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EVIDENCE+

The NUS Medical School turns 110

NUS MEDICINE 110

110 YEARS

OF MEDICAL MILESTONES

1905

The Straits Settlements and Federated Malay States Government Medical School is born at Sepoy Lines, offering a full-time five-year course to train doctors in Medicine, Surgery and Midwifery.

1910

The pioneering class, comprising seven young men, graduates from the medical school with a Licentiate in Medicine and Surgery.

1913

The School changes its name to the King Edward VII Medical School, in recognition of an endowment by the King Edward VII Memorial Foundation.

1921

Another change in name takes place; the medical school is renamed King Edward VII College of Medicine to reflect more accurately its status as an institution that provides tertiary-level education.

1929

The Department of Dentistry admits seven students for its four-year course.

1949

The University of Malaya is formed through the amalgamation of the King Edward VII College of Medicine and Raffles College and the College of Medicine assumes the identity of a university faculty—the Faculty of Medicine.

1950

The University of Malaya confers its first Degrees of Bachelor of Medicine and Bachelor of Surgery on 17 graduands.

First batch of Bachelor of Dental Surgery graduates.

1959

The University of Malaya begins to function as two autonomous divisions, with one located in Singapore and the other in Kuala Lumpur. The Faculty of Medicine operates as the Faculty of Medicine of the University of Malaya in Singapore.

1962

The Singapore Division becomes a fully-fledged university as the University of Singapore. The Kuala Lumpur Division, now also a national university, keeps the name of University of Malaya.

1969

The School of Postgraduate Medicine Studies is formed.

1910 The pioneering class of graduates [back row].

1921 King Edward VII College of Medicine.

1979
The Faculty of Dentistry celebrates 50 years of dental education.

1980
The University of Singapore merges with the Nanyang University to form the National University of Singapore at Kent Ridge.

1983
The Faculty of Medicine begins its move from Sepoy Lines to Kent Ridge. The entire Faculty of Medicine finds a home in the new campus by 1987.

1985
The National University Hospital is established and serves as the principal teaching hospital for the School.

1991
The Medical Faculty undertakes a much-needed review of its curriculum, leading to the setting up of new departments and the reorganisation of the five-year medical course into three distinct blocks.

1997
A further revision of the medical curriculum takes place, with problem-based learning introduced in 1999.

2002
In line with developments in the life sciences, the Faculty of Medicine broadens its entry criteria so that more students will be eligible to study Medicine.

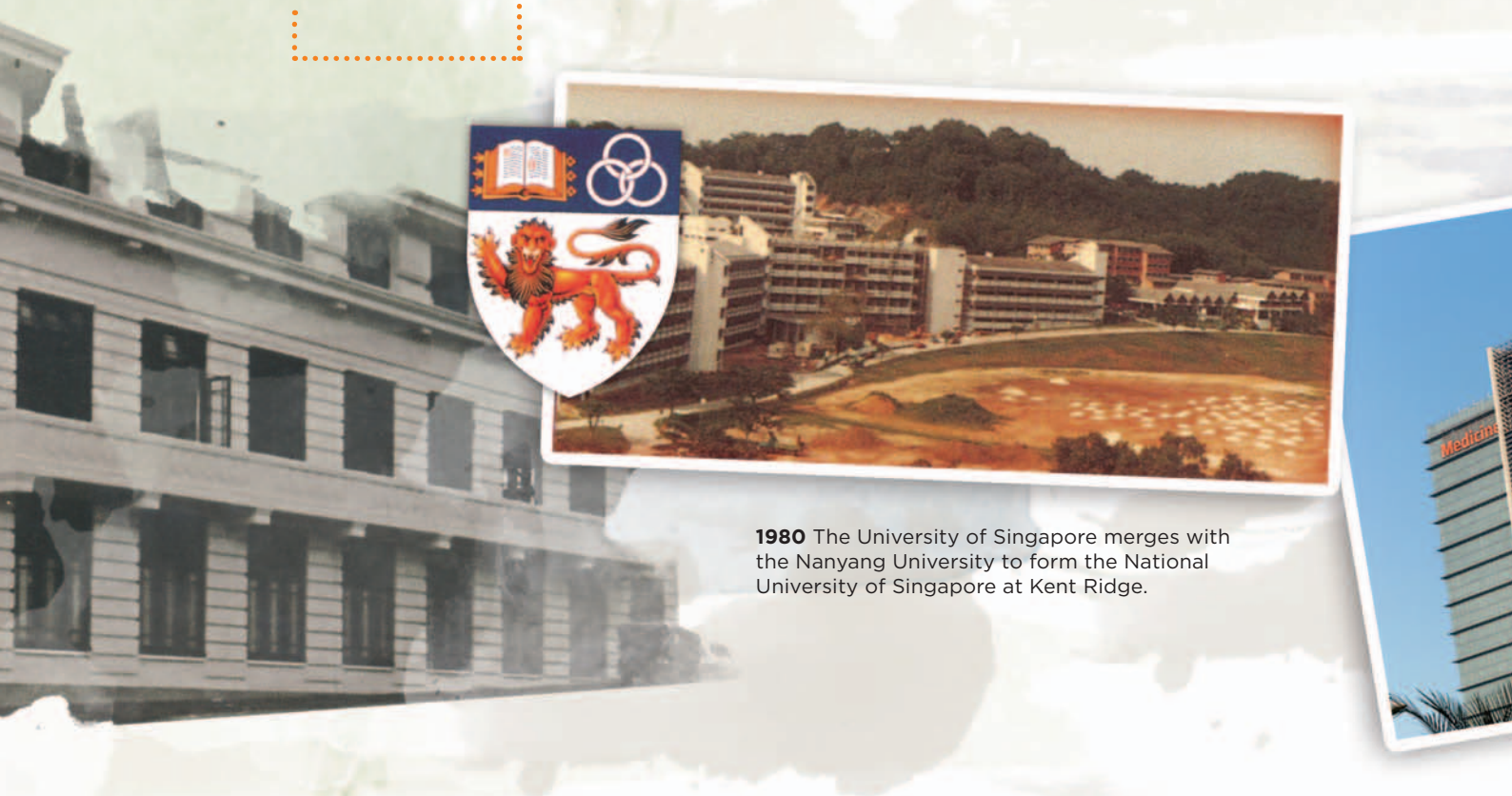
2005
The Faculty of Medicine celebrates its centennial and is renamed the Yong Loo Lin School of Medicine in honour of a transformational gift.

The Alice Lee Centre for Nursing Studies is established. The Centre is the only institution in Singapore to offer academic nursing degree programmes ranging from baccalaureate to doctoral levels.

2006
The Centre for Biomedical Ethics, South East Asia's first academic centre for biomedical ethics in a medical school, is established.

2008
The Yong Loo Lin School of Medicine joins the NUS Faculty of Dentistry and the National University Hospital to form the National University Health System.

2011
The Department of Epidemiology and Public Health becomes the Saw Swee Hock School of Public Health, following a S$30m gift from NUS alumnus Professor Saw Swee Hock. With an Asian focus, the School's strengths include chronic disease epidemiology, statistical genomics and workplace health, as well as a well-developed Master of Public Health programme.



1980 The University of Singapore merges with the Nanyang University to form the National University of Singapore at Kent Ridge.

2012

The Centre for Translational Medicine is officially opened by Singapore Deputy Prime Minister and Chairman of the National Research Foundation, Mr Teo Chee Hean on 3 Jul 2012. A focal point for education and research in Singapore, the Centre houses the Medical Library, and laboratories for investigation into diseases important in Singapore, as well as one of the region's largest simulation centres for medical and nursing students to learn and practise clinical skills.

2013

The School receives a further S$25 million from the Yong Loo Lin Trust to work with the National University Cancer Institute, Singapore, to develop new models of cancer care through research and education. The NUS and The Hebrew University of Jerusalem introduce a joint Doctor of Philosophy (PhD) degree programme to further the study of biomedical science.

2013

The Singapore Centre for Nutritional Sciences, Metabolic Diseases and Human Development is jointly established by the Yong Loo Lin School of Medicine and the Singapore Institute for Clinical Sciences under the A*STAR. The Centre aims to be the leading hub in Asia for research into the connections between nutritional sciences, metabolic diseases and human development.

2014

The Centre for Biomedical Ethics at the School is appointed by the World Health Organization (WHO) as Asia's first collaborating centre for bioethics under its Global Network of WHO Collaborating Centres for Bioethics. A designation ceremony to inaugurate this appointment is held on 2 Apr 2014.

2014

The Centre for Medical Education is established to promote professionalism and excellence in medical education through enhancing support for scholarships and faculty development.

2014

The NUS and the A*STAR set up Asia's first nutritional research centre in Singapore. The Clinical Nutrition Research Centre conducts nutritional studies to understand the causes of metabolic diseases such as diabetes and obesity, and develops products and formulate diets that can reduce the risks of these diseases. It also conducts studies in research areas such as nutrition in women, children and the elderly, and body weight control.

The Faculty of Dentistry celebrates its 85th anniversary.

2015

The School celebrates its 110th year, while the Alice Lee Centre for Nursing Studies marks its 10th anniversary.

2012 NUS Medicine's flagship building, the Centre for Translational Medicine, opens.

2014 Asia's first whole-body calorimeter in the Clinical Nutrition Research Centre.

OUR KIND OF DOCTORS

Singapore's first and foremost medical school turns 110 this year. Its Dean, Dr Yeoh Khay Guan, says he wants the graduates to be proud of serving the community and to be the kind of doctors patients love.

Students of the NUS medical school are being put through a clinical curriculum that gives increased emphasis to geriatric medicine. This is aimed at turning out doctors who are able to competently care for the increasing number of older people in the Singaporean population.

Forecasting, identifying and then preparing its graduates for emerging and future medical and healthcare challenges and roles is something that the School, established 110 years ago this July, believes is key to its ability to fulfil its mission as the fountainhead of Singapore's medical workforce.

From dysentery, kernicterus and malaria in the early years of Singapore, to Severe Acute Respiratory Syndrome (SARS), bird flu, heart disease, cancer and diabetes today—the range of health issues tackled by graduates of the NUS medical school over the course of more than a century is a medical journey that parallels and traces Singapore's metamorphosis from a British colony in the 1900s to the modern city it is today, notes the Dean of the School, Dr Yeoh Khay Guan.

As Singapore grew, developed and prospered, the forerunner of the NUS similarly evolved. It is an integral part of the country's biomedical initiative, collaborating with other research-focused institutions here, like the A*STAR, the National Research Foundation and the Biomedical Research Council on innovative and important discovery work that will benefit Singapore's population health and that of Asian societies in general.

ALUMNI, THE CORE OF COUNTRY'S HEALTHCARE SYSTEM

While technology's role as an enabler allows the Yong Loo Lin School of Medicine today to ramp up its educational and research missions, the medical school hews closely to its founding vision—to train doctors for Singapore. Today, the School's graduates comprise the backbone of Singapore's healthcare system, with many in leadership roles, adds Dr Yeoh. "The great majority of doctors in Singapore are our graduates. We're proud of the health system and the standards that our graduates have built." A number of alumni have gone further, having been appointed to high public office, with a President, a Speaker of Parliament, two serving Cabinet ministers and a succession of Directors of Medical Services at the Ministry of Health at last count.

TRAINING TOMORROW'S HEALTHCARE PROFESSIONALS TODAY

An immediate challenge, however, is the population health issues presented by Singapore's growing numbers of senior citizens, and the concomitant increase in age-related diseases. It has led the School to overhaul its undergraduate and postgraduate medical and nursing curriculum, expand its faculty teaching numbers, and invest heavily in educational technology. The aim is to give the 300 young men and women who enrol in the MBBS as well as the 100 enrolled for the Bachelor of Nursing degree programmes every year a sound clinical foundation so that these doctors and nurses of the future are able to operate effectively in tomorrow's setting.

ROOTED IN THE COMMUNITY

Working with a multicultural population that will consist of a large number of aged people means NUS Medicine graduates must possess more than clinical knowledge. Strong people skills are essential to communicate sensitively and effectively with their patients. Empathy has to be a key trait of a doctor's demeanour, says the Dean. It is something that selectors look out for during admission interviews for the MBBS, where every candidate has a résumé that includes sterling academic records.

"It's not just about the competent delivery of medical care. That is expected. Our graduates have got to have the DNA, the values of the School pulsing in them. We want doctors who understand what a privilege it is to serve, and whose care for their patients is motivated by compassion and respect."

It is a value that he wants NUS Medicine students to be bred on in their formative years at the School, whose establishment was due in large part to the generous support of the local community in the 1900s. "Singapore's early pioneers helped set up the medical school. We must always remember how we came to be and understand that the NUS medical school owes its birth to the people of Singapore and it's the people whom we serve. That is our responsibility and privilege; it is the fundamental purpose of our existence as an institution of higher learning, and it is also what sets us apart," says Dr Yeoh, who graduated in 1987.

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Cover picture: *'The College of Medicine Building' by Ong Kim Seng. The building, together with the adjacent Tan Teck Guan Building, housed the NUS medical school. Used by courtesy of the NUS Faculty of Dentistry.*

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NUHS National University Health System

NUH National University Hospital | NUS National University of Singapore | Yong Loo Lin School of Medicine, Faculty of Dentistry, Saw Swee Hock School of Public Health

National University Cancer Institute, Singapore | National University Heart Centre, Singapore

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The bonds between the School and the Singaporean community have been accentuated and strengthened in recent years through health screenings that cater to the residents of rental HDB apartments, lower-income families as well as the elderly. These yearly screenings are organised and led by medical students, who are also joined by their counterparts from Nursing and the Social Sciences as well as Dentistry in recent times. Residents whose screening tests require further investigation are then referred to polyclinics for follow-up treatment and attention.

THE PATIENT IN THE CENTRE

The importance that the School places on inculcating a compassionate and competent approach to the practice of medicine is emphasised in the Longitudinal Patient Experience programme as well as the medical ethics modules that all medical students undergo. The first lets students spend time with patients, interacting with and observing them through an extended period of time in the community, while the sessions run by the School's Centre for Biomedical Ethics help deepen students' understanding of the issues that healthcare professionals grapple with in the course of their work and which centre on the patient's wellbeing.

This focus on the patient shapes the undergraduate curriculum at NUS Medicine. It is constantly reviewed and updated to ensure that students are fully equipped and prepared to function effectively and independently, and also as members of integrated care teams attending to the complex and varied needs of patients. Adds Dean Yeoh: "We make sure our students are trained rigorously, and training is aligned and contextualised for Singapore's needs. We're constantly innovating and incorporating best-evidence pedagogies into the learning environment, such as collaborative learning, inter-professional education, team training, embedding our students in healthcare teams in hospitals and clinics, and using technology and simulation to enhance learning."

INSIGHTFUL LEARNING

To teach well, one must first learn well. For an institution dedicated to the advancement of medical knowledge, that translates into a lively research environment that features key programmes—undertaken in collaboration with research institutions and universities—in diseases afflicting the population, such as dementia, cancer, heart disease and diabetes. Another major research effort—Growing Up in Singapore Towards healthy Outcomes, or GUSTO—studies the effects of nutrition and the environment upon babies in their mothers' wombs. Each of these programmes has produced new knowledge that is adding to and, in some cases, revolutionising the way the disease is being perceived and approached clinically and from population health perspectives.

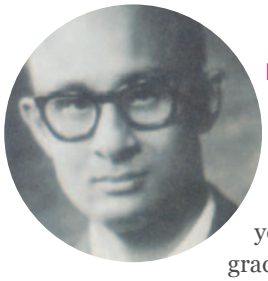
The quality education and head-turning research at NUS Medicine has not gone unnoticed: the School has been consistently ranked as one of Asia's leading medical schools by Quacquerelli Symonds and the Times Higher Education World University Rankings. But rankings do not tell much about what makes a medical school unique or special in the eyes of the nation and the community that it serves. Nor do they remind people about its raison d'être.

That is the responsibility of the men and women who teach and learn there, and who help shape Singapore's own unique approach to the practice of medicine as well as the planning and delivery of healthcare. And so, as the NUS medical school looks to the next 100 years, its work to turn out doctors with "heart and soul" remains a constant. Says Dean Yeoh, "When all is said and done, we would like our students to be physicians with a big heart, the sort of doctors you and I would want to look after us when we need medical care." ✚

THEY MADE A DIFFERENCE

Since its founding in 1905, the NUS medical school has seen countless faculty members and students passing through its portals to go on professional journeys that often paralleled the progress of Singapore as well as the School. Dr Khor Ing Wei tells of 11 such people.

In 1910, the first seven medical students graduated with a Licentiate in Medicine and Surgery (LMS). More than two decades later, in 1937, Singapore was a city buffeted by many different forces. Communist and anti-Japanese groups were gaining ground among the Chinese population. At the same time, Singapore was a Crown Colony, ruled by a British governor. Likewise, all heads of department at the School, then known as the King Edward VII College of Medicine (KECOM), were British.



That year, **Emeritus Professor Kanagaratnam Shanmugaratnam** enrolled in KECOM. It would take 10 years for him to graduate with an LMS, because his studies were interrupted by World War II and the Japanese occupation of Singapore. After specialist training in the UK, he returned to KECOM (renamed the Faculty of Medicine at the University of Malaya), rising to head the Department of Pathology in 1957, and Dean of Medicine later. During his career, Emeritus Prof Shanmugaratnam made considerable contributions to histopathology, tumour classification and cancer epidemiology, including establishing the Singapore Cancer Registry to track local cancer trends.

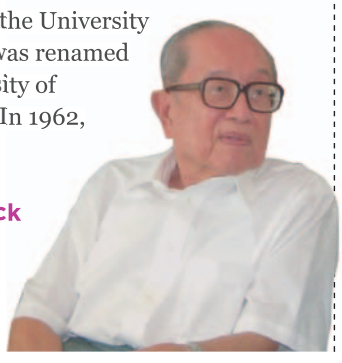
Professor Khoo Oon Teik also enrolled in KECOM in 1937 and graduated in 1947. In 1969, he established the first kidney dialysis unit in Singapore in an attic at the Singapore General Hospital. In the same year, he founded the National Kidney Foundation, a charitable organisation that provides subsidised care to kidney patients and dispenses free health screening and public health education on kidney disease. The agonising death of Prof Khoo's own brother from kidney disease in the 1950s further motivated him in his work.

