

# MediCine

A publication of the Yong Loo Lin School of Medicine ■ Issue 24 / November 2017



**LIVING IN THE  
MOMENT WITH  
KARATE**

# DEAN'S MESSAGE



Dear Friends,

Medicine is all about people. Doctors look after the health of people and this itself gives all the purpose to our work. Equally, the lives of doctors are often a heartwarming and inspiring story about people and about life.

This is certainly true of Dr George Khoo Swee Tuan, a 1954 alumnus of the King Edward VII College of Medicine (the antecedent to NUS Medicine) and a true community doctor. He has tended to Rochor area residents since 1963. Some of his patients span four generations of the same family. Some were very poor and he would waive his fees for them. Others were opium addicts living in the area, which was rife with gangsters and assorted riff-raff. One tried to extort \$200 in "protection money" to shield him against other gangsters; Dr Khoo bargained the man down to \$8, he recalled in a recent interview with *The Straits Times*. "After some time, I realised I enjoy the profession, curing and helping people. And I realised I'm doing some good."

He is still doing good: at 89 years of age, Dr Khoo continues to practise. He relocated his clinic from Rochor Centre, which has been closed for demolition, to Veerasamy Road in Little India last year. "I will continue to work as long as I'm fit and I feel wanted and useful. Many of my patients don't believe me when I tell them my age. I tell them I won't stop (working) as long as they come and see me."

As 2017 draws to a close and a new year approaches, NUS Medicine alumnus like Dr Khoo reminds us that our work has no end, no finish line. Medicine exists to serve people in need, and as long as there are sick people, there will always be a need for healthcare professionals who express the values that our School has always stood for – unwavering care and concern for patients, steadfast devotion to duty, professional competence and excellence.

To this end, we were very heartened to see our medical and nursing students coming together once again with the support of healthcare institutions to conduct free health screening for low-income residents in HDB estates. It has been a decade since these screening exercises began and

participation by students has become a much-anticipated rite of passage.

They also serve who toil away in the classrooms and laboratories, and the fruit of our teaching staff's labour are the 448 MBBS, PhD, MSc and BSc students who graduated this year. They are now part of a healthcare workforce caring for the Singaporean community. Our teachers take heart that this year, 89 per cent of graduating students rated the quality of their educational experience at NUS Medicine as either good or excellent.

Meanwhile, our key Summit Research Programmes in cancer, cardiovascular disease, diabetes and tuberculosis are slowly but steadily adding to our knowledge and understanding of the origins and causes of these illnesses. I am confident that in time, working with our partners in clinical and research institutions here and around the world, we will begin to turn the tide in our favour in the search for better, more effective solutions to these diseases.

I have described NUS Medicine people at work; let me end by talking about our people at play and in this regard, I am very glad to tell you that Team Medicine won gold at this year's NUS Rag Day competition in August. Not only did our students win Gold, they also won the Best Dance Performance award. Medicine students also excelled at the 29th SEA Games held last month in KL, Malaysia – congratulations to Bryan Ong Wei Loong (Gold, Men's Water Polo), Samuel Koh Giap Yang (Silver, Rugby), Samuel Tan Wei Han (Silver, Men's Wushu) and Muhammad Hafiz Bin Abdul Rased (Bronze, Men's Field Hockey).

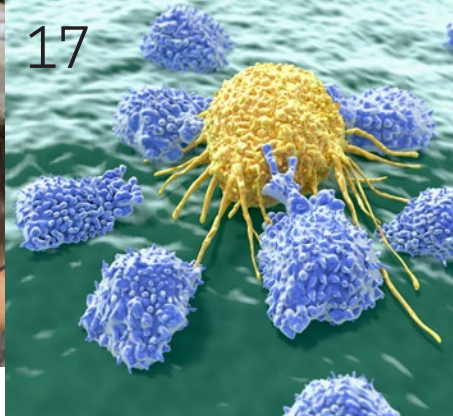
I am tempted to say that NUS Medicine people do it best, but it is much better to let their deeds speak for themselves!

With best wishes for a healthy, happy and peaceful Christmas and New Year.

Khay Guan



08



17



33



22



44

## CONTENTS

### DOSSIER

- 04** A Little Love Goes a Long Way
- 06** 17th International Conference on Integrated Care
- 07** White Coat, Heavy Yoke
- 08** Neighbours First – An Unwavering Commitment to Serve
- 10** Healthcare Competition Challenges Student Teams
- 13** Raffles Dialogue 2017 Focuses on Global Concerns
- 14** A Better Way
- 15** Professor Tan Chorh Chuan to Spearhead Healthcare Innovation

### SCIENCE OF LIFE

- 17** Potency and Potential
- 19** Fighting a Highly Prevalent Disease in Singapore on Multiple Fronts
- 21** Vitamin E Isoform  $\gamma$ -Tocotrienol May Help Protect Against Emphysema in COPD

### IN VIVO

- 22** Healthcare in the Himalayas
- 26** The Future of Medical Education

- 30** More Young School Leavers Drawn to Nursing's New Horizons

### WITH A LITTLE HELP

- 32** A Thirst for Helping People Led Scholar to Nursing

### PEOPLE OF NUS MEDICINE

- 33** Living in the Moment with Karate

### INSIGHTS

- 36** Transforming Healthcare – The Role of Family Physicians and the Primary Care Sector
- 38** Teaching Palliative Care
- 40** Putting Singapore on Map of Medical Advances

### ALUMNI VOICES

- 42** A Country Practice

### ETHICALLY SPEAKING

- 44** Reasonable Patient Standard and Informed Consent
- 46** Regulating the Stem Cell Industry: Needs and Responsibilities

### SCHEDULER

- 49** November 2017 – January 2018

# MediCine

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## A LITTLE LOVE GOES A LONG WAY

In August, the NUS Yong Loo Lin School of Medicine launched the Corporate Social Responsibility (CSR) programme to cultivate a culture of volunteerism and service in the School and build camaraderie amongst staff while making a positive impact on society. The programme comprises three activities – Environmental Conservation, Animal Welfare and Community Service – giving staff an option to choose a cause which resonate most with them.

