of the masterclass session:

THE BANYAN TREE

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

Inspiring CET Digital Learning in the Region

Universitas Gadjah Mada (UGM) and NUS Yong Long Loo Lin School of Medicine (NUS Medicine) came together in August to organise a two-day Digital Course Design and Development workshop for healthcare educators.

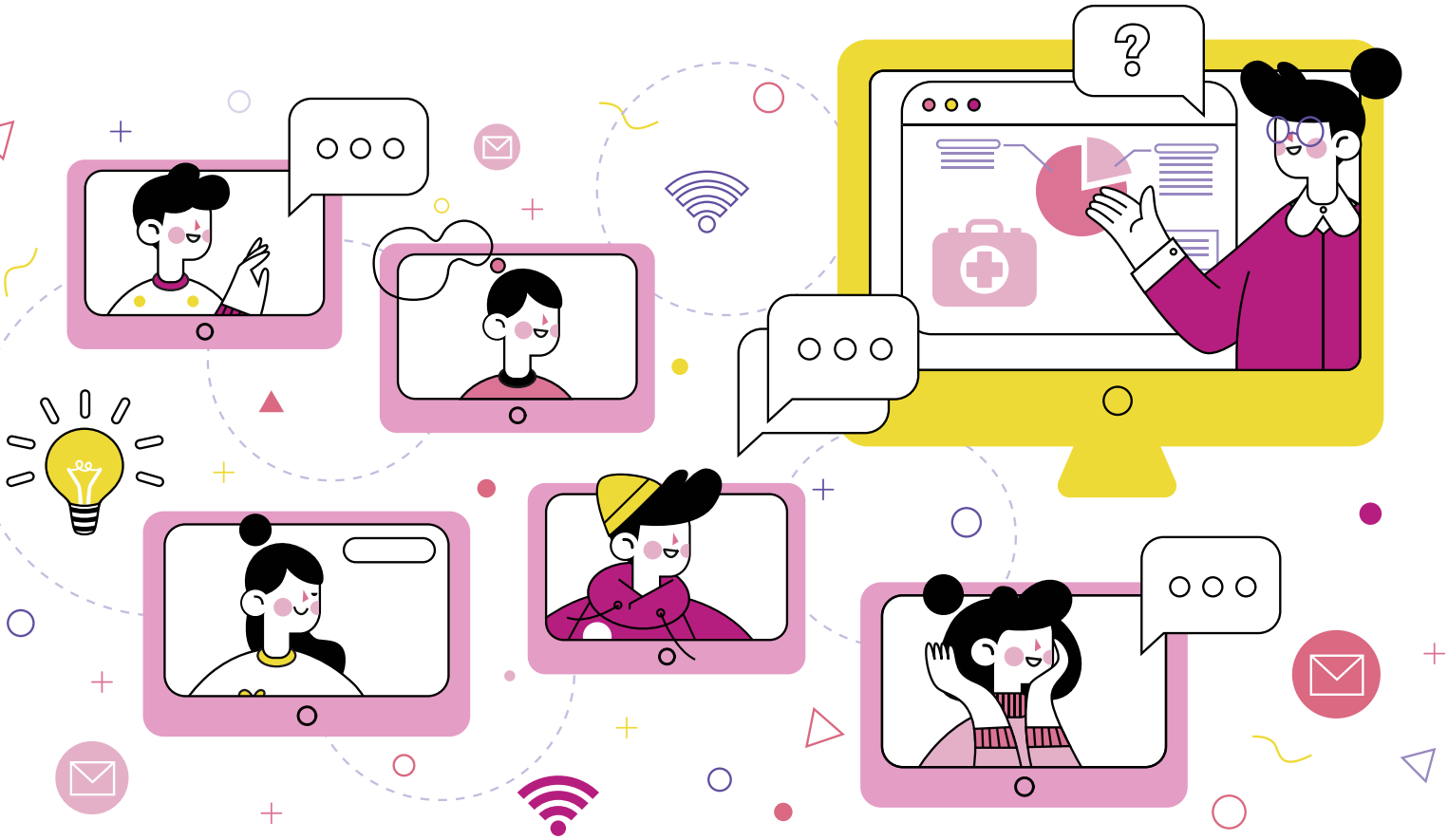
Supported by the International Relations Offices in both schools, this workshop was part of collaborations between the schools to develop Massive Open Online Courses (MOOC) and Technology-Enhanced Learning (TEL) for the region.