Another alumnus who was affected by World War II was **Dr Oon Chiew Seng**, who interrupted her studies to evacuate with her family to Bombay, India. There, she continued her education until she returned to Singapore and obtained her LMS in 1948. Dr Oon was a trailblazer in many ways: she was among the first women in the region to become a Member of the Royal College of Obstetricians and Gynaecologists, and the first gynaecologist to open a private clinic in Singapore (in 1959). Upon retiring from private practice, Dr Oon founded Apex Harmony Lodge, the first Singaporean nursing home for dementia patients.

Professor Lim Kok Ann might have been a contemporary of the above alumni, but he brought his own stamp of scientific curiosity, integrity and a touch of vim to his twin passions: microbiology research and chess. Prof Lim helped to initiate oral polio vaccination of Singaporean children, and was the first to isolate the virus responsible for the 1957 Asian influenza epidemic. Later, he devised a new strategy for diagnosing enterovirus infections that was more efficient than the standard test method of the day. Prof Lim headed the Microbiology department for almost 30 years, and was Dean of Medicine from 1965–1972. He also served as Secretary-General of the World Chess Federation from 1982–1988.

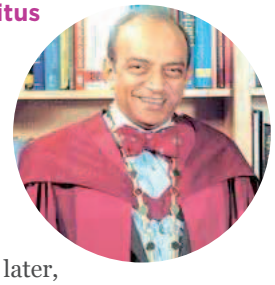
After World War II, Singapore experienced many economic, social and political changes, including food shortages and public protests. Becoming increasingly disillusioned with British rule, Singaporeans supported a merger with Malaya.

In 1961, the University of Malaya was renamed the University of Singapore. In 1962, **Emeritus Professor Wong Hock Boon** became the first Professor of Paediatrics. Emeritus Prof Wong was simultaneously a towering figure in Singapore medicine and a well-loved teacher and mentor. At a time when breastfeeding rates were declining, he promoted it to prevent childhood malnutrition and diarrhoea. Emeritus Prof Wong characterised inherited anaemias, introduced rice water for oral rehydration in serious childhood gut infections, and performed seminal research in enzyme deficiencies, which helped to reduce the rate of severe jaundice in newborns.



The late 1960s and the 1970s was a time of social and political upheaval in the West, with Woodstock and anti-Vietnam War protests in the USA and student-led protests in Europe. Singapore was changing, too, becoming an independent country in 1965.

In the late 1960s, **Professor Chao Tzee Cheng**'s introduction of forensic pathology techniques revolutionised criminal justice work in the region. After obtaining qualifications in clinical pathology and medical jurisprudence, Prof Chao was appointed forensic pathologist at the Ministry of Health in 1969. Over the course of a long and distinguished career, he influenced the outcomes of many important court cases in Singapore, Malaysia, Hong Kong and even West Africa. These cases included the notorious Adrian Lim cult murders and the Scripps body parts murders in Singapore, as well as the trial of Hugh Ashley Johnston in Malaysia.



In 1971, **Emeritus Professor S S Ratnam** performed the first sex reassignment surgery in Singapore. More than two decades later, the legal definition of marriage in Singapore was expanded to include transsexual people and their spouses of the opposite sex. Emeritus Prof Ratnam was also instrumental in

achieving many pioneering events in assisted reproduction, including the world's first live birth after microinjection, and the first infant born via human ampullary coculture. On the Asian stage, he was involved in work on the first test-tube baby (1983), the first Gamete Intrafallopian Transfer (GIFT) baby (1986), and first live birth from a frozen embryo (1987).

The first Singaporean to have a disease named after him in Western medical literature, **Dr Tay Chong Hai** came across a rare syndrome in 1969 that was associated with intellectual impairment, decreased fertility with short stature, ichthyosis and brittle hair. The condition is now documented worldwide as Tay's Syndrome (also known as IBIDS Syndrome, or trichothiodystrophy). Early in 1972, he sounded an alert on the outbreak of foot-and-mouth disease in East Malaysia, Taiwan and Singapore. In 1999, Dr Tay reported another rarity, a condition described by him as eosinophilic arthritis, affecting mainly the knees, ankles and shoulders, with eosinophilia being the only extra-articular manifestation. A pioneer in rheumatology in Singapore and founder chairman of the Singapore National Arthritis Foundation, his investigation of traditional Chinese medicine highlighted the problems of high levels of arsenic, lead and mercury that are sometimes present in herbal medicine. Dr Tay also drew attention to the problem of adulterated Chinese medicines and warned against the misuse of cortisone.

Since 1982, the School has been renamed twice more, first to the Faculty of Medicine, then to the Yong Loo Lin School of Medicine in 2005. What has not changed is the enormous impact that the achievements of the celebrated old guard have had on present-day clinicians and researchers. The high level of innovation in clinical practice and research at the School is a window into our future in the next 110 years.

Professor Prabhakaran Krishnan, pioneering transplant surgeon and educator, is the Director of the Paediatric Organ Transplant Programme at the National University Hospital. Besides the first kidney transplant using a kidney from a related living donor in 1989, he also performed the first paediatric liver transplant in Singapore, and the first combined liver and kidney transplant in Southeast Asia. Prof Prabhakaran believes in passing on his knowledge by training surgeons in developing Asian countries in complex paediatric surgeries, and by helping other countries set up liver transplant programmes.

Another outstanding clinician researcher is infectious diseases specialist **Professor Leo Yee Sin**. She proved her mettle during one of the worst health crises to hit Singapore in recent years: the 2003 Severe Acute Respiratory Syndrome (SARS) virus outbreak. She also worked to fight Chikungunya and pandemic influenza virus outbreaks during the late 1990s and 2000s. While heading the Institute of Infectious Diseases and Epidemiology at Tan Tock Seng Hospital, Prof Leo is also involved in research in dengue, influenza, HIV and emerging infections.

Singapore's evolution from developing to developed country has led to changes in the disease landscape. Cancer is now the No.1 killer in the country, making the research of clinician-scientists such as **Associate Professor Allen Yeoh Eng Juh** vitally important. His work involves developing more cost-effective treatment strategies for children with acute lymphoblastic leukaemia (ALL) and evaluating genes expressed by leukaemia cells to accurately diagnose and classify childhood ALL.

Although certainly not exhaustive, this list of notable NUS Medicine men and women exemplifies the clinical acumen, scientific innovation and heart that the School strives to cultivate in its students. Their dedication to advancing medicine in Singapore and beyond paves the way for even greater progress in the future. ✚

LEARNING THE ART OF MEDICINE

Dr Mayank Dalakoti reflects on his time in medical school.

Medicine has always been more than just a degree or a profession—it is a journey.

In some ways, it is akin to a complex metabolic process, where one stage leads to another and each phase alters the final product (the doctor) irreversibly. One such phase that is both memorable and irreversible is medical school.

Medical school is the time when a doctor not only gains medical knowledge, but also learns about the patients who sit on the other side of the doctor's desk, and what it means to carry their hopes and expectations. In that way, the time in medical school has a deep and lasting effect on the rest of our lives as doctors.

I was fortunate to have had the chance to study medicine at the NUS Yong Loo Lin School of Medicine as a proud member of the Class of 2013. As the NUS Medicine celebrates its 110th anniversary, I look back on my journey through the halls of medical school and look forward to the challenges ahead.

The time at NUS Medicine was both challenging and fulfilling. I am thankful that my training enabled me to be a clinically competent team player with a global outlook.

Throughout the five years of medical school, we had inspiring mentors who encouraged us to strive for clinical excellence while appreciating the balance between the scientific and human sides of medicine. They set high standards for us and were role models whom we could look up to. Besides being dedicated educators, they also emphasised the importance of community and practising medicine with a heart.

The quality curriculum in NUS Medicine was aimed at producing clinically sound doctors with a global outlook in issues of health and community. Part of the reason for its success included a four-month period of elective postings in the fourth year, during which students could explore various disciplines across the globe and gain a better understanding of the practice of medicine internationally.

During this time, I spent three months doing postings in Cardiology and Critical Care, as well as Paediatrics, Surgery and Rural Medicine in the USA and India. The experiences I had and the lessons I learnt will continue to shape my perspective and the type of medicine I practise for the duration of my career.

Closer to graduation, the fifth year of medical school was designed to consolidate learning while providing a practical experience of learning how to function in the wards as junior doctors. The Student Internship Programme enabled us to graduate as competent and safe doctors.

Arguably, one of the biggest reasons for a fulfilling medical school experience was a great community of friends and colleagues; I am certain we will continue to play a lasting part in each other's lives through the journey—even after medical school.

After graduation, I chose to start my Residency in Internal Medicine at the National University Hospital. Although early clinical life in medicine was challenging, I daresay the training in NUS Medicine prepared me well for the tasks expected of me.

There are challenges that lie ahead of the medical school as it attempts to continue to provide a quality experience for graduates. With the opening of the Lee Kong Chian Medical School at the Nanyang Technological University and increased intake of medical students at NUS, the challenge for NUS Medicine is to continue to produce clinically sound, young doctors despite heavy competition for limited clinical resources. This may involve more dependence on simulation training for development of clinical acumen and critical thinking. The Centre for Healthcare Simulation at the Centre for Translational Medicine stands poised to fulfil this task.

"WE HAD INSPIRING MENTORS WHO ENCOURAGED US TO STRIVE FOR CLINICAL EXCELLENCE WHILE APPRECIATING THE BALANCE BETWEEN THE SCIENTIFIC AND HUMAN SIDES OF MEDICINE."

With the increasing size of each medical intake at NUS Medicine, it is also vital that enough resources are put in place for each and every student to tap into, such that they maximise the many opportunities to learn and grow while at NUS Medicine.

It is my sincere wish that the NUS Yong Loo Lin School of Medicine continues to produce doctors with both the heart and clinical aptitude to provide the best care for Singaporeans in the years to come. ✚

UNDERSTANDING THE NATURE OF THE BEAST

The recently opened Biosafety Level 3 laboratory (BSL-3) is where some of the most virulent pathogens known to man are scrutinised.

The laboratory, located in the Centre for Translational Medicine at the NUS Yong Loo Lin School of Medicine, was opened in May 2015 by Mr Gan Kim Yong, the Minister for Health. It is one of several in Singapore that form a line of defence against infectious diseases (ID). By studying and understanding the nature and workings of pathogens such as H5N1 avian flu and tuberculosis (TB), the knowledge gained could be used to develop treatments and solutions.

FIGHTING AN OLD ENEMY

With nine million cases around the world each year, tuberculosis continues to pose a danger, says Associate Professor Thomas Dick, the scientist in charge of the BSL-3 laboratory. "TB is an old threat, but still kills 1.5 million people a year," he reveals. That is second only to HIV.

Asia accounts for 59% of all TB cases globally. Singapore gets about 2,000 TB victims a year, and this is why one of the BSL-3's main programmes is the Singapore Programme of Research Investigating New Approaches to Treatment of Tuberculosis (SPRINT-TB). "With TB, we want to understand resistance mechanisms, for instance," Assoc Prof Dick says.

He goes on to describe latent TB, where a patient carries the bacteria in his lungs, but does not exhibit any symptom. One third of the world's population has this condition, and 5–10% of them will go on to develop active TB. "It's important to kill these sleeping bacteria," he insists. "Even now, we still don't know the physiology of these bacteria and how to kill them. In order to kill them, you need to know what is their weak spot."

SPRINT TO SUCCESS

A major user of the BSL-3 is SPRINT-TB.

This National Medical Research Council-funded national programme is already putting the National University Health System on the map through its portfolio of groundbreaking research in TB treatment. If successful, the benefits to the world will be momentous, declares Professor Nicholas Paton, the programme's Director.

In an era when humans are travelling more than ever, when new strains of influenza keep evolving, and when superbugs are becoming

ever more resistant to antibiotics, laboratories such as the BSL-3 are critical in helping to decode the genetic mysteries of these microorganisms in order to find a way to destroy them.

It is also a facility that Assoc Prof Dick believes will attract ID researchers to the NUS. The laboratory is already collaborating with institutions such as Harvard University and Rutgers University in ID work, which also involves experts from various disciplines at the NUS and the A*STAR. "The NUS is a fantastic place," says Assoc Prof Dick. "I work with chemists here who test molecules they make right here in this facility. So to have this clinical trial capacity, pharmacology and chemistry all within the NUS is excellent. It has all the components for high-impact research."

HIGH-PRESSURE SPACE

Given the risks associated with the work carried out within the Biosafety Level 3 laboratory, every single square inch of the facility has been carefully thought through and planned to ensure the safety and protection of staff in the facility. It has features such as:

- CCTV cameras that monitor 24/7
- vacuum-sealed doors guarded by vein-scanning and passcode systems
- fully protective plastic gear fitted with respirators
- industrial sterilisers
- systems that exchange the laboratory air roughly 20 times per hour
- negative pressure to keep molecules from escaping the rooms
- laboratory waste treated by intense heat "like a pressure cooker"

To work in the facility, laboratory workers must first be rigorously trained. "You need two years of laboratory work experience simply to be eligible for 40 hours of facility training. You get trained how to get in and out, and what to do in case of a spill," describes Assoc Prof Dick.

You even have to learn how to dress, he adds: "You go in, undergo cleaning procedures, don lab protective equipment and gear; at the end of your work inside, you go through the cleaning procedures again before you are permitted to come out."

HEALTHCARE PROFESSIONALS WITH HEART & SOUL

The NUS Yong Loo Lin School of Medicine scales up two existing programmes in response to an increasingly team-based and patient-centred healthcare landscape.

[From left] Medical students Ms Janice Lim and Ms Chia Ching Yee with patient Mr Muhammad Khair Bin Abdul and Dr Derek Soon.

Tomorrow's doctors should possess good clinical skills and be filled with compassion for the patients under their care. They should also be adept operators, comfortable in managing a patient on their own, and be equally versatile functioning as a member of a team that is providing care holistically for patients.

This is the objective that Assistant Professor Keith Lim of the NUS Yong Loo Lin School of Medicine takes to heart in his role as the School's Co-chairperson of the NUS Medicine Interprofessional Education (IPE) committee and lead for the Longitudinal Patient Experience (LPE) programme. It is one that is doubly important, because data from various international medical schools, including NUS Medicine, indicate that medical students lose empathy for patients by the time they are in their third and fourth year of studies. "These are the years in which they are trying to digest a lot of information, so they become more fixated on problem-solving and meeting goals," explains Dr Lim. In the process, their teachers' reminders that the patient rather than the disease should be the focus get crowded out.

This dissolution of empathy on the part of medical students is being addressed by NUS Medicine, because healthcare emphasises the centrality of the patient. Patients also respond better to doctors who show cognitive understanding of their medical conditions as well as an appreciation of what is going on in their everyday lives. Operating as members of a team focused on the wellbeing of a patient is also given great emphasis at the School.

The hospital, like most workplaces, is an all-too-human environment in which errors and accidents inevitably occur. But while an error during a trade may result in an investment firm losing money, one made in the hospital could cost someone his life. According to Dr Lim, a senior consultant at the National University Cancer Institute, Singapore, the majority of medical errors occurs not because of incompetence on the part of healthcare professionals; rather, they are due to poor communication between members of the healthcare team: "A lot of safety errors were due to poor communication, misunderstanding orders, and not being able to work as a team. As a result, a patient could receive the wrong drug dosage, or a team member could receive orders that are not carried out or are carried out on the wrong patient."

That is why NUS Medicine students are rapidly expanding both their hard and soft skill sets. They are learning the importance of empathy in ministering to patients; at the same time, they are also imbibing and honing team skills, working and training alongside classmates as well as colleagues from Nursing through two key programmes.

Both the LPE and IPE are designed to produce competent doctors who genuinely care for their patients. NUS President Professor Tan Chorh Chuan, himself a doctor, puts it thus: "Medicine is a difficult course that requires a deep understanding of a large range of subject matter, so academic capacity is necessary, but not sufficient. Students intrinsically need to be interested in people and have a sense of wanting to help. At the end of the day, the practice of medicine is not about the technical delivery of care; it is also about delivering that care with compassion and empathy in ways that connect and comfort patients and their families."

TWO STUDENTS' EXPERIENCES

Past students in the programme picked a variety of ways to interact with patients and their families—tutoring their children, helping out with household chores—through which they can learn about the physical challenges and social difficulties their patients face beyond the hospital.

Year 2 NUS Medicine students Ms Janice Lim and Ms Chia Ching Yee came away from their Longitudinal Patient Experience stint with a new perspective on friendship and camaraderie.

Last year, both were introduced to Mr Muhammad Khair Bin Abdul Rahman, a 30-year-old multiple sclerosis patient of Dr Derek Soon, a consultant from the Division of Neurology. While they were initially uncertain about what to expect, it was the patient, whom they now fondly address as 'Khai,' who took the initiative to break the ice during the first meeting.

"The very first thing that Khai did was to give us his brightest smile, which immediately put us at ease and built rapport," recalls Ms Lim. "Khai is a very jovial person, and I think Ching Yee would agree that we both learnt that, in interacting with people, it's these small gestures that help you communicate with patients."

She reveals that the most important thing she and Ms Chia learnt from Dr Soon and Khai was how Khai's condition impacts his life and family, and how he has been pulling through each obstacle. "That's something we'll never learn by sitting in the clinic for 15 minutes with the patient," she adds.

As the two medical students got to know Khai and Dr Soon better through more visits, they realised that a good doctor-patient relationship can extend beyond professional boundaries. "What they showed me is that it's possible to talk, laugh and joke, yet maintain that professional relationship," reveals Ms Chia, who now uses her friendship with Khai as a reminder that patients appreciate the same consideration she extends to friends.

LONGITUDINAL PATIENT EXPERIENCE (LPE): LEARNING FROM PATIENTS

In 2012, the LPE was set up as a voluntary, soft skills programme in which a pair of Year 1 students is assigned to a clinically active patient at the National University Hospital (NUH). Under the supervision of a mentor—the patient's primary physician—the pair followed up on the patient outside of school hours at least four times in one academic year. Mentors accompanied students on their first and final visits. In between, students were free to devise ways of interacting with their assigned patients, the goal being to build rapport and understand how they coped with their diseases.

The programme, initially confined to just the NUH, was launched to make students aware of the impact of the social environment on patients with chronic illnesses such as diabetes, hypertension and stroke, and to develop empathy between students and patients.