### PUTTING TRASH IN ITS PLACE

The first of the three CSR activities to be rolled out was Environmental Conservation. For its maiden activity, the team focused on marine litter in mangroves and partnered with International Coastal Cleanup Singapore (ICCS). ICCS has over 20 years of experience in coordinating clean-ups and raising public awareness of coastal conservation.

A safety briefing and educational talk conducted by the

ICCS prior to the cleanup gave informative and thought-provoking information to participants, who learned about the resurgence of biodiversity in Singapore, the effects of trash on recovering habitats and the importance of conservation.

Volunteers reached the Lim Chu Kang mangrove site on August 12, excited to start their day. Nine teams fanned out to retrieve trash along the 150-metre stretch of mangrove. The discarded bottle caps, straws, plastic bags, foam pieces, glass and construction materials added up to 164kg!

Observed a participant, “The activity ended with a substantial amount of trash cleared and many new friendships forged. Most importantly, it was an opportunity for a group of people to be closer to nature and understand the intimacy between us and the environment, which has been silently providing for us”.

### ADOPT, DON'T SHOP

The animal welfare volunteers were greeted by Stinko, the office dog at Mutts and Mittens on the morning of August 24. The mild-mannered dog was blind, injured, frightened and reeked of a foul smell (hence, the name Stinko) when rescuers found her at an illegal breeding farm in Singapore.

## DOSSIER



This is just one of the many sad stories that staff shared with volunteers at the commercial boarding facility, which is also heavily involved in animal welfare work. There are about 100 rescued dogs and cats under their roof, waiting for new homes. Many are old and require medical and tender loving care.

NUS Medicine volunteers were brought on a short tour of the facility before cleaning the area, which includes a park and swimming pool. While the act of sweeping leaves and pulling weeds under the blazing sun may not be appealing, it was certainly most rewarding. Clean spaces provide these animals a healthy and conducive haven as they wait for adoption.

The rest of the day was set aside for staff to spend time with the furry friends. Canines were let out of their cages into the spacious field for their afternoon run, while felines took a lazy afternoon nap. Many purred in contentment when their chins were gently stroked. It was a joyful sight to see these once abused and abandoned animals now free of the horrors of their past.

### FOOD FROM THE HEART

Staff who signed up for the Community Service CSR came together on September 15 to lend a helping hand at Willing Hearts. A secular, non-affiliated charity, Willing



Hearts operates a volunteer-run food kitchen that offers free, nutritious meals to the needy in Singapore. They distribute about 5,000 meals daily to over 40 locations islandwide year-round.

The hustle and bustle in the kitchen starts as early as 4.30am and food is distributed before 9am each day. NUS Medicine volunteers arrived in time to help with kitchen cleaning and the washing of used utensils. That done, the volunteers were next tasked with food preparation duties, helping to cut and clean vegetables and poultry meat. These would be placed in the chiller room, ready to be cooked the next day.

Care had to be taken to ensure that food was cut into small, bite-sized pieces for senior citizens who may have difficulty chewing and swallowing.

It is heartening to know that there are good samaritans out there working hard to provide for the less fortunate without expecting anything in return. For the group of 45 NUS Medicine volunteers, it was meaningful time spent away from the office – mingling with co-workers and doing good work. And exhausted as they might be, they left the soup kitchen with their hearts full.



## 17<sup>TH</sup> INTERNATIONAL CONFERENCE ON INTEGRATED CARE

By Huang Xiao Ting and Amanda Teng,  
Phase V Medicine students

During our Phase IV electives, we were very privileged to attend the 17th International Conference on Integrated Care in Dublin, Ireland, under the guidance of Associate Professor Reshma Merchant, Department of Geriatrics in NUH. Delegates came from all over the world and worked in various parts of the healthcare system, e.g. nurses, allied health professionals, healthcare management professionals. We were thoroughly thrilled to attend the event and glean new insights.

One of the presentations that stood out and remained in our minds for a long time was a success story of a community programme which was aimed at engaging the elderly in a neighbourhood. The neighbourhood had a substantial number of elderly and the programme did not take off initially as the participation and retention rates of elderly participants was low. They wanted to engage the seniors and encourage active ageing, i.e. to engage them mentally, socially and physically, to help them age better within the community. The team persisted and gave more autonomy to the elderly to allow them to take charge of the programme. This gave them ownership over their own health and created a welcoming and fun community.

With Singapore's own population of seniors increasing, we felt that the perception of ageing is often viewed in a pessimistic light, with many elderly resigned to their fate and accepting frailty and multiple illnesses as a natural progression in life. However, we were inspired and believe that active ageing is a good way to reduce the healthcare issues that develop from frailty, social isolation, loss of function and depression. This involves linking up with various partners in the community and healthcare on common platforms, with seamless workflows to enable a successful revolution. On top of that, as evidenced by the presentation, a key component would also be empowering the elderly to take charge of their health, to allow them to start planning and be more involved in their own management.

Integrated Care has multiple definitions, and it is defined differently across the healthcare spectrum. Essentially, it works towards the coordination of care across the different service providers within an organisation and across organisations, to facilitate holistic and comprehensive forms of care. It includes utilising technology to improve patients' access to healthcare or improving internal workflows in an organisation. An idea that was brought up in the conference was also the concept of recognising that patients are also important partners and determinants in how healthcare is delivered. This understanding has changed the way in which healthcare is provided. From the top-down approach of the past, where the doctor prescribed to a placid, receiving patient, to the current model where it is a therapeutic partnership between the healthcare provider and the patient, there is a definite movement towards integrated care. It is one that addresses different aspects (health, social, environmental).