Working with the Centre for Medical Education (CenMED), Mr Alvin Tan, Senior Manager, NUS Medicine from the Continuing Education and Training (CET) department, conducted the workshop from 29 to 30 August for over 50 faculty members from UGM's Faculty of Medicine, Public Health and Nursing.

Over the two-day workshop, participants explored and experienced first-hand various education technologies including gamification, interactive video scenarios, e-learning authoring tools, VR/AR and even the metaverse.

To enhance learner centricity, participants applied Design Thinking tools and the Technological, Pedagogical, and Content Knowledge (TPACK) framework to assess their teaching practices. The workshop cumulated with a showcase of participants' digital learning projects developed during the hands-on practical session. The project showcase included e-learning courses, 360 camera and gamification and mobile video lecture.

The workshop helped participants to embrace technology in enhancing digital learning. We look forward to the next collaboration to inspire CET digital learning.



"Wonderful workshop. We learnt a lot of useful concepts and techniques."

Dr Lutfan Lazuardi, M.Kes., Ph.D, Senior Lecturer

"Thanks so much for these amazing two days. I discovered new EdTech tools and picked up tips on how to make e-lessons interactive."

Dr Eryna Ayu Nugra Desita, M.Biomed, Researcher

"I got this 1 key takeaway: Be open to the many possibilities of making learning fun, because it may be much easier than you think."

Dr Naela Himayati Afifah, M.Sc, MD, Radiologist

So cool, beyond my imagination, thank you for opening your perspective in different field

I feel excited when learning about design thinking, it encouranges me to re-think and to re-view the course I have been developing

Take 5:

Q&A with Ms Alaine Teu, Senior Staff Nurse, Ng Teng Fong General Hospital

Q: What are your views on pursuing lifelong learning in healthcare?
Ms Teu: Lifelong learning is essential in healthcare to ensure that we keep our knowledge current and skills up to date in order to remain relevant and continue to provide safe and effective patient care. Lifelong learning also helps healthcare professionals pursue a wide variety of new knowledge and skills in areas that they are passionate about and interested in.

Q: What are the challenges faced by healthcare professionals in continuing education?
Ms Teu: As the healthcare world is a vast and complex one that is always evolving, lifelong learning can help empower healthcare professionals to think more broadly and keep up with current trends in healthcare education, innovation and technology.

Q: What was a recent CET course that you took with NUS Medicine?
Ms Teu: This was the Graduate Certificate in Teaching and Learning for Healthcare Professionals. Although the course was conducted online, it was still very engaging. It was interesting to connect and share our experiences with participants from the different organisations and areas of specialty. Through our discussion, we were able to exchange our viewpoints and approach the learning materials with a better perspective.

Q: How has this CET course supported your career development?
Ms Teu: The course supported my professional development by equipping me with the skills and knowledge to perform a learning needs analysis, to develop a curriculum and have a greater understanding of the various teaching strategies and evaluation methods.

Q: What motivates and drives you to pursue continuing education in healthcare?
Ms Teu: I have always been quite curious and love learning new things, so I am motivated to continue pursuing education in healthcare. I joined this course because I felt that I had a gap in knowledge and skills in the areas of planning, delivering, teaching and learning activities. It has been such an exciting and empowering journey to learn new skills and knowledge and be able to gain a broader understanding of how things work!

Scan here to view an excerpt of the interview with Ms Alaine Teo:

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