Over the last three years, the programme has gained traction, and now enrols almost 70% of the freshmen cohort. This is thanks in large part to the extension of the LPE to include clinicians from all medical specialties across the island; these now comprise nearly half of the participating mentors. The other half comprises NUH clinicians such as Dr Derek Soon, a consultant from the Division of Neurology.

The LPE has three primary goals.

Firstly, it hopes that students will get a better understanding of their patients' lives away from the hospital environment, in which they only spend a small portion of their time. Through this, they develop a sense of empathy towards patients and an understanding of how society affects patient recovery.

Secondly, students learn to observe and understand the regression or progression of a disease over a period of time. "If they're only observing amputation as a means to treat a diabetic patient's gangrene, they're not going to understand the rest of the complications that may arise after the patient loses his leg," notes Dr Lim. Every patient has a unique story from which students can draw powerful, humanistic experiences. While Dr Soon may be a mentor, he says that he is not the one from whom his students learn the most. "I always take away something from all of my patients," he reveals. "It's the patients themselves whom medical students will continue to learn from throughout their careers as doctors."

The third goal would be to help the students understand Singapore's healthcare system better.

What is perhaps most evident in the LPE is the profoundly human experiences that instil young minds with the right attitudes. As Dr Soon notes, it is all about helping these aspiring doctors to refocus on their motivation to help people. "There's so much more to being a doctor than knowing physiology and pathology!" he insists. "What's our impetus, why do we come to work every day? For a lot of us, our impetus gets lost in the workload, and I think that the LPE refocuses us on why we are here."

Students have given largely positive feedback about their LPE elective stints. Last year, 90% of volunteers felt they were better able to relate to patients, while 87% indicated that they understood and could better assist patients in navigating Singapore's healthcare system.

INTERPROFESSIONAL EDUCATION (IPE): LEARNING TO WORK AS A TEAM

While the LPE nurtures the heartware, NUS Medicine is also focused on building up its students' team skills by getting them to learn how to work with peers as well as their counterparts from Nursing, Pharmacy, Social Work and Dentistry in an interprofessional, team-based environment.

"The idea is to expose students to avoid any 'first day at work' surprises, such as being expected to work as part of a healthcare team. No one can work in isolation anymore," explains Dr Lim. "Good relationships don't happen overnight; that's why everyone is thrown into the fray."

IRON SHARPENS IRON

The students learn together, build friendships and cultivate professional relationships through two core IPE activities: the Interprofessional Enrichment Activities (IEA), and the mandatory Interprofessional Core Curriculum Activities (ICC).

The former is a student-led initiative that involves members from two or more faculties. For example, NUS Medicine students and their peers from the Nursing and Pharmacy courses learn Malay together, or set up screening programmes such as the Liver Awareness Week and Tuberculosis Day. Enrichment activities can be community-focused or educational, for their own or the community's benefit.

The second core activity is compulsory and features formal classes that students must attend. In these activities, students learn with fellow students from other faculties; they are taught not only by faculty from NUS Medicine, but also by faculty from the other academic units. Examples of such modules are the patient-based learning programme where medical students shadow nurses and members of the allied health team, the upcoming patient safety module and the clinical skills foundation course.

NURSE-TEACHERS FOR FOUNDATIONAL CLINICAL SKILLS TRAINING

Year 2 medical students have to undergo the Clinical Skills Foundation Programme (CSFP) as a part of the ICC, and some modules in this course are run by certified nurses rather than doctors.

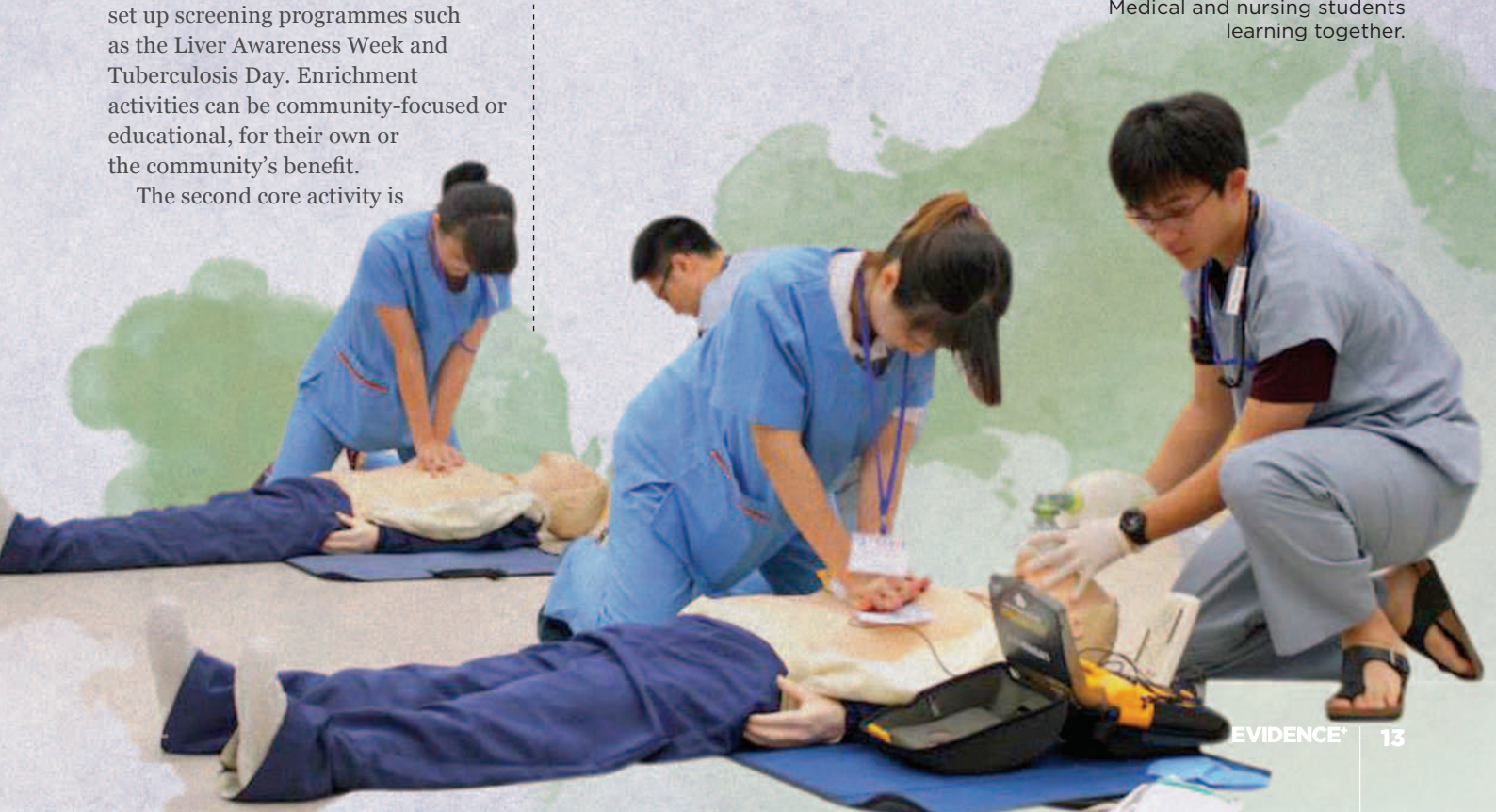
"What we realised is that some key skills in patient care, such as taking the hypo-count for diabetic patients, are mostly done by nurses, not doctors," says Dr Lim. Nurses who conduct these day-to-day tests may be better qualified to instruct students in these essential skills.

To explain the importance of a team-based learning structure, Dr Lim describes a changing healthcare landscape in which doctors no longer play the sole, primary role as caregivers: "A lot of professions have been scaled up, and patients no longer just rely on us." For instance, a stroke patient not only sees a physician, but also physiotherapists who rehabilitate him, nurses who teach homecare, and pharmacists who advise on anti-coagulants.

"At the end of the day, everyone in the team needs to be able to see that behind every cerebral aneurysm is the face of a human being, and that everyone's got a story," concludes Dr Lim. ✚

"THE IDEA IS TO EXPOSE STUDENTS TO AVOID ANY 'FIRST DAY AT WORK' SURPRISES, SUCH AS BEING EXPECTED TO WORK AS PART OF A HEALTHCARE TEAM. NO ONE CAN WORK IN ISOLATION ANYMORE."

— DR KEITH LIM



Medical and nursing students learning together.

AFFAIRS OF THE HEART

Professor Hooi Shing Chuan, Vice-Dean (Education) at the NUS Yong Loo Lin School of Medicine, talks about the importance of producing compassionate doctors.

I am an accidental academic. I did not plan for a career in academia; I stumbled upon it.

I had pretty much decided on a career in surgery, and opted for surgical postings during my medical officer days. It was while attending a revision course in preparation for the part 1 FRACS exam that I decided to make the switch to academia and joined the Physiology Department in the NUS.

"EDUCATION INCLUDES THE HOLISTIC DEVELOPMENT OF THE INDIVIDUAL, MAKING PEOPLE BETTER CITIZENS AND NEIGHBOURS, AND CREATING A BETTER SOCIETY."

I was inspired by Professor Ross Hawker, a lecturer in Physiology. His passion for the subject was infectious. I marvelled at how inter-connected and integrated the different body systems were, and how foundational pathophysiology was to clinical practice. I approached Professor Peter Hwang, then the Head of Physiology, about joining the Department. I am grateful to him for taking me in and setting me on an immensely fulfilling 'road less travelled.' So what have I learnt after teaching for more than two decades?

That it is far easier to teach about the human heart (I teach cardiac physiology) than to educate the heart. It was Aristotle who said, "Educating the mind without educating the heart is no education at all." Education is more than the transmission of knowledge, or even preparation for a career. It includes the holistic development of the individual, making people better citizens and neighbours, and creating a better society.

Educating the heart is especially important for the healthcare profession. Doctors and nurses are expected to embody compassion and care. Yet, the majority of medical schools—including our own—find that measures of empathy drop as students enter clinical training, and continue to decline during the clinical years.

Empathy is not the only value we want to nurture in our students, critical as it may be. We also want to nurture humility, respect, integrity, community responsiveness and the willingness to give back to society. These values are not only difficult to nurture, they are difficult to assess. As educators, we agonise over how best to assess the desired outcomes in our curriculum. But, how can one assess the heart?

Difficult though it may be, we continue to look for innovative ways to nurture and assess these values in our students. Here at NUS Medicine, two of the seven aspirational goals in education have to do with cultivating good citizenship and nurturing values among our students. We empower students to add value to patients' care and to give back to the community through community involvement projects that make a difference to healthcare outcomes in the community. Professionalism, values and ethics are caught, taught and assessed in an integrated manner, in formal and informal settings. For example, students learn respect and gratitude as they reflect on the sacrifice and generosity of those who donated their bodies for anatomy dissection. Students visit patients' homes and interact with patients and their families in their first year in school, so they can better appreciate the physical and social contexts in which patients manage their disease. Students reflect on professional practice observed in the wards during their clinical years, and debrief with mentors.

We have good reason to be optimistic. The majority of our students volunteer on community projects locally and regionally. They are enthusiastic about giving back to the community, and have welcomed training and advice on how they can have an even greater impact on the communities they are working in. Students have initiated projects to help their peers with academic work, raised money for bursaries and charities, and recent graduates have come back to help students as house mentors. There is a growing sense of optimism among students as they feel empowered to make a difference in the lives of others.

As the School celebrates its 110th birthday this year, we pride ourselves on being the heart and soul of Singapore Medicine. The majority of doctors and graduate nurses practising in Singapore graduated from NUS Medicine. Our alumni shape and model the practice of medicine in Singapore. As the training wellspring of Singapore Medicine, we continue to emphasise the importance of instilling values in our students.

As Aleksandr Solzhenitsyn, Nobel laureate and novelist, pointed out, "The line separating good and evil passes not through states, nor between classes, nor between political parties either, but right through every human heart." Get the heart right, and we will have a better society. Get the hearts of the NUS Medicine students right, and Singapore Medicine will continue to flourish far into the future. ✚

"THE MAJORITY OF OUR STUDENTS VOLUNTEER ON COMMUNITY PROJECTS LOCALLY AND REGIONALLY. THEY ARE ENTHUSIASTIC ABOUT GIVING BACK TO THE COMMUNITY, AND HAVE WELCOMED TRAINING AND ADVICE ON HOW THEY CAN HAVE AN EVEN GREATER IMPACT ON THE COMMUNITIES THEY ARE WORKING IN."

CLINICAL IMAGING'S ANSWER TO THE HUBBLE TELESCOPE

The powerful imaging technologies at the A*STAR-NUS Clinical Imaging Research Centre are helping clinicians and medical scientists see and understand the human body and disease progression in a whole new way.

Wilhelm Conrad Roentgen would be impressed. The man who discovered the use of the x-ray to peer inside the human body in 1895 would have been floored by the body-scanning marvels housed in the basement of the Centre for Translational Medicine building of the NUS Yong Loo Lin School of Medicine.

These devices at the A*STAR-NUS Clinical Imaging Research Centre (CIRC) play a key role in allowing scientists and doctors to examine the human body's anatomical and functional detail. This ability—akin to the Hubble telescope's galaxy-spotting capabilities, albeit on a different scale—promises immense benefits for medical science. Researchers are able to define and locate diseases accurately while potentially identifying underlying molecular causes. The ability to study disease pathways can also be used to develop new drugs and therapies to address health issues of particular relevance to Singapore's population, including cancer, heart disease, obesity, and neurodegenerative disorders such as dementia.

Established in 2008 by the A*STAR and the NUS, CIRC is also a focal point for the development and validation of new imaging methodology.

The multimodality and multidisciplinary research centre focuses on specific areas of biomedical research, including clinical trials of new therapies, novel applications, and validation of new approaches. It is designed to support translational and clinical research by bringing together basic scientists and clinicians keen to study the impact of new therapies and devices in human patients. It is also training postgraduate students in clinical imaging research.

SEEING LIKE NEVER BEFORE

CIRC has two 3-Tesla (3T) Magnetic Resonance Imaging (MRI) scanners, a PET/MR and a PET/CT scanner, as well as an entire radiochemistry laboratory equipped with a cyclotron, hotcells and synthesis units for the manufacture of radiopharmaceuticals.

The Centre is one of the few clinical research sites in the world that has a PET/MR scanner, an innovative medical imaging device developed by Siemens Healthcare that combines two leading-edge imaging techniques: 3T MRI and Positron Emission Tomography (PET). The former provides detailed anatomical images and measures of function; the latter gives molecular information of physiological processes.

Conducting both simultaneously with the PET/MR, clinical researchers can define and locate disease accurately while identifying certain underlying molecular causes.

While these instruments are not likely to wow a layperson, they delight researchers. "Researchers here do not have to compete with routine clinical services. CIRC is for research studies only," notes Professor David Townsend, Director of the Centre. "In most places in the world, researchers usually have to compete with clinicians performing routine scanning of patients."

PEOPLE, NOT MACHINES

Amazing as the imaging equipment is, it is humans who interpret the findings. Of the 52 people who work at the Centre today, at least 15 are responsible for processing and analysing the images. "That's probably the biggest image analysis team on the island," adds Prof Townsend. "There is no Centre like this in Southeast Asia; nowhere I know—other than CIRC—has such a concentration of expertise and equipment."

"BUYING EQUIPMENT IS THE EASY BIT; THE MAJOR CHALLENGE IS RECRUITING THE RIGHT PEOPLE."

— PROF DAVID TOWNSEND

Prof Townsend believes there is still much work to be done to get CIRC to achieve its full potential. "As a national Centre, we still have a way to go," he insists. "Buying equipment is the easy bit; a major challenge is recruiting the right people and attracting motivated clinical researchers."

PEOPLE WATCHING

The 'right' people are not only staff, but also patients. Currently, most patients come from the National University Hospital, primarily because they are located just across the road. But CIRC is making the effort to recruit patients from other medical institutions across Singapore.

It will take time to gather adequate numbers of patients for the different diseases, but there are strategic benefits in CIRC's work with patients here. Due to Singapore's population characteristics, the existing patient pool allows researchers to make their projects more inclusive, an aspect particularly useful for institutions abroad. For instance, the Chinese, Malay and Indian populations here enable researchers to glean interesting insights about diseases. After all, these illnesses are not exclusive to any one community, although incidences of a certain disease may be higher in some groups.

One foreign institution that has approached CIRC is Johns Hopkins University from Baltimore, USA. That collaboration involves using a PET/CT scanner to view patients with nasopharyngeal carcinoma (NPC) with an Epstein-Barr virus component (EBV). The motivation for this is the higher incidence of the EBV component in NPC patients in Asia compared to the USA.

Currently, there are more than 50 active research projects at CIRC, focusing on cardiology, neurology, oncology, metabolic diseases and infectious diseases.

AN EYE ON THE FUTURE

Such international collaborations allow both sides to learn much, and CIRC hopes to foster more links between scientists and clinicians, particularly between local institutions. In fact, several CIRC projects are focused on diseases likely to put a strain on local healthcare resources in the future, such as dementia. This disease is of particular significance, given Singapore's fast-aging population.

One such study looked at 238 patients from a local memory clinic that diagnoses dementia. Using the 3T MRI system, the researchers determined that cerebral microinfarcts (areas of cell death in the brain) can indicate cerebrovascular disease in dementia patients. Such findings can pave the way for a greater understanding of and novel interventions for these diseases, whose incidence rates will very likely rise here.

In the Director's view, other issues that will increasingly be of concern in Singapore—making them CIRC's concerns—include cardiac problems and diabetes, especially "if we see the progression of obesity in Asia as in the USA and Europe," adds Prof Townsend. This possible drain on national healthcare resources makes imperative CIRC's translational work, from the discovery of biomarkers to planning effective therapy and monitoring response.

With so much at stake, Prof Townsend sums up the future of CIRC in one word: sustainability. "We've spent the last three to four years building up CIRC; it's not inexpensive and you don't make money doing this type of research, but it is important and it has to be sustained," he stresses.

As such, CIRC also conducts lectures and provides a course in molecular imaging for NUS students in the hope of stimulating more interest in research and preparing motivated researchers-in-waiting to take over the research at the Centre.

Roentgen would be impressed!

One of CIRC's aims is manufacturing novel radiopharmaceuticals with dedicated cyclotron and synthesis units. The availability of these compounds will substantially increase the number of oncology projects at CIRC. However, the Centre will require some form of regulatory approval for the manufacture of tracers to be used in human subjects.