The conference opened our eyes to this huge field and we are now better able to appreciate the efforts made towards improving care.

# WHITE COAT, HEAVY YOKE

By Cowan Ho, Phase I Medicine student

The White Coat Ceremony (WCC) has been a rite of passage for the matriculation of first year medical students at the Yong Loo Lin School of Medicine since 2008. It's a symbolic moment for us bright-eyed and aspiring youth, giddy with excitement and embarking on our journey to becoming medical professionals.

The memory of the WCC is still vivid in my mind and I am sure it will stay for the many years to come. Half a semester of an increasingly demanding course has gone by. I know the journey would grow more arduous with each passing day; even more so when we graduate and become house officers (while for some of us, national service and the gruelling but rewarding Medical Officer Cadet Course). I know that being perplexed by gross anatomy and being unable to frequently meet my friends from other faculties is just the beginning. I know that many sleepless nights and exhausting shifts await me.

Despite all these, I remain optimistic, looking forward to the future with the same excitement and enthusiasm I felt ever since I dedicated myself to a career in medicine.

Just before that, I had interned at Faith Clinic Toa Payoh with Dr Jeremy Tan, an alumnus of NUS Medicine. Having also explored many other possibilities such as careers with the Ministry of Foreign Affairs and the Republic of Singapore Air Force (RSAF), I was at a crossroads when Dr Tan shared his experiences as a medical student and then a physician. He reminded me of the tough journey ahead, but at the same time, also enlightened me on how fulfilling it could be.

In learning to become doctors, we are taught to care. While clinical knowledge comes with the medical degree, it is compassion that makes a doctor a true healer.

That realisation came home powerfully to me when I was helped into my white coat. The fabric was light, but I knew it was an emblem of the heavy responsibilities that my classmates and I were going to learn to shoulder from that day on.

**The White Coat Ceremony is a significant moment for medical freshmen and marks the official start of their learning journey. Here, Associate Professor Samuel Tay from NUS Medicine's Department of Anatomy helps Cowan don his very first white coat.**





Volunteer bonding with a resident at the Eunos Crescent screening.

## NEIGHBOURS FIRST- AN UNWAVERING COMMITMENT TO SERVE

*By Tseng Fan Shuen and Kwek Xin Yi Rachel, Phase II Medicine students, Project Directors, Neighbourhood Health Service 2017*

In 2007, a small group of passionate and committed medical students congregated to discuss the possibility of starting a new health screening project focussed on serving residents living in HDB rental apartments. They gathered what little funds and resources they had and proceeded to introduce Singapore's first, student-organised and led, health screening service to residents in Taman Jurong.

Eleven years later, the Neighbourhood Health Service (NHS) has progressed by leaps and bounds to become one of NUS Medicine's flagship health service projects, having served more than 4000 residents in eight different districts. It now offers 26 screening services and modalities - from just three at the beginning - managed by the committee and more than 10 other health service providers in Singapore.

"It's heartening to see how far we have come, from humble beginnings to where we are now. It has become bigger than what we have imagined, and most importantly, I'm glad to see that throughout the years, despite the many changes,

the desire to serve has remained the same," said Dr Chiong Yee-Keow, the director of the pioneering NHS committee.

NHS identifies residents-in-need, especially the elderly and residents living in rental blocks, and reconnects them to the healthcare system. This is achieved through (i) free health screenings (at a centralised venue and also via door-to-door visits for immobile residents), and (ii) rigorous follow-ups via house visits and phone calls to residents with abnormal screening results.

During health screenings and follow-up sessions, calibrated efforts are taken to break down the financial, psychological, physical and knowledge barriers to healthcare that many residents face. For example, NUS Social Work students evaluate the socio-economic situation of residents, and refer them to relevant regional social organisations to help ensure that the residents' holistic socio-economic needs are met.

NHS finds its place in Singapore's public health sphere by serving the underserved. MOH has placed a heavy emphasis on chronic conditions by rolling out the enhanced \$5/2/0 Screen For Life Programme and declaring a "war" on diabetes. However, the rental block community will likely continue to face barriers to healthcare and remain disconnected from the healthcare system without active engagement.

NHS hopes to bolster healthcare policy efforts by reaching out to this community and overcoming their barriers to healthcare. Ultimately, the aim is to increase the health-seeking behaviour of these residents, to bring them back into the healthcare system, so they can receive regular follow-up for their chronic conditions.



## DOSSIER



**A resident undergoing advanced eye screening, managed by Singapore Eye Research Institute and Singapore National Eye Centre. NHS works with more than 10 health service providers to offer residents a comprehensive screening package.**



**Volunteers performing a Random Capillary Blood Glucose measurement for a resident to monitor her transient blood glucose level.**

The 2017 Committee has worked tirelessly over the past year to execute key initiatives at this year's screenings. Examples of these include the introduction of a Fall Risk Assessment, Geriatric Dementia and Depression Assessment, new collaboration with organisations to offer advanced screening and treatment-based services, including free colonoscopy referrals and free spectacles, as well as profiling and risk stratification to help residents understand their risks of developing chronic conditions.

The screenings conducted at Eunos Crescent and Kampong Glam earlier in September and October 2017 saw a total of over 895 residents served by 941 student volunteers from NUS Medicine, Nursing, Social Work and the NTU Lee Kong Chian School of Medicine. Indeed, it is this continued dedication and hard work invested by the committee and volunteers that will make a positive difference in the lives of these residents.



**“Hipportable”, a transportable belt that allows caregivers to lift and transport elderly people with disabilities won the first prize at the Medical Grand Challenge.**

## HEALTHCARE COMPETITION CHALLENGES NUS STUDENT TEAMS

A belt to transfer patients safely and easily, a device to reduce infections in dialysis patients, and an electronic band to prevent pooling of blood in legs were just some of the innovative projects displayed at the inaugural Medical Grand Challenge (MGC) organised by students of the NUS Yong Loo Lin School of Medicine (NUS Medicine).