The PET/CT scanner incorporates two imaging techniques. PET imaging allows investigators to detect the metabolic activity of cells and tissues in the body, while the CT technology provides detailed and intricate cross-sectional views of the anatomy and any aberrations within. At CIRC, this hybrid scanner is primarily used to look at cancer, and is the focal instrument for eight projects there, including a collaboration on nasopharyngeal carcinoma with Johns Hopkins University in the USA.

Medical students conducting a health screening at a resident's home.

SERVING THE COMMUNITY

Medical undergraduates at the NUS Yong Loo Lin School of Medicine learn to care through health screenings and research.

Getting trained to the highest clinical standards at the NUS Yong Loo Lin School of Medicine goes beyond postings to hospitals and laboratories.

NUS Medicine students take part in community programmes that involve working with residents of one- and two-room rental flats. They aim to persuade the mainly elderly occupants to accept free health screening and follow-up services. It is all part of the School's efforts to nurture doctors who are responsive to the community's needs.

Community service is part of the School's founding ethos. Since the introduction of the Community Health Project (CHP) module more than 30 years ago, students have been encouraged to plan, organise and participate in a wide range of social projects, such as the health screening as well as other outreach projects. Supervised by faculty from the NUS Saw Swee Hock School of Public Health, the CHP puts students in touch with the community they will eventually serve. This is key, as most doctors will work outside a hospital setting, says Dr Gerald Koh, Joint Associate Professor at NUS Medicine, and Director of Medical Undergraduate Education at the School of Public Health.

The definition of 'community' has since expanded to include foreign workers in dormitories, persons on public assistance, and the general public. Meanwhile, the CHP, which used to be disease-centric, now looks at health holistically. CHP projects are run entirely by students, who choose the health areas they would like to study to plug a service or healthcare gap.

An important aspect of the CHP is educating students on the value of research and its methodologies. Findings are then used to make recommendations and provide feedback to the participating community. "Upon completion of the CHP, students have a better understanding of public health principles, their applicability to the population, and the value of working in teams to address community health issues," says Assoc Prof Koh.

TAKING A CLOSER LOOK

Last year, one group of students evaluated the patient experience at the Agency for Integrated Care's Community Case Management Service. They visited patients at home and conducted a survey to identify what could be improved. "The students not only learnt about integrated healthcare, but also about seeing things from the patient's perspective," says Assoc Prof Koh.

Another group looked at the quality of care patients receive at the National Cancer Centre oncology clinics. A major finding was that patients did not always tell oncologists about the pain they feel or the barriers to treatment they encounter, because they were reluctant to confide in their doctors.

Two other groups targeted public awareness of organ donation. They looked into why Singapore has one of the lowest organ donation rates in the world, and explored why people are reluctant to donate their bone marrow. "People think that you need to give blood. Actually, all that's required is DNA, which means a cheek swab is all you need. People don't realise that it's painless," explains Assoc Prof Koh.

MAKING THE COMMUNITY BETTER

Students learn much from being on the CHP, but there are tangible benefits for the community, too, as students are encouraged to disseminate their findings at local and international conferences, and the data gets published in local and international journals. As the CHP is carried out in partnership with relevant agencies, these agencies can then use the results to implement positive changes.

One such example was a qualitative malnutrition study of people on public assistance. Although there was a low prevalence of malnutrition, the findings indicated that the risk of malnutrition was high. The data was presented to the relevant parties, with one of the recommendations being to tailor meals that suit individual nutritional needs.

STUDENTS GET IT

The students' understanding of basic public health and health services practices is further enhanced through peer learning. After the presentations, students are often posed questions, such as how they would change or improve the programme, which makes them consider how the data will affect them as doctors, reveals Assoc Prof Koh.

Another important quality about the CHP is that it inculcates teamwork. "The future of medicine is teamwork. If you don't have EQ and are self-serving, you're not going to be a good doctor," insists Assoc Prof Koh.

Of course, the students also learn how to interpret and apply research results. At the end of the day, the students recognise the value of medical and public health research, and how it can contribute to improved health outcomes.

SEE THE PATIENT, NOT JUST THE DISEASE

Because he worked on the Neighbourhood Health Service (NHS) project as a medical student, Dr Wee Liang En understands how health can be affected by social and economic status. "You see the patient in his own home with his family, and you see the barriers he faces in accessing healthcare," the internal medicine resident explains. "The project is a good reminder to always bear in mind the patient's socioeconomic context. After all, to be successful, we should aim to keep the patient out of the hospital and in the community."

He is convinced that patients complying with a health regimen depend a lot on the non-medical part of their treatment. He gives the example of someone requiring insulin injections. "Are there particular barriers in this patient's life to accepting insulin?" he asks. "Perhaps his apartment has poor lighting, making it difficult for him to read the numbers on the syringe."

Initiated by nursing and medical students of the NUS Yong Loo Lin School of Medicine, the NHS aims to identify elderly residents from the lower economic strata who have fallen through the cracks of the healthcare system, and re-integrate them into the health system.

It provides door-to-door screening for those aged 40 and above living in one- or two-room rental flats. The team follows up with a quarterly review of the patients' medical, financial and social situation, working closely with grassroots and social work partners to ensure they seek medical attention early, and that their social and financial issues are addressed.

"I think student-led projects mean that students have a very real stake in the planning and the execution. Hence, the passion is there, the excitement is there, because you're working on something that's of your own creation, as opposed to a more top-down approach," Dr Wee asserts.

PUBLIC HEALTH SERVICE

Another student-led initiative is the Public Health Service (PHS), which attracts about 1,500 people annually to a free, basic health-screening event and, more recently, its health education events.

The target has long been those aged 40 and above, but the 10th edition this year will also cater to the youth, says Year 3 medical students Mr Lee You Jun and Mr Ivan Low, directors of the PHS 2015.

PHS 2015 will be promoting health education through community events and a young ambassadors programme—the focus will be on the primary prevention of diseases. "We hope to empower them to influence the health behaviours of families and friends," says Mr Lee.

This year, the PHS team also intends to develop its follow-up processes to better re-integrate patients into local healthcare systems. They are also spearheading a new research effort that seeks to enhance the quality of healthcare services in Singapore.

MEDICINE'S BACKROOM BOYS

Out of sight is not out of mind for the Department of Microbiology at the NUS Yong Loo Lin School of Medicine. As it reaches its 90-year milestone, the Department's work on tiny disease carriers that threaten to invade our bodies has contributed greatly to medical knowledge.

"YOU DON'T ALWAYS SEE US, BUT THAT DOESN'T MEAN WE ARE NOT THERE."

— ASSOC PROF VINCENT CHOW

Public health was an issue that Singapore struggled with throughout much of the 19th century and early 20th century. Smallpox and tuberculosis were rampant, while venereal disease was problematic. In 1911, malaria accounted for 20 deaths a day in Singapore.

Those were the circumstances in which the Department of Microbiology was born in the predecessor of the NUS. For the next 90 years, the Department would go on to make significant strides in combating these diseases and contributing to public health, research and education.

ASIAN FLU VIRUS ISOLATED, SARS PATHOGENESIS STUDIED HERE

The Department has roots in the Departments of Bacteriology and Parasitology, established in 1925 and 1950 respectively. It was not until the 1950s, however, that the Department made its first major breakthrough.

In 1954, the Department built its very first air-conditioned laboratory, which allowed tissue culture work to be performed for the very first time. Three years later, Professor Lim Kok Ann (Head of Department, 1959–1977) and his team isolated a new pandemic strain of the Asian influenza virus, which led to the development of a vaccine.

The Department's contributions to public health did not stop there.

When Severe Acute Respiratory Syndrome (SARS) struck in 2003, the Department collaborated with institutions and hospitals in Singapore and overseas to investigate SARS pathogenesis, and to study patients with antibodies. "We also worked with a Dutch company and collaborated to generate monoclonal antibodies that neutralised the SARS virus," reveals Associate Professor Vincent Chow, the Head of Department from 2002–2005. "We are like the backroom boys. You don't always see us, but that doesn't mean we are not there."

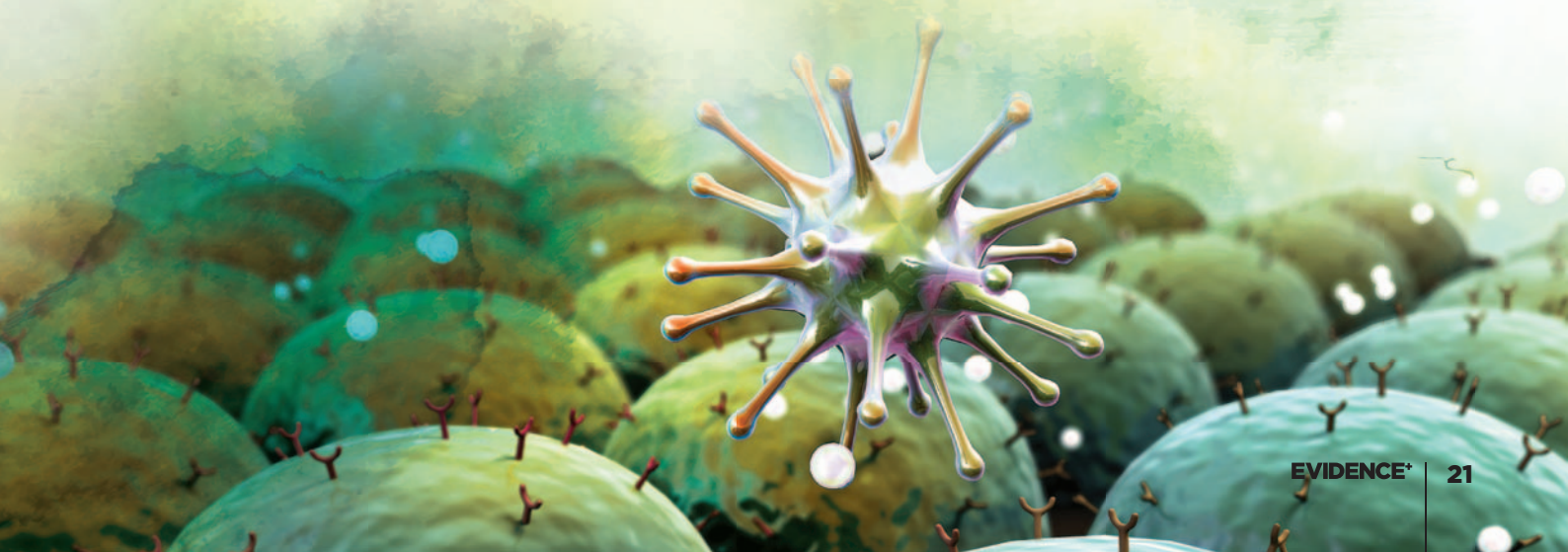
Even today, the Department continues to work with regional and international colleagues, says Professor Nicholas Gascoigne, the current Head of Department. An example of a regional collaboration is a recent publication from Associate Professor Lee Yuan Kun's team on the diversity of gut bacteria in children, in collaboration with colleagues in Indonesia, Thailand, China, Japan and Taiwan. The Department also works closely with the Cambridge Infectious Disease and Immunology faculty to work on diseases relevant to Southeast Asia.

ANCHOR DEPARTMENT

Aside from addressing public health challenges, the Department is the anchor that coordinates modules on microbiology, infectious diseases and immunology. As a result, students from Medicine, Dentistry, Science and Nursing have all benefited from the Department's work over the years.

As healthcare becomes more collaborative, the Department is pulling various disciplines together so that doctors, nurses, dentists and scientists of the future can be fluent in the language of microbiology. "We view microbiology and immunology as core knowledge for medical students, and aim to give them a solid grounding in the aspects that are crucial to other practice," Prof Gascoigne states. Assoc Prof Chow concurs: "It's not about turning them into microbiologists; it's about giving them the concepts and principles of microbiology that will help them in their clinical practice."

Pathogens are evolving all the time, and the Department must adapt in order to stay relevant in protecting Singapore's public health. One way it does so is by doing what it has effectively done for the past 90 years: educating and training students so that they are prepared for the challenges of tomorrow.



CONGRATULATIONS, MEDICINE & NURSING CLASSES OF 2015

THEY DO NOT LEARN FOR SCHOOL, BUT FOR LIFE.


NUS
Yong Loo Lin

BLOOD, SWEAT & TEARS

GRITTY REALISM IS A STAPLE IN MEDICAL EDUCATION AND TRAINING

The more realistic and comprehensive the training, the better prepared the trainees. This is the maxim of the Centre for Healthcare Simulation, which is using simulation training to teach budding doctors and nurses to handle clinical situations while working as a team.

Nothing is what it seems at the Centre for Healthcare Simulation (CHS).

Located on the third floor of the NUS Yong Loo Lin School of Medicine's flagship Centre for Translational Medicine building, the 5,247m² facility comprises hospital wards, consultation rooms, an operating theatre, an intensive care unit and an emergency room—all identical to those found in hospitals in Singapore. While the rooms are not filled with patients and busy staff, the realistic and gritty training that is delivered in these facilities is intended to prepare medical and nursing students for very real medical emergencies and situations.

The CHS designs and delivers training programmes that thrust medical students into emergency-type scenarios, replete with blood, gore and groans emanating from dummy patients. These are electronically controlled manikins with uncannily life-like and interchangeable physical features. This means each manikin can produce a seizure or simulate a heart attack when the situation calls for it, and even swap genders in between cases.

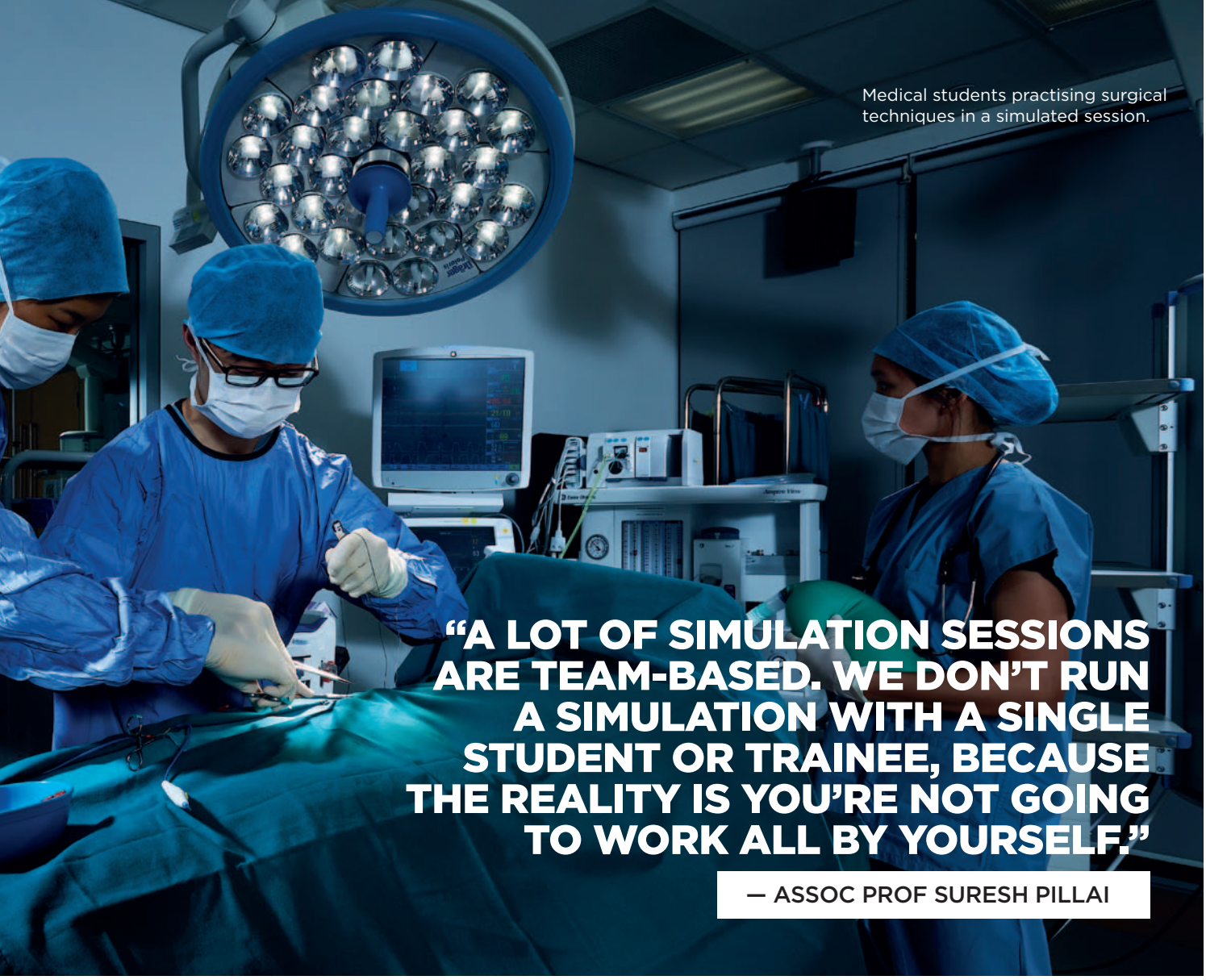
FAKE CRISES, REAL TEAMWORK

Through these sessions, medical students learn to work together under real-world stresses. But the work takes place in a safe space, where mistakes made can be addressed and corrected at the debrief session conducted after the training. No patient dies, and the only discomfort suffered are the occasional winces and grimaces that the students evince when their mistakes are picked upon and discussed by their teachers. And it is all for the purpose of turning out well-trained doctors and nurses.

"A lot of simulation sessions are team-based," says Associate Professor Suresh Pillai, Director of the CHS. "We don't run a simulation with a single student or trainee, because the reality is you're not going to work all by yourself." As such, students work in teams of three or four, and their actions, interactions and reactions in different medical situations are observed by Assoc Prof Suresh.

Prior to Assoc Prof Suresh giving and controlling the scenario—much like a director orchestrating a hospital-based movie—roles are distributed among the team: one student is the team leader, another is in charge of the airway, and a third places an intravenous line and administers drugs, while someone else stands by to defibrillate the heart, if required.

This hands-on, team-based learning not only helps to impart clinical competencies, it also improves the students' other critical skills. "In addition to competency in certain skills, we are testing them on the 'soft' skills such as teamwork, communication, crisis management, patient safety



Medical students practising surgical techniques in a simulated session.

"A LOT OF SIMULATION SESSIONS ARE TEAM-BASED. WE DON'T RUN A SIMULATION WITH A SINGLE STUDENT OR TRAINEE, BECAUSE THE REALITY IS YOU'RE NOT GOING TO WORK ALL BY YOURSELF."

— ASSOC PROF SURESH PILLAI

awareness and compliance, and even professionalism," explains Assoc Prof Suresh.

In addition to Assoc Prof Suresh's feedback, video recordings of the sessions allow the students to take note of their performance and missteps individually and collectively. The competencies that are tested may be different each time; each lesson is designed with specific objectives in mind, and is dependent on the programme. These can be specifically focused on areas within a medical specialty, such as Emergency Medicine, Paediatrics, Anaesthesia, Internal Medicine and Surgery. Singular artificial body parts called task trainers are also available for students to practise their skills, such as hooking a patient's arm up to an IV drip correctly, or suturing a wound.

Year 4 medical student Mr Zebedee Wong still remembers his first encounter with simulation training: performing CPR on a manikin in his second year. "As we went on to Years 3 and 4, we were introduced to more complex clinical situations, such as learning how to run advance cardiac life support protocols as a team," he reveals. "The first time anyone runs advanced cardiac life support protocols, it's a big mess. People are running and bumping into each other. But by the end of a few rounds, you start to familiarise yourself with it and think, 'I've done this before; what do I need to do next? What are the other people in my team supposed to do?' It becomes second nature to you."

The development of this second nature, or the knowledge about what to do and the role of the others on a team, is vital when practising medicine, where events can take an unexpected turn that requires immediate and appropriate responses from the whole team.

These benefits are the reason the CHS is keen to arrange inter-faculty simulation sessions, getting staff and students from different disciplines to train together. Students in the same school or course often train among themselves and sometimes across disciplines. The latter can be challenging, due to differing scheduling templates. It also plans to expand simulation training to occupy one-third of the NUS Medicine curriculum, up from the current 12% of the medical undergraduate syllabus.

EXPANDING THE SIMULATED UNIVERSE

Moving forward, the Centre plans to acquire dummies with haptic capabilities, where the manikin can react to physical contact, so that a higher degree of verisimilitude can be achieved. Also, the CHS and the Keio-NUS Connective Ubiquitous Technology for Embodiments Centre (CUTE) are collaborating to deliver two virtual reality simulation (VRS) programmes: VIHA and VISE.

MORE SIMULATION COMING

News of the upcoming Virtual Reality Simulation (VRS) system was announced at the official opening of the Tahir Foundation Building in April this year. The facility is part of the NUS Medicine campus, and is named after Indonesian business leader and philanthropist Dato' Sri Dr Tahir, who donated S$30 million to the NUS in 2012 to advance medical education and research. His generosity has enabled this development of the VRS system, as well as research and educational programmes.

The layout of the new building reflects the NUS' goal to further inter-professional education. It houses the NUS Saw Swee Hock School of Public Health as well as the Pharmacy and Chemistry programmes of the NUS Faculty of Science, thus paving the way for the integration of present and future healthcare professionals. Spanning 17 floors, the expansive structure mixes research laboratories, teaching and learning spaces and student activity areas.

The Virtual Interactive Human Anatomy (VIHA) programme takes the corporeal visualisation of patients and the approach of hands-on learning much further. Adopted for the teaching of undergraduate anatomy classes, the VIHA programme is a 3D reconstruction of a human cadaver. The cadaver's multi-faceted and interactive form provides for the intricacy of dissection, thus further educating students on the nuances of human anatomy. "This new model will allow students to virtually dissect the skin, subcutaneous tissue, muscle and bones down to the underlying organs, and trace all the blood vessels and nerves that originate from the organ, and be able to go back and forth at their own pace," describes Assoc Prof Suresh.

Converting cadavers into a virtual medium also ensures that each dissection leaves no trace, thus enabling lessons to be dispensed to multitudes of students—a cost-effective and sustainable approach. This will supplement the exposure that students get from anatomy classes, where actual cadavers are studied: NUS Medicine has been using prosected cadavers since 2003 because of a shortage of donated bodies. The pilot programme is slated to be introduced to first and second year medical students of the 2018 academic year, and is expected to be officially incorporated into the curriculum the year after. The CHS also plans to introduce the VIHA programme to

"THE SPs WILL BE LOOKING OUT FOR EMPATHY. IN FACT, WE TRAIN THEM TO PROVIDE OPPORTUNITIES IN THEIR PORTRAYALS TO ELICIT EMPATHY FROM THE STUDENTS. THIS ALLOWS THE SPs TO GIVE FEEDBACK ON APPROPRIATE EMPATHY AND MISSED OPPORTUNITIES FOR EXPRESSING EMPATHY."

— ADJ ASSOC PROF NICOLA NGIAM


Medical student Mr Zebedee Wong [second from left] reacting to a simulated emergency with his fellow medical students.

nursing students eventually.

The Virtual Interactive Simulation Environment (VISE) provides for a large-scale virtual teaching platform. Students learn how to work quickly and in collaboration with each other in real-life scenarios, such as in a mass-casualty incident, a hospital emergency room, or an operating theatre. "They put on goggles and gloves, walk into an environment and they react to it, like in a video game," Assoc Prof Suresh describes.

This trinity of pedagogies—traditional training with cadavers, and novel approaches such as virtual interactive technology and other types of simulation such as manikins—will have a substantial impact on medical education and beyond, says Professor Tan Chorh Chuan, President of NUS, at an event in April. "Training our students on VR systems will ultimately help to improve the quality of clinical care and patient safety. Both basic procedural skills and difficult surgical procedures can be practised and rehearsed with the VR system to improve performance in real-life situations." Examples of these procedures include administering lumbar punctures, chest tube insertion and urethral cauterisation.

LESSONS FROM LIFE

The CHS also works very closely with 160 individuals trained to portray the roles of patients, family members or others to allow students to practise physical examination skills, history taking skills, communication skills and other exercises.

Simulated Patient Ms Valerie Tan having her forearm 'sutured' by medical student Mr Zebedee Wong.

Known as simulated patients (SP), these volunteers have to undergo rigorous training to know how to manifest the signs of illness convincingly. SPs are also trained to assess verbal and non-verbal cues from doctors and nurses. These range from knowing how to deal with distraught relatives who barge into the ward, how to react with appropriate body language, and how to handle all other interactions during the course of a busy day in hospitals and clinics.

"The SPs will be looking out for empathy," expounds Adjunct Associate Professor Nicola Ngiam. "In fact, we train them to provide opportunities in their portrayals to elicit empathy from the students. This allows the SPs to give feedback on appropriate empathy and missed opportunities for expressing empathy."

The SPs themselves have seen how their involvement has progressed over the years. "The SP's role over the last five years has expanded from simple role playing to complicated ones that involve psychotic illnesses, such as depression and bipolar disorder," observes Ms Valerie Tan, an SP since 2010, when the programme began to expand.

Other illnesses that can be 'performed' through speech and actions include Parkinson's disease, diabetes, gout and even toothaches—the last to engage dentistry students and hone their communication skills, so vital when dealing with anxious and uncomfortable patients on dental chairs.

Simulation training is also tailored and localised to put students through the healthcare issues that they are most likely to face in the future. "Breast cancer is so prevalent nowadays, so little beads are put inside the dummy's breast and placed on top of you—my goodness, it weighs a ton!" Ms Tan exclaims. "And they can feel for lumps in your breast."

This translates to a form of hybrid simulation training, where manikins and task trainers are used in conjunction with SPs, layers of artifice laid upon each other in a bid for heightened realism and accuracy in the teaching of budding healthcare professionals.

The 'live' element of SPs also means that they can be used in different areas of an actual hospital, and for the continued education of medical professionals. "We have inter-professional programmes coming up between Nursing, Medicine and even Pharmacy," Assoc Prof Suresh reveals. "For example, someone orders the wrong drug, and the pharmacist who dispenses it can pick up on the error and correct it. We're aiming to have the pharmacists work together with doctors and nurses."

Signing up as an SP right from the start has given Ms Tan the opportunity to witness first-hand the cumulative impact simulation training has had on the student population. "There is a difference, and you can see it," says Ms Tan. "That's why I derive the greatest satisfaction when I give feedback on communication skills to Year 2 students, and they take the effort to communicate better when they do Family Medicine in Year 3. Some of them are so smooth that I've taken note of their names so they can become my doctors in the future!" ✚

ETHICS, SERIOUSLY

Professor Alastair V Campbell, Director of the Centre for Biomedical Ethics, explains why the practice of medical ethics is essential for a more equitable society.

A medical friend of mine, who was Professor of General Practice in London, once told me of an experience he had when he tried to raise ethical questions in a clinical case conference: "When people start talking about ethics," said the very senior doctor leading the meeting, "I reach for my golf clubs!"

In those days, such an attitude—at least in Britain—was not uncommon. Doctors felt they knew perfectly well how to do the right thing, and they did not need outsiders such as philosophers or—even worse—lawyers telling them what to do. Fortunately, that kind of professional arrogance is rapidly dying out.

Here in Singapore, the profession has welcomed with open arms the development of ethics in medicine. Under the inspired leadership of two Deans of Medicine, John Wong and Yeoh Khay Guan, the Centre for Biomedical Ethics has grown since its foundation in 2006 to be one of the biggest centres in Asia, and the only one in the region to be recognised by the World Health Organization as a Collaborating Centre.

So what does it mean to take ethics seriously?

First, it means that ethics is at the very heart of medicine and healthcare, not some optional extra or add-on. Every encounter with patients raises ethical questions; not necessarily highly dramatic dilemmas, maybe just basic issues of treating people with respect and listening to their concerns. So it is essential that, as happens at the NUS Yong Loo Lin School of Medicine, students are alerted to ethical issues from the very start of the course, and learn how to deal with them in practice throughout the clinical years. They have to learn both how to 'do things right,' and also to 'do the right thing.' This is what it means to be a professional: they need to have the knowledge and skill to practise medicine safely and effectively, but they also have to have the right attitude, one that puts the welfare of patients beyond any personal gain or advantage.

"IT IS NOT JUST HEALTH PROFESSIONALS WHO NEED TO TAKE ETHICS SERIOUSLY—WE ALL DO! THAT WAY, WE CAN BETTER ENSURE THAT OUR ELECTED REPRESENTATIVES THINK BEYOND THE FINANCIALLY PROSPEROUS SOCIETY TO A JUST SOCIETY."

Second, ethics is a discipline, not just 'common sense,' as is sometimes thought. It is essential to ask critical questions about medical practice, to be a 'reflective practitioner,' for common sense can often be a cloak for prejudice or outmoded practices. So, at the Centre, we do research to establish best ethical practice in an international context. Some examples of our research projects include appropriate care for the terminally ill and dying, controlling the use of innovative and untested therapies, how to make decisions about withholding or withdrawing futile medical treatment, and how to involve families appropriately in decisions when the patient is no longer competent or able to do so.

Third, ethics has to deal with policy, not just with individual clinical encounters. Issues such as universal health coverage, pandemic preparedness, regulation of organ transplantation or stem cell therapy require relevant and well-researched advice to government and other policy makers. It is not just health professionals who need to take ethics seriously—we all do! That way, we can better ensure that our elected representatives think beyond the financially prosperous society to a just society.

The ancient Greek philosopher, Socrates, said, "The unexamined life is not worth living," and that is why we need to face up to the many complex ethical issues in modern medicine rather than reaching for the golf clubs. After all, we surely want, both for ourselves and everyone else, lives that are worth living! ✚

THE ROAD LESS TRAVELLED

Most medical professionals practise in the country where they trained, with many remaining in their chosen field of medicine for the duration of their careers. But NUS Medicine alumnus Dr Andrew Ng Kang Chin (Class of 1971) chose a different path, one that led him to Africa!

Dr Ng and his wife, Belinda, packed their belongings and moved to Niger in 1978 with their two young sons. There, the ex-Singapore General Hospital (SGH) surgeon worked long hours in a 120-bed bush hospital on the edge of the Sahara desert—fresh supplies from the nearest city was a gruelling 500km drive away.

The obvious question is 'why'?

"I loved medicine and I wanted to do something to serve humanity," Dr Ng replies, citing the examples set by his medical school teachers, such as the late Emeritus Professor Wong Hock Boon and Professor Seah Cheng Siang. "They were dedicated professors and teachers. Their impact on me is their sense of dedication to professionalism, of doing their best for their patients."

The Gan Eng Seng Secondary School graduate enjoyed his undergraduate studies at the University of Singapore, the predecessor of the NUS. "I had reasonably good exposure to various disciplines of medicine," he says, but it was Surgery that appealed the most. "I fell in love with it while doing a surgical posting as a houseman at the SGH. Surgery seems to come naturally to me, and I like the fact that it usually makes an immediate, dramatic difference for the patient."

But why Niger, when his job at the SGH offered plenty of scope for professional growth and development? "I felt a sense of conviction to serve the poor and the suffering, especially those without access to surgery. This comes from my Christian conviction that we are to love all mankind unconditionally," he reveals.

In the 1970s, Singapore had enough doctors to care for the population; not so in Niger: the little hospital where Dr Ng was working, Galmi Hospital,

Aerial view of Galmi Hospital.

"THEY WOULD SAY, 'OH, IT'S GOD'S WILL.' BUT I WOULD TELL THEM, IT'S NOT GOD'S WILL; THE DECISION THEY MADE THEN WOULD DECIDE WHETHER THEIR CHILD LIVED OR NOT."

served two million people from the surrounding region! Run by the Sudan Interior Mission, it had just two or three doctors—including Dr Ng—as well as a few nurses. The patient load kept him and his colleagues busy through the 12 years that he and his family were in Niger.

"Ninety percent of the diseases I dealt with in Niger include those found in Singapore; some are rarer, such as gallstones, while some are more common, such as bladder stones, typhoid perforations, abscesses, tropical ulcers and parasitic diseases," he reveals. Then there are obstructed labours and childbirth injuries—about 25% of his workload is on obstetrics and gynaecology.

"All kinds of traumas had to be handled due to poor road conditions and long journeys," Dr Ng recalls. "Late or neglected cases of large tumours anywhere in the body are common. As a 'bush' doctor-surgeon, I had to learn to handle any medical or surgical conditions, including dental emergencies, as I was often the only doctor-surgeon at the hospital. In surgical operations, no matter how big or long, I had only one local assistant nurse." Dr Ng adds that, although anaesthetic was usually administered by a nurse, he occasionally had to do it himself first, pass the task to the attending nurse, then continue with surgery!

Besides adapting to a hugely different lifestyle and standard of living, Dr Ng also had to contend with the fatalistic mindset of the locals. "They would say, 'Oh, it's God's will.' But I would tell them, it's not God's will; the decision they made then would decide whether their child lived or not," he emphasises.

As Dr Ng was sometimes the only physician around, he had to multi-task to cover every aspect of hospital work. "I made trips to the capital city for administrative meetings with officials for hospital purchases, for supplies not found in the remote village, as well as for our own mission administration," he reveals, quipping that the hospital's remoteness contributed to a "logistical headache."

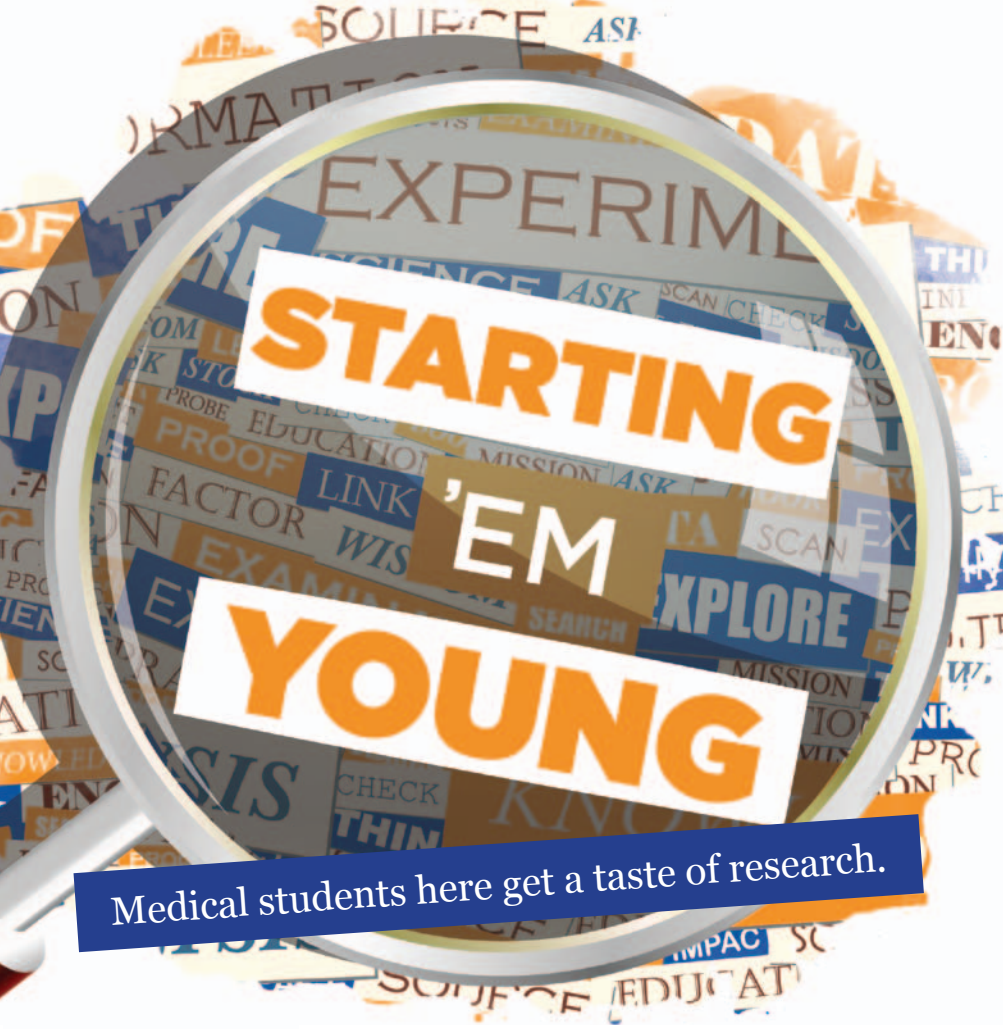
But it also meant opportunities to learn new skills and gain fresh insights, such as learning to use a first-generation portable Osborne computer to run the hospital pharmacy and do administrative work. "I have gained much from handling a whole hospital, from the medical workload with its wide spectrum of diseases to the pharmacy and to the administration of the hospital," Dr Ng says. "I learnt to embrace all specialties and manage them in the context of caring for those with minimal resources and minimal access to the medical services that we Singaporeans usually take for granted."