Undergraduates from NUS Medicine, Engineering, Law, Arts and Social Sciences, and Business faculties formed multidisciplinary teams and spent over a year developing solutions to various healthcare problems. The prototypes of 17 shortlisted teams were exhibited at the final showcase on August 18 and assessed by a panel of judges for business strategy, creativity, design quality and healthcare impact.

“The Medical Grand Challenge serves as a stimulus to encourage bright young minds to collaborate, unleash their creativity and apply their ingenuity to important needs in Singapore healthcare. We hope this sparks a lifelong interest in innovation, thinking out-of-the-box and solving real life problems,” said Associate Professor Yeoh Khay Guan, Dean of NUS Medicine.

Walking away with a grand prize of \$20,000 was the team who developed Hipportable, a device that facilitates one-to-one lifting and transferring of disabled elderly.

The team chose to tackle the prominent issue of an ageing population in Singapore and visited nursing homes to uncover the most difficult tasks. “The nurses told us it was lifting. They spend about three hours each day just lifting and transferring patients,” said Julian Low, Phase II NUS Medicine student.

The group then tried different methods of lifting another person and eventually devised a double loop belt system that capitalises on the strongest parts of the human body, the hips and legs, allowing a 40kg female to easily lift a 60kg male with the device. Hipportable has since been awarded a provisional patent.



Guest of Honour, NUS Provost Professor Tan Eng Chye (second from left) and Professor John Wong, Chief Executive of the National University Health System (third from left), tested the prototype of "FootSense", an affordable, portable, home-based foot temperature monitoring system for the early detection of foot ulcers.

"THE NURSES TOLD US IT WAS LIFTING. THEY SPEND ABOUT THREE HOURS EACH DAY JUST LIFTING AND TRANSFERRING PATIENTS,"

— Julian Low, Phase II NUS Medicine student

Coming in second place was the team behind PDSafe, a contactless sterilisation system for peritoneal dialysis used to treat kidney failure.

Improper sterilisation of the peritoneal dialysis connecting tubes can result in infections, which proves to be fatal in half of infected patients in Singapore. PDSafe, which showed 100 per cent inactivation of E.Coli in preliminary tests, makes the sterilisation process foolproof for patients.

Year 4 NUS Engineering student Poon Chong Wei found his experience in the Challenge rewarding and appreciated the opportunity to work in a cross-faculty team. "I found the team very inclusive and saw how I could use my technical expertise to fill the gaps for this project."

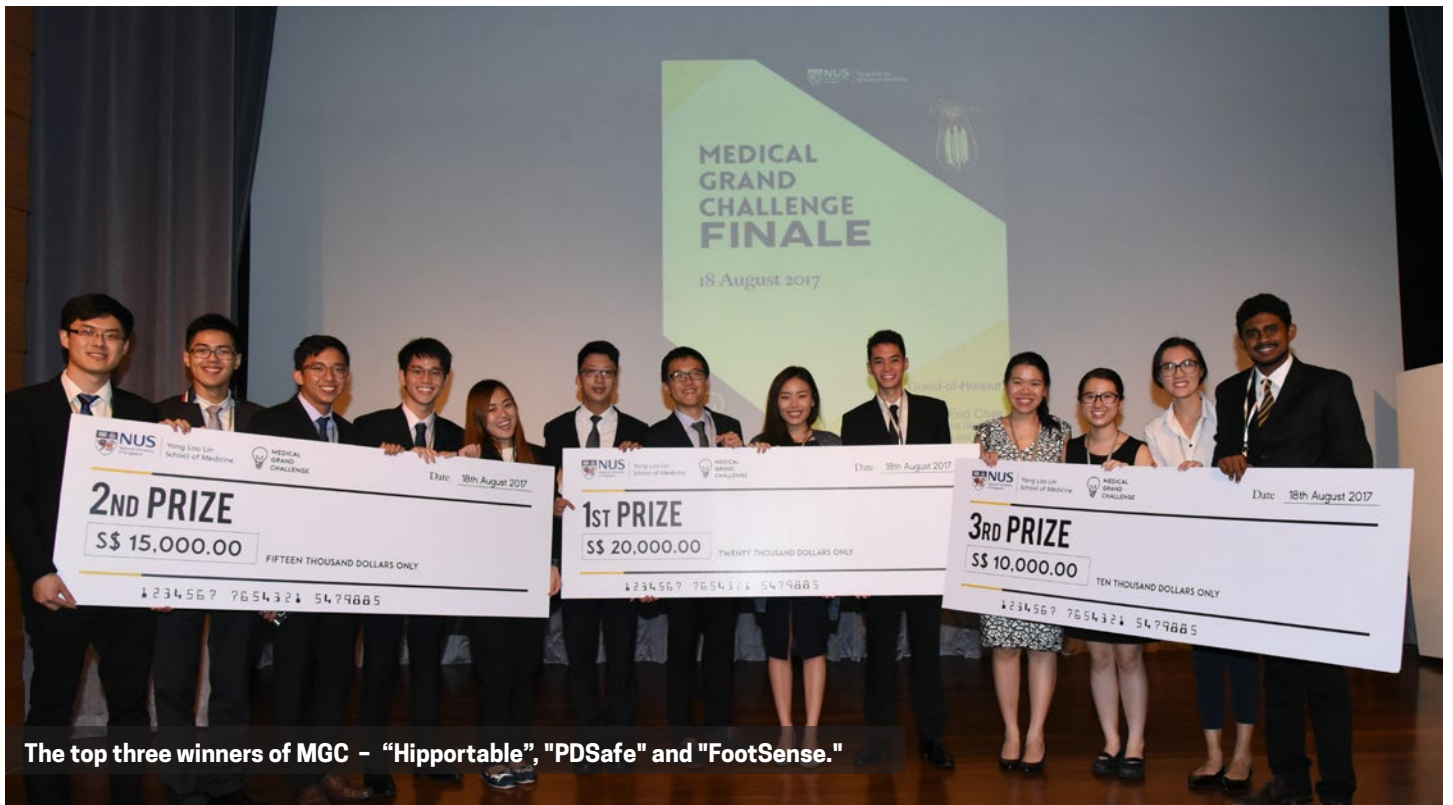
Clinching the Change Maker Prize for the most creative and impactful project was eVand, a palm-sized electronic leg band for treating chronic venous insufficiency, a common condition that causes blood to pool in the legs resulting in swelling, skin changes and leg ulcers.