In 1990, Dr Ng brought his family home so that his two sons, Nathaniel and Joel, could receive a Singaporean education. But Niger and its people continue to tug at his heart, and he has since gone back to serve at Galmi Hospital for up to a month every year, taking time off from his administrative work at the mission office here in Singapore.

For how long more, though?

"As long as I have the health and can be of use. It has helped me to be more compassionate towards the marginalised, the weak and the poor, as fellow human beings on the same journey of life. They are not lesser beings," he insists.

He also does not feel that the years he and his family spent in Niger were a poor lifestyle choice. Certainly, he could have gone on the conventional route most medical professionals have taken, "but I felt that this [his work in Niger] was more important, and my father gave me his blessings." ✚



Medical students here get a taste of research.

Stephen Hawking once observed, "No one undertakes research in physics with the intention of winning a prize. It is the joy of discovering something no one knew before."

The NUS recognises the importance of instilling interest in research among its undergraduates at the NUS Yong Loo Lin School of Medicine, and the need for students to incorporate research endeavours on top of their academic curriculum to expand their medical horizons. Associate Professor Theodoros Kofidis, Chairman of the Medical Dissertation Certificate programme at the NUS, explains, "This involves encouraging students to be acquainted with research, its ethics and methodologies, besides setting them on the research path beyond the institution to collaborate with clinical researchers. At its core, research is critical to a university's growth." He also emphasises that research work not only trains young undergraduates to think on their own, it also enables students to contribute to the advancement of medicine, healthcare and the good of society.

RESEARCHERS IN THE MAKING

There is more to the medical school's effort than believing in the research creed.

Established in 2010, the Wong Hock Boon (WHB) Society is an excellent model of the School's aim to promote research among undergraduates. Named after the late Emeritus Professor Wong Hock Boon—who is affectionately known as the Father of Paediatrics locally—the Society aims to nurture a community of motivated and proficient student researchers in NUS Medicine.

Today, the student-led society conducts talks, workshops and symposiums, and even coordinates research projects with external institutions such as the Singapore General Hospital, KK Women's and Children's Hospital and Tan Tock Seng Hospital.

The Society has made significant strides since it was set up. Its President and Research Director, third-year medical student Mr Sim Meng Ying, says that, when it first started, the Society conducted talks mainly on research skills, because there was a lack of such skills being imparted to students. Common topics included journal critique and hypothesis research skills. Over the years, in addition to organising talks and workshops, the Society has taken the initiative to create research openings for undergraduates. "We are constantly approaching different institutions and expressing our students' interest in research," Mr Sim says. "We also ask them for a list of projects we can participate in. As such, we are building an important bridge between clinicians and students. We started with a handful, and now we have approximately 200 members."

GROUNDWORK

So what kind of projects does the Society get involved in?

A second-year medical student [extreme left] presenting her poster to the judges at the Wong Hock Boon Symposium 2014.

There are two types of research projects for undergraduates: wet and dry laboratory projects. Working in a wet laboratory means getting your hands dirty and the opportunity to use laboratory equipment; working in a dry laboratory is mainly about statistical analysis, where students interview patients to collect data and analyse them to look for trends and other significant information that influence clinical work.

The merits of introducing students to research work early in their academic career are palpable. "I believe Singapore is looking for high research output, so it's important to start early," he adds. "As we have relatively more free time in medical school compared to clinicians, we can start nurturing the right mindset for undergraduates to start now so they will not be lost in the future."

The School recognises that research complements its curriculum; it also trains students to practise critical thinking and not to be content with what they are told. "When we study, we tend to focus on the content, and we don't usually think about how we can change aspects of clinical work. When we are introduced to research, however, we begin to make the link," Mr Sim adds. "When we apply this knowledge to improve patients' lives, we realise we're able to play a more substantial role. Research is not limited to top clinicians; students can play a vital part, too."

A vital component of research is funding, and even that is being offered to students for their projects. Throughout their undergraduate years, students may use a fixed funding amount of up to S$700 for their projects or to attend conferences, workshops and other training opportunities. To qualify for financial support, students must be members of the Society—among other criteria— and financial assistance is provided on a reimbursement basis.

"WHEN WE APPLY THIS KNOWLEDGE TO IMPROVE PATIENTS' LIVES, WE REALISE WE'RE ABLE TO PLAY A MORE SUBSTANTIAL ROLE. RESEARCH IS NOT LIMITED TO TOP CLINICIANS; STUDENTS CAN PLAY A VITAL PART, TOO."

— MR SIM MENG YING

THE FUTURE

"Research is taught throughout the medical curriculum, because innovation is part of medical practitioners' way of life. Without innovation, medicine would not be what it is today. Without innovation, doctors of the future will not be able to improve patient care and enhance population health," explains Professor Lawrence Ho, Vice-Dean of Research at NUS Medicine. He adds that students are also encouraged to undertake community research projects so that they can learn how to solve real-life issues using scientific and innovative solutions.

"There are plans to further nurture the interest in research in the minds of our medical students by recognising their scholarly efforts through a certification programme," Prof Ho reveals, adding that the School will introduce a Medical Dissertation Certificate programme in the third quarter of this year. The aim of this initiative is to provide a formal framework and certification process to encourage undergraduate students to engage in research work, and to nurture a future pool of clinician scientists. Notes Assoc Prof Kofidis, "We are trying to motivate students to adopt existing practices in research and, of course, get a sense of accomplishment for their efforts."

Medical students are also encouraged to participate in the Community Advancement with Research & Education Synergies (CARES) initiative, a programme that engages the community and leverages on the University's research expertise to solve persistent problems facing the community. "It is envisaged that this programme will provide experiential learning for our students," adds Prof Ho. ✚

PRIZE-WINNING RESEARCH

Mr Bryce Tan, a third-year medical student and a committee member of the Society, has made significant headway in his basic science and clinical research work. "My projects focus on two prevalent neurodegenerative diseases: Parkinson's and Alzheimer's," he shares.

His basic science work aims to identify novel molecular mechanisms in Parkinson's Disease, which could enhance our understanding of the disease and be translated into novel therapeutic targets for treatment. Meanwhile, his clinical research work focuses on the Epidemiology of Dementia in Singapore (EDIS) Study, and looks at associations between blood markers and neuroimaging in the community setting.

Mr Tan has since garnered a number of accolades for his work, including the Singapore Medical Association-WHB Society Best Poster Award over the past three years, and the WHB Symposium Oral Presentation Distinction Award in 2014.

Third-year medical student Mr Bryce Tan [right] receiving the Distinction Award from Professor S T Dheen at the Wong Hock Boon Symposium 2014.

GERIATRIC MEDICINE GETS REDISCOVERED

Recognising that Singapore's rapidly aging population requires specialised attention, the NUS Yong Loo Lin School of Medicine has updated its syllabus in geriatrics and palliative care to ensure that its graduates can meet the healthcare needs of the elderly.

Singapore's increasing life expectancy and lower birth rates mean the country must come to terms with a fast-aging population. According to the Department of Statistics, the number of people aged 65 years and older will rise to 900,000 by 2030.

As the number of elderly patients in hospitals will also increase, there is a need to develop competent and caring physicians to manage the complex conditions of the aged. Thus, the NUS Yong Loo Lin School of Medicine set out to develop a new geriatric medicine curriculum in 2008. Prior to that, it consisted of only two lectures in the first year, followed by a two-week clinical posting in the final year.

NEW FOUNDATION

In the new curriculum, geriatric medicine is spread across the five years of the undergraduate medical course. In Year 2, an intensive two-week foundation programme covers topics such as geriatric epidemiology, communication with the elderly, and ethical issues on aging and dying. "We wanted to integrate the basic science of geriatrics with clinical science," explains Associate Professor Reshma Merchant, from the School's Department of Medicine.

Students are also introduced to interactive simulation workshops to nurture greater empathy towards the

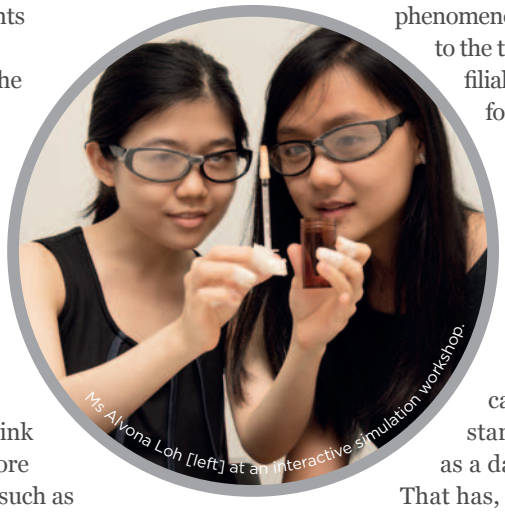
elderly. Here, students tape their digits to simulate numb fingers or paste a piece of translucent plastic over spectacles to mimic cataracts. These activities help them understand what it is like to be old. "Many of us may have visualised the patient's troubles in our minds before, and thought about the inconveniences that an illness brings," contemplates Year 3 medical student Ms Alvona Loh. "But to face the hard truths of those limitations in real life, to feel for ourselves the agony of being unable to accomplish a task deemed simple by healthy people, was truly a salutary experience."

It is the sensitisation that begins in the pre-clinical years, with students already voicing concern that, too often, patients are being prescribed too many types of pills. "That's our target," says Assoc Prof Merchant, referring to this awareness the new curriculum will hopefully engender in students.

LONGITUDINAL STUDIES

One of the aims of the geriatric course is to ensure that students develop a healthy attitude towards the elderly on top of acquiring clinical competencies. That is why the longitudinal educational track includes postings to community care facilities in Year 3.

In Year 4, students learn more about psychogeriatrics—the psychiatric study of the elderly—before applying their clinical knowledge in their final year during a three-week internship at geriatric wards. This is also when they will learn to think laterally and ask more probing questions, such as why an elderly patient fell instead of just treating the injuries from the fall, and interact with other members of the interdisciplinary team involved in the patient's care.



Ms Alvona Loh (left) at an interactive simulation workshop.

IMPROVING ATTITUDE & KNOWLEDGE

Before and after the curriculum changes were implemented, medical students were asked to take the UCLA Geriatrics Attitude and Knowledge Tests to assess their attitude towards the elderly as well as their knowledge of geriatric medicine respectively. The results show that students under the new curriculum performed significantly better in geriatrics knowledge, while improvements in attitudes towards geriatric patients were of a comparable magnitude in their final year, compared to students in the old curriculum.

"I am pleasantly surprised by the improvement of geriatric knowledge and, more importantly, the attitude," muses Assoc Prof Koh. "I am happy to find there's progress in this aspect, unlike in the US. It appears to be an Asian phenomenon, possibly due to the taught values of filial piety and respect for the elderly."

END-OF-LIFE CARE

The terminally ill have not been neglected, either.

The palliative care programme started out in 2002 as a day's programme. That has, since 2010, evolved into a four-day event, with interactive workshops, home visits, and attachments to hospices and hospitals. Year 3 students under the new curriculum have the opportunity to learn from palliative staff and interact with patients warded in institutions, such as Dover Park Hospice and Khoo Teck Puat Hospital.

Besides online lectures, the programme also employs films to impart medical education. Examples include *Wit*, about a woman dying from ovarian cancer, and *After Cicely*, which features palliative care pioneer Sister Geraldine Tan from St Joseph's Home and Hospice. Students are encouraged to discuss themes and explore their emotions with a physician facilitator after screenings.

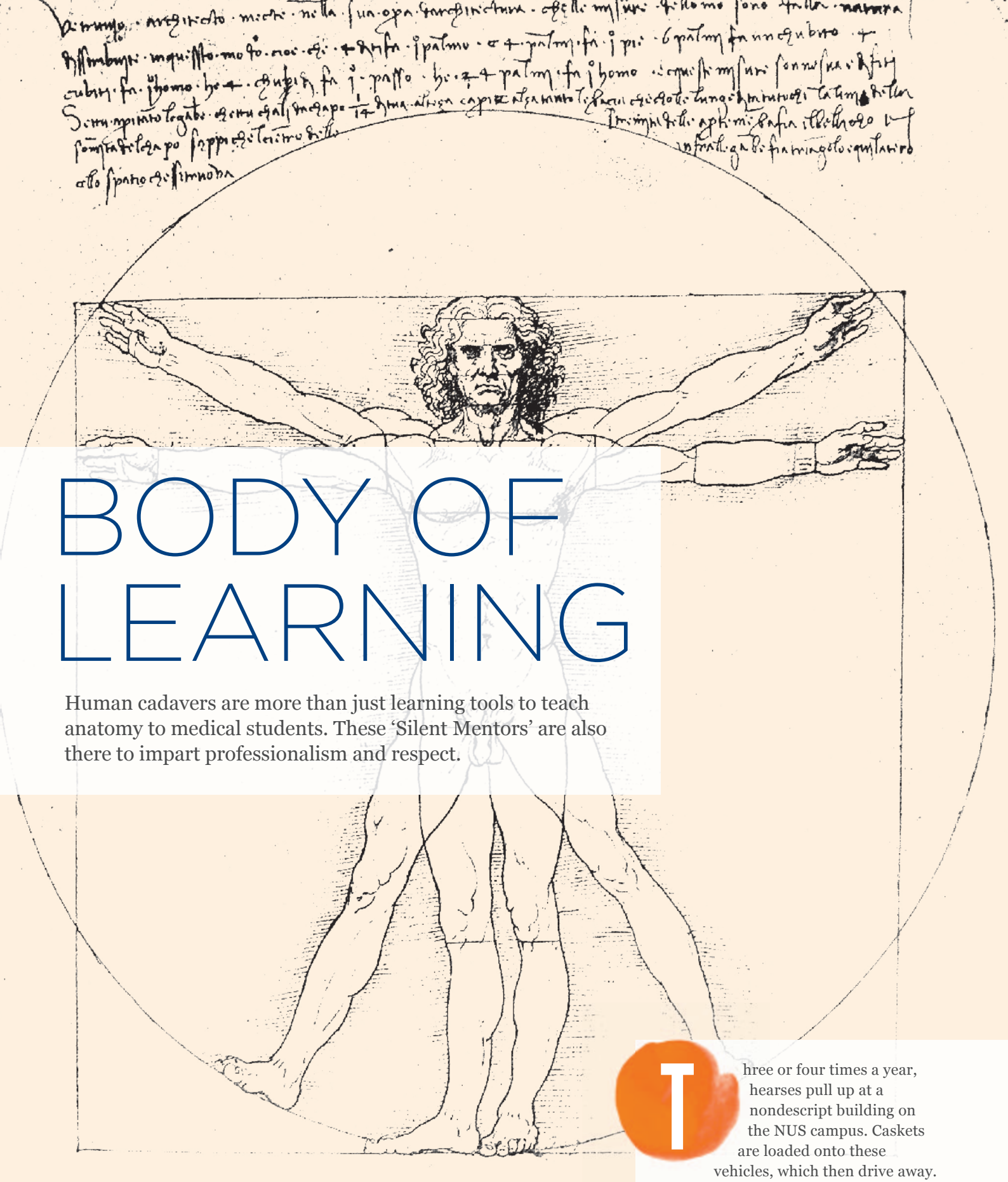
Dr Noreen Chan, an Associate Professor with the School's Department of Medicine, says, "It's about raising awareness and laying the foundation on the understanding of palliative care, and how it applies to different patient populations." Undergraduates are young, with limited life experiences. It is thus imperative for them to confront serious illness and death, topics that even veteran doctors have difficulty grappling with at times. "It isn't just about dying. It's about understanding suffering, and living as meaningfully as possible," asserts Dr Chan. "This requires an approach often at odds with modern medicine because it focuses on people, not just diseases, organs, age or gender."

Dr Chan hopes a similar longitudinal curriculum for palliative care can be implemented in the near future, so that students can continue to build on the existing foundation.

"I AM PLEASANTLY SURPRISED BY THE IMPROVEMENT OF GERIATRIC KNOWLEDGE AND, MORE IMPORTANTLY, THE ATTITUDE. I AM HAPPY TO FIND THERE'S PROGRESS IN THIS ASPECT, UNLIKE IN THE US. IT APPEARS TO BE AN ASIAN PHENOMENON."

— ASSOC PROF GERALD KOH

"We want to expose students to community care, including attachments in nursing homes, community hospitals, day rehabilitation centres, and patients' homes," says Associate Professor Gerald Koh, Director of Medical Undergraduate Education of the NUS Saw Swee Hock School of Public Health. "We embedded it in the family care postings because that's when they actually go out to interact with the GPs and patients in the community."



BODY OF LEARNING

Human cadavers are more than just learning tools to teach anatomy to medical students. These 'Silent Mentors' are also there to impart professionalism and respect.

Three or four times a year, hearses pull up at a nondescript building on the NUS campus. Caskets are loaded onto these vehicles, which then drive away.

The coffins contain the mortal remains of people, including those who have willed their bodies to medical education at the NUS Yong Loo Lin School of Medicine. The School returns the bodies to the donors' families, and will even arrange for the

"THIS IS WHERE YOU LEARN PROFESSIONALISM AND EMPATHY. IF YOU CANNOT TREAT A CADAVER WITH DIGNITY, HOW ARE YOU ABLE TO MANAGE A LIVE PATIENT WITH COMPASSION?"

— PROF BAY BOON HUAT

cremation of the bodies and sea burial, where necessary. It is the School's way of honouring the donors, and an expression of appreciation for their invaluable gift of their remains, says Professor Bay Boon Huat, Head of the School's Department of Anatomy.

Cadavers—referred to as 'Silent Mentors'—are vital teaching tools because they are instrumental in helping medical, dental, nursing, pharmacy and life science students learn the intricacies of the human body. Anatomy classes are attended by nearly 750 undergraduates. In 2014, the department received 22 bodies: eight were unclaimed bodies that came from the Health Sciences Authority while the other 14 were donated bodies.

ESSENTIAL TEACHING TOOLS

"The human body is the most essential tool. When students work with cadavers, they are able to keenly appreciate the three-dimensional relationships between different body systems, regions and organs. While computer-aided learning has its benefits, many pedagogical studies have shown that practical experience with cadavers remains superior," Prof Bay explains. Adds Associate Professor Ng Yee Kong, "We can use iPads to teach anatomy; it's much easier. But we use cadavers to teach respect and empathy, because these are our future doctors."

While the use of cadavers in the teaching of anatomy is common in many medical schools, NUS Medicine insists its students be deeply aware of the fact that the bodies they are scrutinising and working on were once living, breathing human beings—just like themselves—and proper care and respect must be accorded to these Silent Mentors at all times. Practical sessions are always preceded by the recitation of a pledge to respect the dignity and integrity of the human remains, and students must be suitably attired. "This is where you learn professionalism and empathy. If you cannot treat a cadaver with dignity, how are you able to manage a live patient with compassion?" Prof Bay asks. "Lectures in ethics are lectures; what's best is practice, putting the ethics into action."

The Department also goes the extra mile to make sure that cadaveric body parts remain intact. This, adds Assoc Prof Ng, accords the human remains the necessary dignity. "We show the students pictures and brief stories of the Silent Mentors so they know exactly who they are working with."

Ms Melissa Yeo, a first-year medical student, says the sensitisation was instructive. "When you look at the patient, you can tell his or her life story. If his heart is very big, maybe he had some breathing problems. If his lungs are black, you know that he was a smoker. So it's not about, 'Oh, this is a heart, and that is a lung.' They are not just specimens."

GIVING THANKS

Yes, when this flesh and heart shall fail,
And mortal life shall cease;
I shall profess, within the veil,
A life of joy and peace.

— 'Amazing Grace'

So ended the opening performance of this year's Appreciation Ceremony for Silent Mentors, the annual event organised by the NUS Yong Loo Lin School of Medicine's Department of Anatomy to honour the memory of people who donated their bodies for research and educational purposes.

The event featured speeches and poetry recitals, music and songs from the assembled first-year medical and dental students, who shared their reflections on working with their Silent Mentors.

This year's ceremony, however, was especially poignant as Benjamin Tan, a second-year medical student, shared about his late medical doctor father's decision to bequeath his body to NUS Medicine.

The Appreciation Ceremony is also what sets the School apart from others, elaborates Professor Bay Boon Huat, Head of the School's Department of Anatomy. "In the year that they spend in anatomy studies, the students gain insights into and understanding of the workings and structures of the human body. It is a deeply profound learning experience, one that we encourage them to express in words, even music, at this Appreciation Ceremony."

Medical students attending an anatomy session.

EVERY BODY COUNTS

A typical cadaver remains at the Department for up to three years. They are then returned to their next of kin, while the School arranges for the necessary cremation.

Some families request burial at sea. “We want the families to have proper closure as well,” says Prof Bay. “Our team works very hard to liaise with the relatives, and all cremation costs, including the coffin and sea burial, are borne by the Department. We want to walk the talk, so we want to be there to say goodbye and express our thanks. The family members do appreciate this.”

Mr Tee Koon Tiong, a 55-year-old businessman who pledged his body to the School last December, is thankful for the lengths that the Department goes to for the deceased and their families. He is one of 1,500 people in Singapore who have decided to donate their mortal remains to medical science.

Inspired by the body donation efforts of a religious organisation he had come across in Taiwan, Mr Tee pledged his mortal remains to medical education. “I learnt that this is a difficult area to get donors. I figured, when I pass on, what is the body for? You can't do anything with it, so I thought if someone can make use of the body, then I don’t mind.” ✚

GOING THE EXTRA MILE

Mr Gobalakrishnan P, or Mr Gobal, has been with the Department of Anatomy for the past 45 years. The 65-year-old laboratory technologist is the custodian of the Silent Mentors, making sure that they are free of fungi, as well as helping his colleagues with embalming when he has the time. Mr Gobal is also on call 24/7 for when the National Organ Transplantation Unit informs him of the availability of a newly donated body. He also attends the cremations of cadavers at the end of their stay with the Department.

It is not part of your job to be on call 24/7 to meet the families. So why do it?

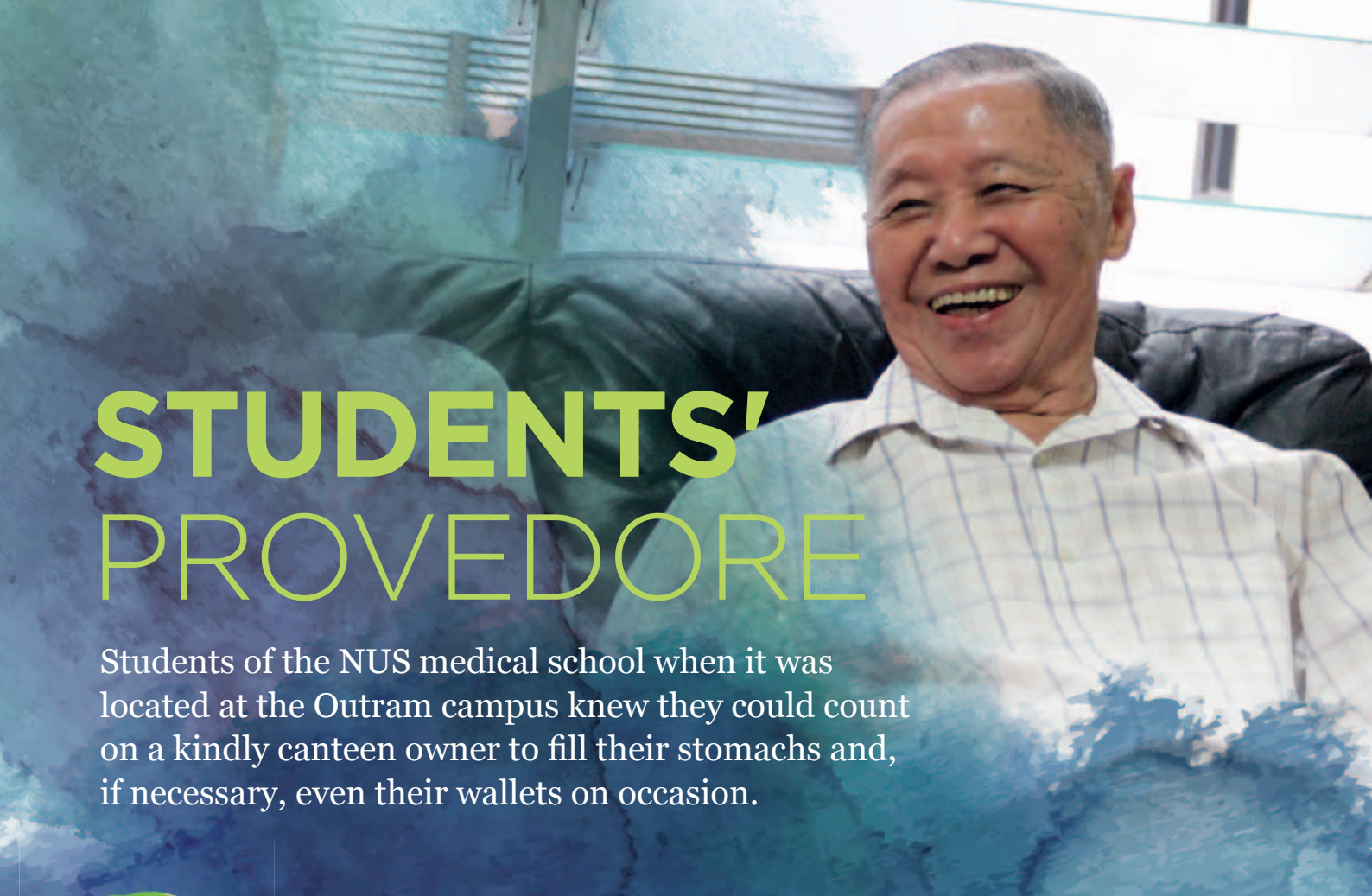
The usual arrangement is this: the undertakers collect the body, and I just have to open the mortuary for them. But I feel that something is missing, you know, if you just send a stranger to collect a body from the next-of-kin. I feel that if I go there personally, introduce myself and answer their questions, they will feel happier.

What are the most common questions they ask?

They ask why we need to keep the bodies for up to three years, how we handle the body, what happens to their belongings, how we prepare the body for anatomy classes.

What is the most rewarding aspect of your profession?

I usually call the relatives about two weeks before we return the remains to them, and the first thing they ask me is if I will be there at the cremation. They tell me that they are used to dealing with me, and that they are happy that I will be there. And that is very nice to hear.



STUDENTS' PROVEDORE

Students of the NUS medical school when it was located at the Outram campus knew they could count on a kindly canteen owner to fill their stomachs and, if necessary, even their wallets on occasion.

Thanks to Mr Wong Niap Leng, hungry students got fed—and on credit terms, too. A quick bite in between lectures? Breakfast, lunch, dinner? Choose from *kaya* toast or ham-and-egg sandwiches and *kopi*. Take your pick from hot favourites such as vegetarian *bee hoon*, fried rice, *hor fun*, Hainanese chicken and pork chop. All available at Ah Leng's.

Ah Leng, as Mr Wong was fondly referred to by those he provided succour to, dished up the goodies at his canteen to generations of medical and dental students and housemen between 1947 and 1983. Built atop a little rise just a trot away from the King Edward VII Hall hostel and today's Singapore General Hospital (SGH), the canteen that Mr Wong took over from his father was also a veritable meeting place for students.

Associate Professor Grace Ong, one of yesteryear's hungry students and today Dean of the NUS Faculty of Dentistry, remembers the man and his cooking. "Ah Leng's canteen was the oasis where we used to hang out at the end of a tiring day in dental school, complaining and moaning about the hard time our lecturers gave us over *kopi peng* and *teh*. This routine was somehow very therapeutic. Ah Leng's canteen… that was a highlight of my time as a student."

Dr Wong Wee Nam, writing in the *SMA News* of Dec 2007, says, "Ah Leng's canteen evokes different memories for different people. To hostelites, mostly Malaysians, of KE Hall, it was a home away from home. Some remember it for the authentic Hainanese food. Quite a number remember Ah Leng's beautiful daughter, Miss Wong. At that time, the inmates of KE VII Hall even declared her the most beautiful lass on Sepoy Lines. To second and third year medical and dental students, it was a breath of fresh air from the anatomy dissection room. To others, it was a place to rest when one did not want to attend a lecture.

"To the impoverished medical students and those who had run out of money due to over-spending, delay in remittance from home or a run of bad luck at card games and *mahjong*, Ah Leng's canteen was like a bank where students went to eat on credit or borrow money to pay school fees."

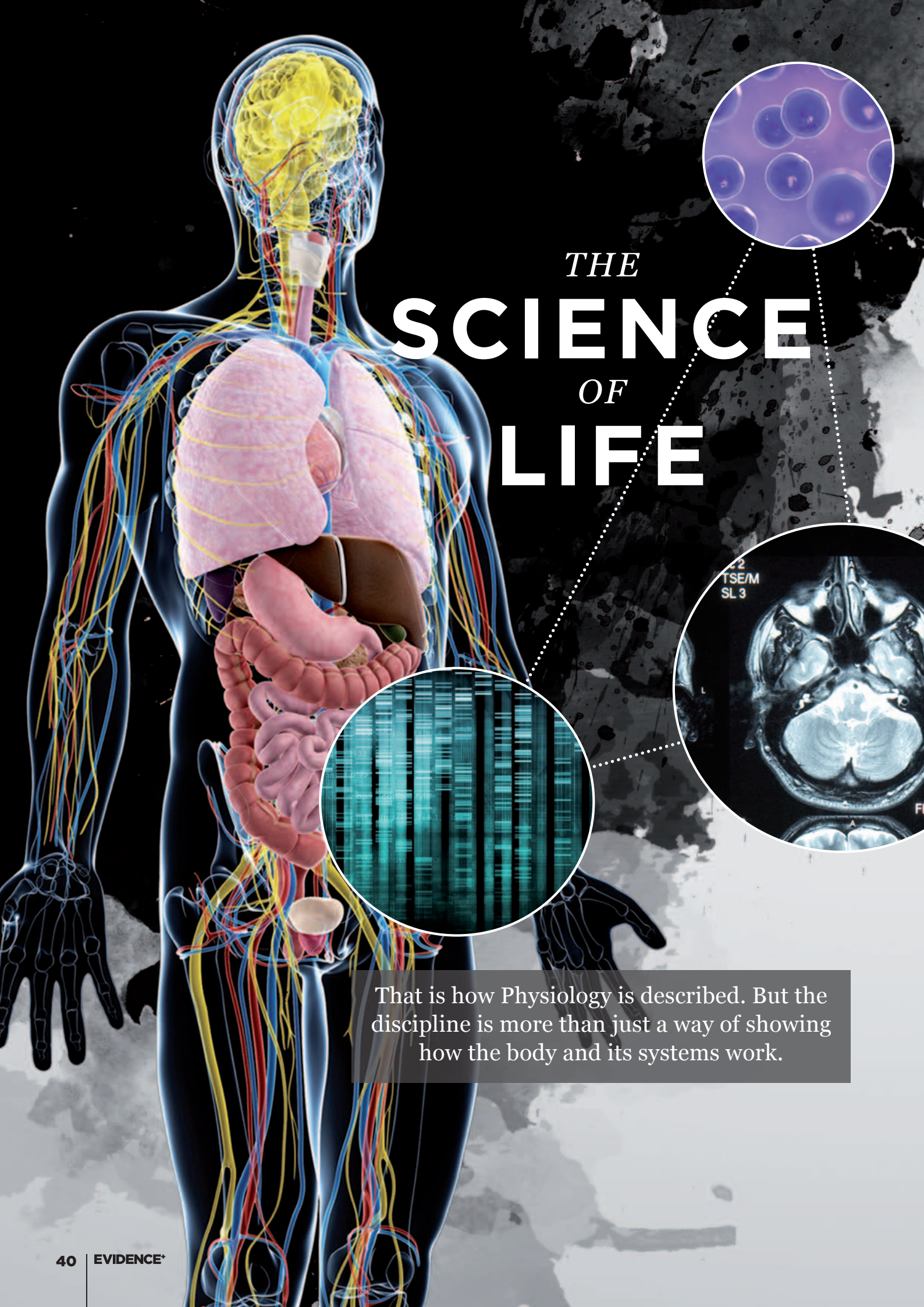
Mr Wong Hoe Sang, Ah Leng's eldest son, says his father, "always very kind and soft", found it hard to turn away students who asked him for temporary credit. "He found it difficult to say no."

He did, however, scribble the names of those he lent money to and the amounts they owed him in little notebooks, copies of which are on display at the NUS Medicine museum at Kent Ridge as well as the SGH Museum. "It was nothing. I felt happy helping the students in need," he told *NUS News* last year.

His generosity and kindness is remembered by many, including Professor K Satkunanantham. Says the former Director of Medical Services at the Ministry of Health and current senior consultant in Orthopaedic Surgery at the National University Hospital, "When I remember my medical school days I always think of Ah Leng as a quiet, observant man who never raised his voice and always had a smile for us students.

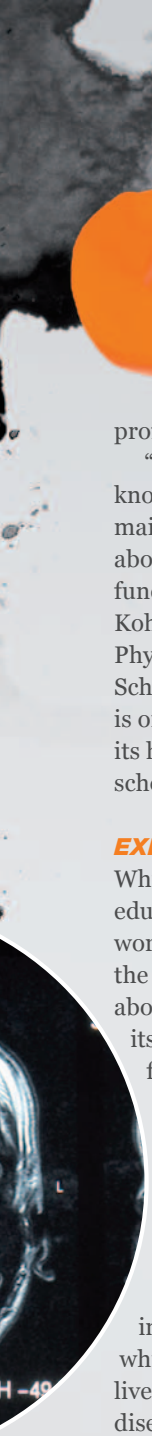
"To many of us in KE Hall, Ah Leng was much more than a canteen operator. He was our foster parent; which is why, some years ago, my wife and I chose Father's Day to take him and his family out for dinner."

Mr Wong also receives invitations to reunions organised by the medical school, which he sometimes attends. When he does, it is his former customers who happily pay for the meals.



THE SCIENCE OF LIFE

That is how Physiology is described. But the discipline is more than just a way of showing how the body and its systems work.



It also helps to explain why—and even when—genes, proteins, organs and entire body systems do not work. And this understanding is crucial to a medical professional.

"A practising doctor needs to know what organ systems do to maintain health before he can know about pathophysiology or disordered function," says Associate Professor Koh Dow Rhoon of the Department of Physiology in the NUS Yong Loo Lin School of Medicine. The Department is one of the School's oldest, tracing its history back to the year the medical school was established.

EXPLORING THE SIGNS OF LIFE

While undergraduate and postgraduate education comprise a major part of its work, the Department is also leading the way in uncovering new information about the human body and the way its component parts and systems function. For example, Professor Hanry Yu is working towards creating an artificial liver using a cutting-edge microscope to observe how the liver regenerates, which cells do what, and what molecules regulate the process.

"When things go wrong, two important diseases occur: fibrosis, which leads to a hardening of the liver, and non-alcoholic fatty liver disease, which eventually leads to liver cancer. From these biological understandings, we use an engineering microenvironment that helps to grow small pieces of liver tissue outside the body to facilitate safety testing of drugs to prevent drug-induced liver injury," explains Prof Yu.

Tissue regeneration is just one area of research that the Department is active in. Other areas include neuroscience, cancer biology, immunology and inflammation—areas that cover common diseases afflicting the local community. The completion of the human genome sequence also presents new challenges and opportunities to understand function, especially how genes, proteins and organ systems interact to sustain function.

"Physiology is the intersection between basic science and translational science. For us, we have always been interested in translational science," explains Professor Soong Tuck Wah, Head of the Department. The Department's contributions to research that sheds new light on the workings of the human body has been recognised, with strategic funding from the NUS having been granted recently.

GIVING LIFE TO THE SCIENCE

The Department's other mission is to nurture competent, community-responsive medical students who are adaptable, life-long learners.

In line with that, the physiology curriculum has evolved to meet the changing needs of the community over the years. It is now outcome-based. "If it is the general practitioner we want to develop, what are we going to teach in physiology that will support him or her in future practice?" asks Assoc Prof Koh.

"PHYSIOLOGY IS THE INTERSECTION BETWEEN BASIC SCIENCE AND TRANSLATIONAL SCIENCE."