The device uses an electric current to induce contraction of the calf muscles and promote blood circulation. It incorporates a motion sensing technology which automatically turns the device off when the user is walking to prevent falls. The team hopes to further develop their device into the size of a watch and revolutionise existing treatment options which are either bulky, unsightly or uncomfortable.

Said Phase III NUS Medicine student Samuel Ng, "This competition is a good platform for us to learn from students of other faculties and how each can contribute to the healthcare landscape of Singapore."

*This article was first published on August 22, 2017 in NUS News at <http://news.nus.edu.sg/highlights/cross-faculty-students-unite-healthcare>*

# DOSSIER



The top three winners of MGC – “Hipportable”, “PDSafe” and “FootSense.”



"PDSafe", a device that helps reduce infections in peritoneal dialysis patients by allowing contactless sterilisation, won the second prize.



Former Indonesian president Dr Susilo Bambang Yudhoyono delivering the Keynote Address during the Welcome Dinner.

## RAFFLES DIALOGUE 2017 FOCUSES ON GLOBAL CONCERNS

The second edition of the Raffles Dialogue took place from September 4 to 6 at the NUS University Hall. Themed “Human Well-Being and Security in 2030: The Critical Role of Innovation”, the conference focused on the world’s most pervasive healthcare issues today.

Eminent opinion leaders congregated at the three-day conference to share insights and discuss novel approaches to tackling exigent global health concerns, such as managing infectious diseases in an interconnected world, financing research of neglected tropical diseases and chronic conditions, rethinking personalised care for the elderly and improving mental health and resiliency, among others.

The bi-annual event attracted over 100 local, regional and international participants as well as NUS Medicine students like Edward Lim Jianyang. The Phase III student attended the event despite his clinical posting and busy curriculum.

“It was centred around a topic that struck me greatly because I have always been interested in the field of innovation in medical technology. I hope to gain experience and insightful thoughts from the leaders in this field.”

Asked for his biggest takeaway from the conference, he felt that the talk about mindfulness by Associate Professor Jeremy Hunter, Founding Director and Associate Professor of Practice, Executive Mind Leadership Institute, Peter F. Drucker School of Management, USA was striking. “His key message was for us to compose our thoughts before making any rash decisions. It was a very powerful statement and served as a reminder to us as future doctors to always stay calm, and put our patient’s interest first before making any decisions.”

There were also medical students who participated in the event in other ways. Phase I student, Caitlin O’Hara volunteered her services at the event as a student liaison officer. Attached to a speaker, her role was to ensure the smooth settling in of the speaker during the conference. “I got to interact with her on a personal basis, where she shared with me her experiences in her area of work. It was very insightful. Aside from that, I also gained practical skills from the conference committee, such as effective workplace communications and the work that goes on behind the scene of a conference. It was a rare opportunity.”



## A BETTER WAY

Quicker, simpler, smoother, even cheaper. To foster a work culture based on quality, value creation, efficiency and continuous improvement, and to encourage staff to improve their productivity and excellence, the NUS Yong Loo Lin School of Medicine established the Organisational Excellence (OE) Unit on May 1, 2016.

A team of 25 staff – also known as Continuous Improvement Champions – was picked to undergo a Lean Six Sigma Foundation Course online, to help them tackle business problems and devise innovative solutions. The course was administered by the NUS School of Continuous and Lifelong Education (SCALE) in partnership with BMGI, a leading Lean Six Sigma course provider, and its certification is recognised internationally by the International Association of Six Sigma Certification (IASSC).

“The three reasons staff should embrace continuous improvement are self-development for career progression and mobility, to be able to simplify work through leveraging on technology or reducing red tape, and be recognised and valued by the organisation in the process,” said Mr Vickneshwaran Thangavelu, Head of the OE Unit.

The staff were awarded ‘Yellow Belt’ certificates at the “Let’s Celebrate Continuous Improvement” event held on July 31, 2017. The 12 staff who completed their CIP also received certificates at the event.

Three Continuous Improvement Projects (CIP) subsequently undertaken by 12 staff proved the merits of embracing the value of continuous improvement. These projects achieved a 60 to 82 per cent increase in efficiency in their work processes, shortened the work process by one day to about 26 days, as well as saved the School between \$530 to \$12,300 in terms of manpower cost per year. These time and cost savings meant that the departments could shift their focus to other key work areas.

### OUTCOMES FROM CONTINUOUS IMPROVEMENT\*

- ↑ **82%** efficiency
  - ↓ **46** days less work
  - ↓ **\$23,000** manpower cost
- \*Based on 3 completed CIP

For more information on Organisational Excellence, please write to Vickneshwaran at [medvt@nus.edu.sg](mailto:medvt@nus.edu.sg)

## PROF TAN CHORH CHUAN TO SPEARHEAD HEALTHCARE INNOVATION



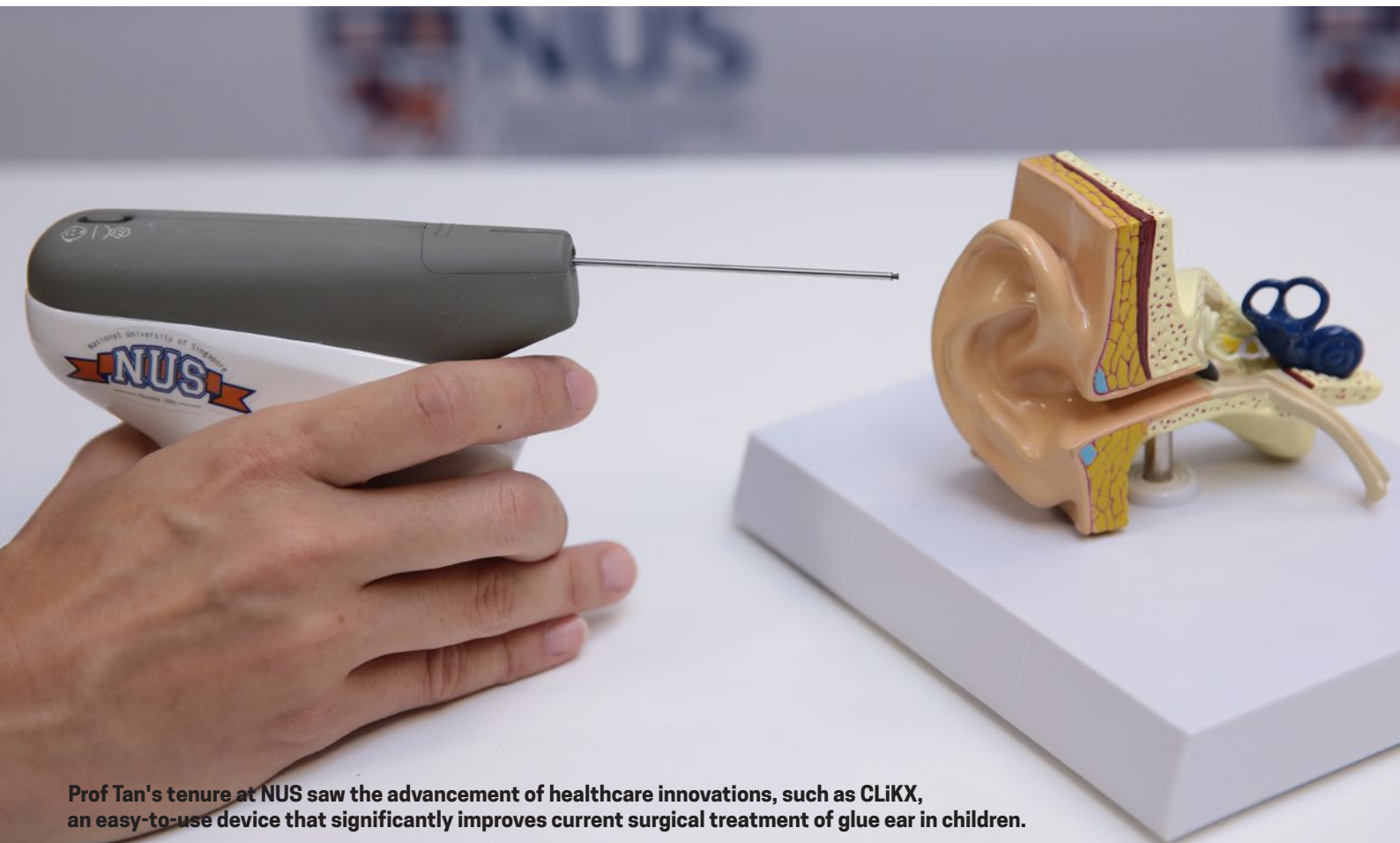
NUS President, Professor Tan Chorh Chuan will be helming the new Ministry of Health (MOH) Office for Healthcare Transformation as its founding Executive Director from January 1, 2018. He will also concurrently serve as MOH's Chief Health Scientist. This was announced by the MOH on September 4. Prof Tan will assume these appointments after he steps down as NUS President at the end of the year, capping an impressive 10-year term in which he transformed the institution into a leading global university.

Prof Tan will be playing an instrumental role in establishing the new MOH Office for Healthcare Transformation. The Office will identify and test-bed new concepts and innovations to promote the good health and well-being

of Singaporeans, as well as enhance the delivery of care to patients. Prof Tan shared that the new Office will focus on several critical areas, such as helping Singaporeans adopt health-promoting behaviours to prevent or delay the onset of chronic conditions; making home-based management a viable and effective care model for patients with chronic diseases; as well as providing more holistic inpatient care for patients with multiple medical conditions.

As MOH's Chief Health Scientist, Prof Tan will also lend his leadership, as well as wealth of experience in healthcare and research, in driving MOH's research and development (R&D), especially in the health and biomedical sciences. In his new role, he will oversee and strengthen the translation

## DOSSIER



**Prof Tan's tenure at NUS saw the advancement of healthcare innovations, such as CLiXX, an easy-to-use device that significantly improves current surgical treatment of glue ear in children.**

of research into concrete ways to better manage and treat diseases, as well as drive the development of novel therapies and more effective diagnostics.

**"IT HAS BEEN A UNIQUE PRIVILEGE TO LEAD AN INSTITUTION LIKE NUS AND TO WORK WITH SUCH TALENTED COLLEAGUES WHO ARE SO FIERCELY COMMITTED TO TRUE ACADEMIC EXCELLENCE AND INNOVATION."**

— Prof Tan Chorh Chuan, NUS President

Looking back on his tenure at NUS, Prof Tan said, "It has been a unique privilege to lead an institution like NUS and to work with such talented colleagues who are so fiercely committed to true academic excellence and innovation."