— PROF SOONG TUCK WAH

It is no moot question, because physiology is the foundation of many other areas of medicine. Knowing all the parameters has an impact on diagnosis, therapy and prevention. For example, if something happens to your coronary blood flow, you get a heart attack. By understanding why the artery gets blocked, preventive methods can be developed and recommended.

With an eye to how students learn best, the Department was one of the early adopters of new teaching methods. Recognising the value of participatory learning, it brought in a couple of innovative simulators, such as the Harvey mannequin, to teach medical students cardiorespiratory physiology in early 2000. "The student can see what happens when he collapses the lung on the computer and when he tweaks things. Participatory learning allows students to understand that they are doing things for a purpose," notes Assoc Prof Koh. Another key change in physiology pedagogy was the use of real clinical cases in tutorials. "This is a powerful way to learn, as students can learn physiology in the context of future practice," he points out.

As the whole organism is looked at in physiology, students also learn about the integration of the different body systems. "For example, when you do something to the heart, it also affects kidney function, and so forth. This makes it important for students to learn about the body as a system rather than as isolated parts. Otherwise, you miss the connectivity; you would not realise that if you do something here, other systems may change," explains Assoc Prof Koh. Being an integrative science, physiology is just as relevant to dentistry, pharmacy, life sciences and nursing.

A significant part of the teaching of physiology also occurs in the research laboratory. That is why the Department has, since the 1950s, offered research opportunities for students who wish to pursue Masters and PhD degrees in research.

REACHING OUT TO THE YOUNG

Outreach activities are held to interact with potential graduate students. In a bid to reach out to the younger community and attract future students, the Department conducts public outreach events in secondary schools to inspire teenagers on a particular aspect of physiology, such as neuroscience.

At the Singapore Technologies Endowment Programme (STEP)-NUS Sunburst Brain Camp for instance, students are immersed in sessions to learn how the brain functions, learns and retains knowledge. Participants are tasked with writing a chapter on the brain and also work on a research project on a disease, which they must present and defend to their peers. "It challenges them on all levels," reveals a delighted Prof Soong. "Students come back from the camp raring to write the chapter for next year!" ✚

INTERNATIONAL VOICES

There are 139 teaching faculty and 363 international exchange students here at the NUS Yong Loo Lin School of Medicine, representing about 45 countries. We ask three of them—two professors and a visiting student—to share their thoughts about their time in NUS Medicine.

ASSOCIATE PROFESSOR ROGER FOO
Cardiovascular Research Institute
National University Heart Centre, Singapore

I LEFT SINGAPORE FOR THE UK after my National Service in 1995, and returned at the end of 2012.

While training to be a clinical registrar, I became attracted to basic-science molecular research, and decided on a career as a clinician scientist that I never imagined I would be doing back in my NUS medical school days.

Being at the frontier of medical research appeals a lot. It is nice to think that some of the medical biology we are studying could end up re-writing the understanding of medical science.

During my time overseas, I was forced to mature quickly, and learnt that the world is a much bigger place than the Bedok and the NUS that I was used to. I had to adapt to a different culture, even in simple contexts such as ward rounds. Junior doctors in the UK are given a lot of independence; they find the time to think about what they really like about each job, and question the thinking and science behind what has been taught in medical school. Work took on a different dimension because I had people to discuss my thoughts with, and role models to emulate. I realised that it is easy to become parochial as a junior doctor, and seeing healthcare in a different setting opened up for me very new dimensions.

As a registrar, I had the responsibility to teach students. The greatest thing that struck me teaching students in Cambridge was their intellect and curiosity. They were always interactive at bedside teaching, asked intelligent questions, and kept me constantly on my toes.

I came back to Singapore in 2012 because of the enormous funding support here, and the strong dedication in the NUS and research institutions to help clinician scientists succeed.

My main research focus remains Heart Failure. My research team now consists of 30 scientists. This year, seven of our interns have been awarded places at medical schools. Six PhD students have received A*STAR and NUS scholarships. Back in Cambridge, two clinician scientists I mentored are now independent researchers themselves. It is exciting to think that I may inspire clinician scientists here, too.

The School is clearly positioned for excellence in medical education, science and service. I am so pleased to be part of the team that can contribute towards these goals.

Having been overseas also makes me appreciate the simple things in Singapore: trains that run on time, somewhere to buy a meal even when it is late after work, clean streets, warm sunshine. I am glad I am back home.

MR BENJAMIN LIU
Exchange Student from Tzu-Chi University, Taiwan (here for a month in Apr 2015)

BEFORE COMING TO SINGAPORE, I had heard that medical students here were all smart and hardworking—I witnessed this during my time here, during which I participated in the clinics and OT, and observed scopes done at the National University Hospital. I joined the bedside teachings at wards and saw how a medical officer guided students in approaching a patient.

I think the students really respect their school and show great interest in their studies. They know they are one of the best, and prove it constantly.

There are also many teachers and doctors from different countries with different training backgrounds—that is really different from Taiwan—and I believe it is a way to broaden a medical student's vision. It was inspiring to see doctors in Singapore capable of dealing with patients from different cultures, which I think is an important ability.

It is a pity that I did not have many opportunities to meet and talk to the local students in the month I was here, but generally people are nice and willing to help me learn. ✚

ASSOCIATE PROFESSOR PAUL MACARY
Department of Microbiology
NUS Yong Loo Lin School of Medicine

I ARRIVED IN SINGAPORE FROM Cambridge, UK, in 2005. The transition was easy, thanks to the quality of public services, schools and medical care, combined with excellent support from the NUS and the National University Hospital (NUH).

The close association between my Department and the NUH was a real selling point, given my interest in human immunology. I also come from a tradition that recognises the importance of teaching in the research process. Working in the NUS allows me to contribute directly to the training of Singapore's next generation of scientists and scientist-clinicians, thus giving something back to the country that has treated me and my family so well.

I have had a long-standing interest in emerging infectious diseases. Southeast Asia is a key region from which most of the new infectious threats for humans are emerging. Singapore is unique, being a country in this region with a First World healthcare system. This allows me to work on a disease such as dengue to a level of sophistication that would simply not be possible elsewhere.

I have managed to establish a laboratory that can make fully human therapeutic antibody candidates taken directly from patients who have recovered from disease. We are now one of only a handful of academic laboratories in the world that can do this. This allows me to show how the dengue virus is targeted by human antibodies as part of a natural immune response (we were the first laboratory in the world to do this), and one of these antibodies is under clinical development for the treatment of dengue by GlaxoSmithKline. We are now in a strong position to take a new generation of therapeutic candidates into clinical trials, and are working closely with pharmaceutical partners on this.

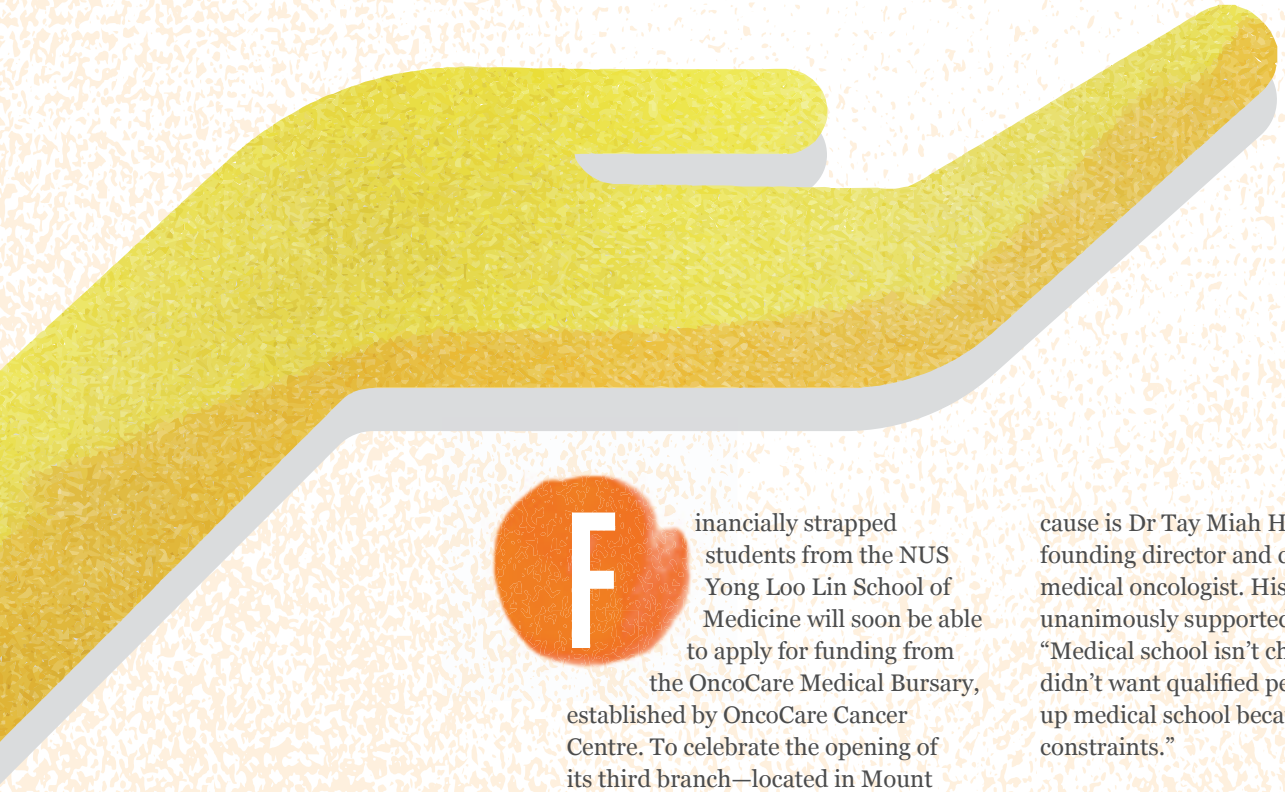
NUS Medicine has been successful in recruiting local and international faculty who conduct research at a very high level. The decision makers in NUS Medicine understand that conducting internationally competitive research is exceptionally challenging. This is important, given the level of bureaucratic oversight we are exposed to in the day-to-day conduct of our research by agencies outside the NUS Medicine umbrella.

There is room for improvement. For example, as a strategic approach, we should be exploring methodologies to improve the degree of interaction between basic scientists/clinicians and other healthcare professionals who are part of NUS Medicine. We should also have advocates who feed information and suggestions to Singapore's funding agencies.

To me, NUS Medicine is now the premier centre for academic medicine in Asia. This is a huge achievement for a country as small as Singapore. Our augmentation of our international reputation in this sphere represents the key challenge for our school as we move forward, because our competitors are well funded and equally ambitious. ✚

THE REASON FOR GIVING

A NUS Yong Loo Lin School of Medicine alumnus sets up a bursary to help young medical students the same way he was aided when he was in medical school.



Financially strapped students from the NUS Yong Loo Lin School of Medicine will soon be able to apply for funding from the OncoCare Medical Bursary, established by OncoCare Cancer Centre. To celebrate the opening of its third branch—located in Mount Elizabeth Medical Centre—in Feb 2015, the integrative cancer specialty centre has pledged S$750,000 over five years.

The person who championed this cause is Dr Tay Miah Hiang, the Centre's founding director and consultant medical oncologist. His proposal was unanimously supported by his team. "Medical school isn't cheap, and we didn't want qualified people to give up medical school because of financial constraints."

HIS FATHER AND A BURSARY

Dr Tay knows what he is talking about, having experienced the uncertainty of not knowing whether he was going to

"SOMEONE ONCE ASKED ME WHAT SORT OF STUDENTS MAKE BETTER DOCTORS. I SAID THAT STUDENTS WHO HAVE GONE THROUGH A LOT MAKE BETTER DOCTORS. GOING THROUGH STRUGGLES, BE IT FINANCIAL OR EMOTIONAL, CAN MAKE THEM BETTER DOCTORS."

— DR TAY MIAH HIANG

have the resources to complete his medical education. When he enrolled in 1987, the fee for his undergraduate medical degree course was S$3,900. It jumped to S$7,200 in his third year, and increased to S$10,200 in his final year. The fee for the final year alone was more than what his father was prepared to foot for his entire university education. "I didn't come from a rich family. My father gave me S$10,000 and said it was for my entire five years of medical school," recalls Dr Tay.

To help fund his education, he took a study loan and worked as a tutor. He confesses that, had the starting fee been any higher, he would have dropped out of medical school. "If I had difficulty paying S$3,900, today's students would be worse off," he exclaims.

It also helped that Dr Tay received assistance with living expenses. "I had a small bursary from NTUC in my fourth year and also in the final year," he says.

NURTURING COMPASSION

That NTUC bursary was on Dr Tay's mind when he initiated the OncoCare Medical Bursary. "Certainly, I think that played a part," he reveals.

His early education in St Stephen's and St Patrick's schools also made an impact. "The Catholic schools left a deep impression on me. They have this civics class for which there was no test. It was about how to make life easier for other people. These are the things you cannot learn from books," says the son of a deliveryman and a housewife.

Growing up with limited financial resources made him a better physician. "Someone once asked me what sort of students make better doctors," he recalls. "I said that students who have gone through a lot make better doctors. Going through struggles, be it financial or emotional, can make them better doctors."

He also thinks that working as an oncologist has sensitised him to the struggles of his patients. "We encounter a lot of people, people who are sad and are very poor; even the rich are sad sometimes. So from all these experiences, you start to develop compassion. Sometimes, you go beyond the call of duty to help a patient," he muses.

The altruism of his friends was also influential in his decision to help poor students at his alma mater. "My friends help others, too. Friends can influence you, and you can certainly influence them," he insists.

ENGENDERING KINDNESS

The doctor has also participated in medical relief missions to disaster-affected countries such as Afghanistan and Sri Lanka, and has received awards for patient care. He also started a Twitter movement called One Kind Act a Day. "It encourages people to do one kind act a day. It can be a simple 'good morning' to the people in your office, or a 'thank you' to your office cleaners," he describes. "Yesterday, I tweeted a message urging others to smile at people who are sharing a table with them at the hawker centre, so that these folks won't feel like pariahs."

Although the short-term aim of the OncoCare Medical Bursary is providing support to financially strapped medical students, Dr Tay has a larger vision: "At the end of the day, I've always liked the idea of paying it forward." His hope is that the students who are helped through the bursary will remember and return the kindness one day by doing the same thing for other needy students. "It will have a domino effect. I think we can make this world better if we just helped the less fortunate more often," he muses.

To corporations and individuals thinking of emulating OncoCare Medical Centre's generosity, Dr Tay says, "There is no need to wait for the best time. If you want to help, do it now while you can!" ✚

NUS
National University
of Singapore

Yong Loo Lin
School of Medicine

We've been writing medical history since 1905.

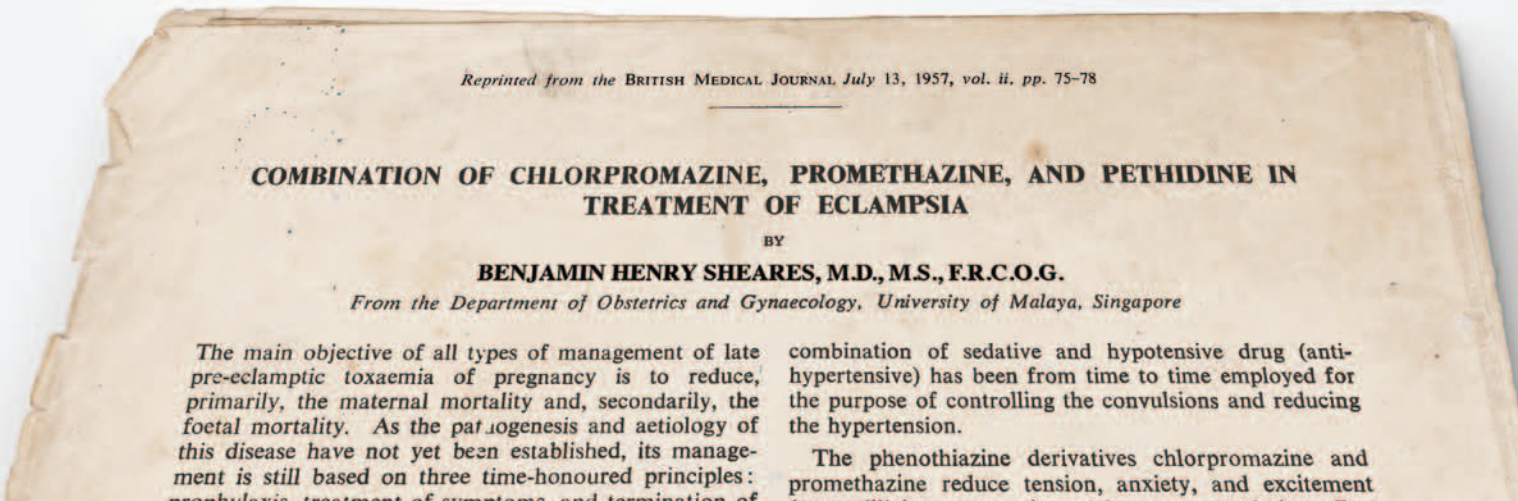
The medical school that Tan Jiak Kim and other local businessmen petitioned the colonial government to establish more than a century ago, marks its 110th anniversary this year.

Through two World Wars, independence and into the 21st century, NUS Medicine graduates have served the nation faithfully.

They've delivered babies, tended to the sick and the dying, and fought epidemics.

Along the way, their alma mater grew to become one of Asia's finest.

Today, the NUS medical school continues to do what it has always done excellently – training Singapore's best and brightest to care for our community.



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COMBINATION OF CHLORPROMAZINE, PROMETHAZINE, AND PETHIDINE IN TREATMENT OF ECLAMPSIA

BY

BENJAMIN HENRY SHEARES, M.D., M.S., F.R.C.O.G.

From the Department of Obstetrics and Gynaecology, University of Malaya, Singapore

The main objective of all types of management of late pre-eclamptic toxaemia of pregnancy is to reduce, primarily, the maternal mortality and, secondarily, the foetal mortality. As the pathogenesis and aetiology of this disease have not yet been established, its management is still based on three time-honoured principles:

combination of sedative and hypotensive drug (anti-hypertensive) has been from time to time employed for the purpose of controlling the convulsions and reducing the hypertension.

The phenothiazine derivatives chlorpromazine and promethazine reduce tension, anxiety, and excitement