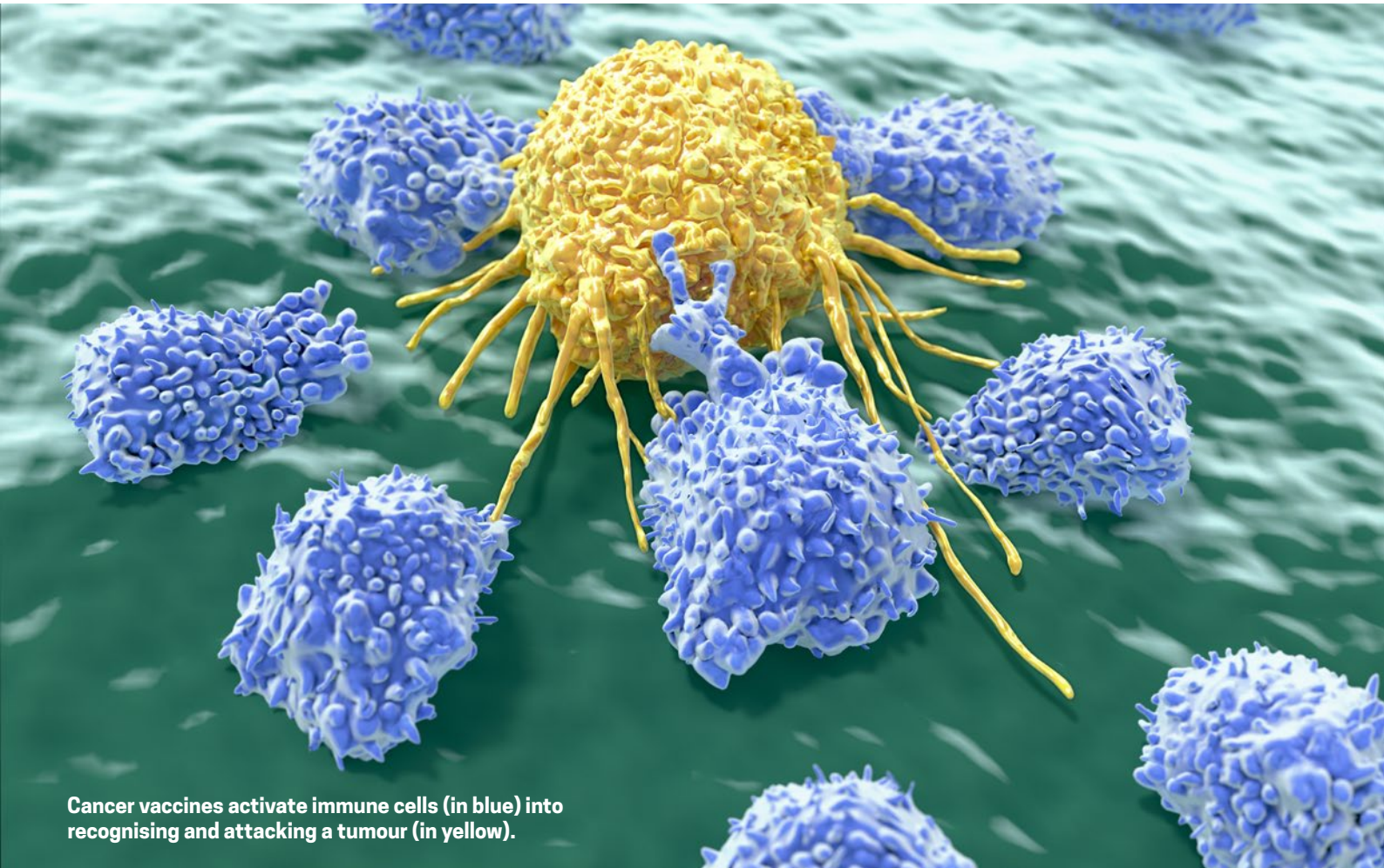
On his new MOH appointments, he added, "I am now deeply honoured to have this rare opportunity to contribute to the transformation of our healthcare system for the future. This is linked, in several ways, to the further growth of our strengths in biomedical research and their

application to address health issues of greatest relevance and impact for Singapore. In this regard, the concurrent appointments which I will hold at the MOH will therefore be highly synergistic."

This marks a return to MOH for Prof Tan, after his earlier secondment there as its Director of Medical Services from 2000 to 2004, where he led the public health response to the 2003 SARS epidemic and for which he received the Public Service Star award. Prof Tan has also been a front-runner in the Singapore healthcare system, having served in multiple leadership capacities, including as Chairman of the National University Health System since 2011, of which the NUS Yong Loo Lin School of Medicine, NUS Faculty of Dentistry and the Saw Swee Hock School of Public Health at NUS are members. He has been Deputy Chairman of the Agency for Science, Technology and Research since 2004. He is also the first Singaporean to be elected to the influential US National Academy of Medicine.

*This article was first published on September 4, 2017 in NUS News at <http://news.nus.edu.sg/highlights/prof-tan-chorh-chuan-spearhead-healthcare-innovation>*





Cancer vaccines activate immune cells (in blue) into recognising and attacking a tumour (in yellow).

## POTENCY AND POTENTIAL

By Dr Khor Ing Wei, Department of Medicine

In this final instalment of our series, we take a look at cancer vaccines.

Cancer vaccines work by activating the immune system to attack cancer cells. There are two types of vaccines – the first fights cancer that already exists, while the second type (more like the vaccines most people think about) protects against getting cancer or prevents the cancer from growing.

### THERAPEUTIC VACCINES

The first type of cancer vaccine (called therapeutic vaccines because they work against existing cancer) can take several forms. One version involves antigen-presenting cells (cells that present bits of foreign organisms to the immune system, priming it to recognise and attack these alien intruder). An example of this is sipuleucel-T (Provenge®) for certain types of metastatic prostate cancer; it is also the only U.S. Food and Drug Administration-approved cancer

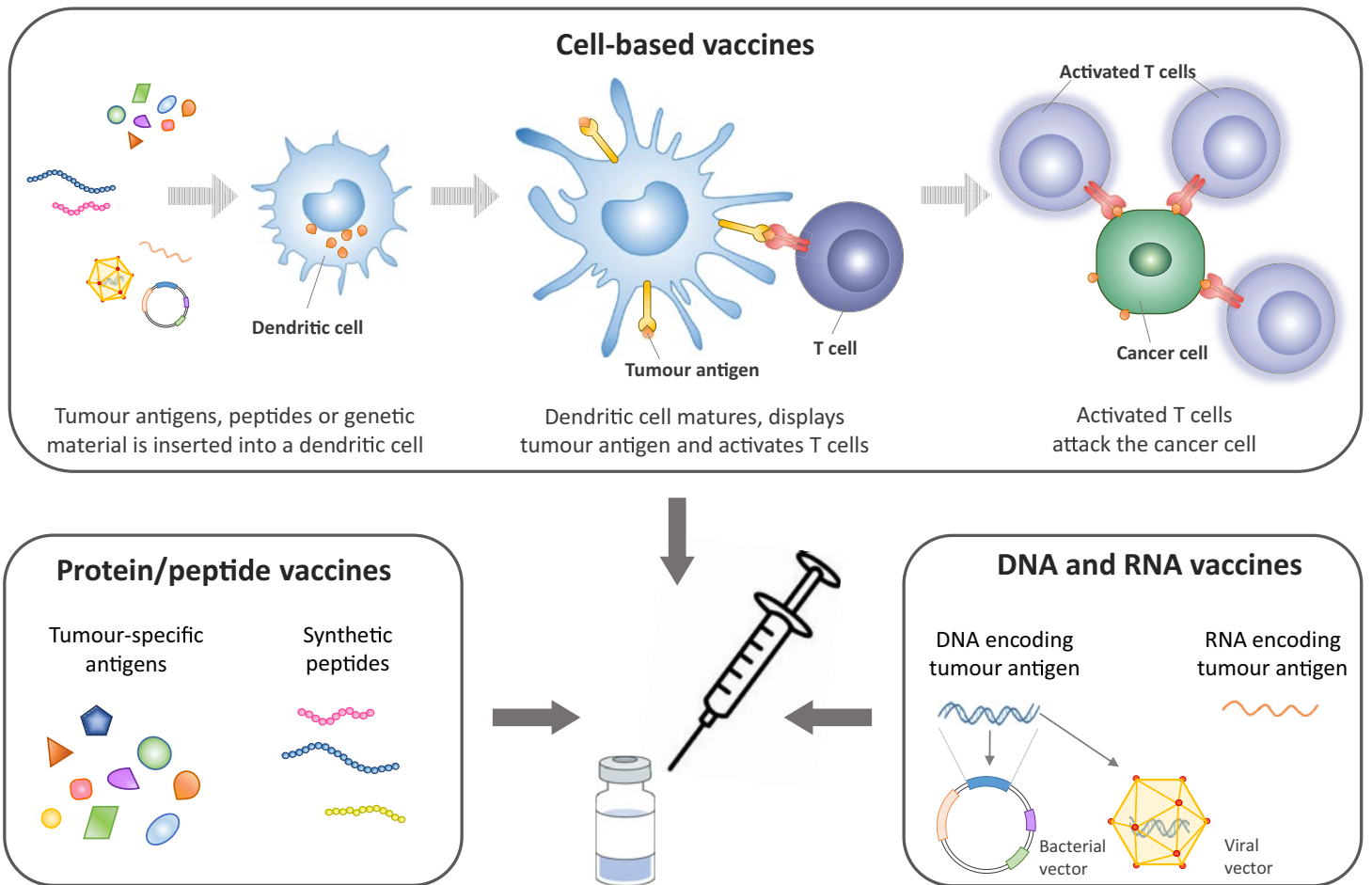
vaccine. Here at NUS Medicine, a vaccine developed by Associate Professor Herbert Schwarz, of the Department of Physiology is being tested together with Associate Professor Goh Boon Cher, Department of Haematology-Oncology, National University Cancer Institute, Singapore. This is being done through a phase I clinical trial for treatment of nasopharyngeal cancer.

Other forms of therapeutic vaccines are at different stages of development. For example, one promising vaccine consists of an extract from the ground-up tumour, which has the advantage of containing all of the different antigens in that specific tumour. This approach works best in melanoma, which is more easily recognised by the immune system than other cancers. Another vaccine uses peptides (short pieces of proteins) that are then presented on antigen-presenting cells. A third type of vaccine in development comprises genetic material (DNA or RNA) that is taken up by cells, which are instructed to make cancer-specific antigens to stimulate an immune response.

### PREVENTIVE VACCINES

The second type of cancer vaccine, preventive vaccines, involves either treating viral or bacterial infections that are known to cause cancer, or actually preventing the development of cancer itself.

**Figure: Different Types of Cancer Vaccines**



Graphics by Dr Koh Shimin Grace, Clinician Scientist Unit, NUS Medicine

Several treatments for infections are also effective at preventing cancer. For example, Gardasil prevents HPV infection and cervical cancer, HIV drugs prevent Kaposi's sarcoma, and H pylori drugs prevent gastric cancer. Preventive vaccines that act on the cancer itself are still unavailable, though the hope is that someday vaccines against cancers with very well-defined risk factors, such as BRCA1 or BRCA2 mutations that carry a high risk of breast cancer, will be added to clinical treatment options. Vaccines can also be developed that target cancer proteins normally present in childhood, but which are later lost in healthy adults, or seek out proteins found in early-stage cancer cells that are absent in normal tissue. This will train the destructive power of the immune response specifically to on to cancer cells, reducing side effects.

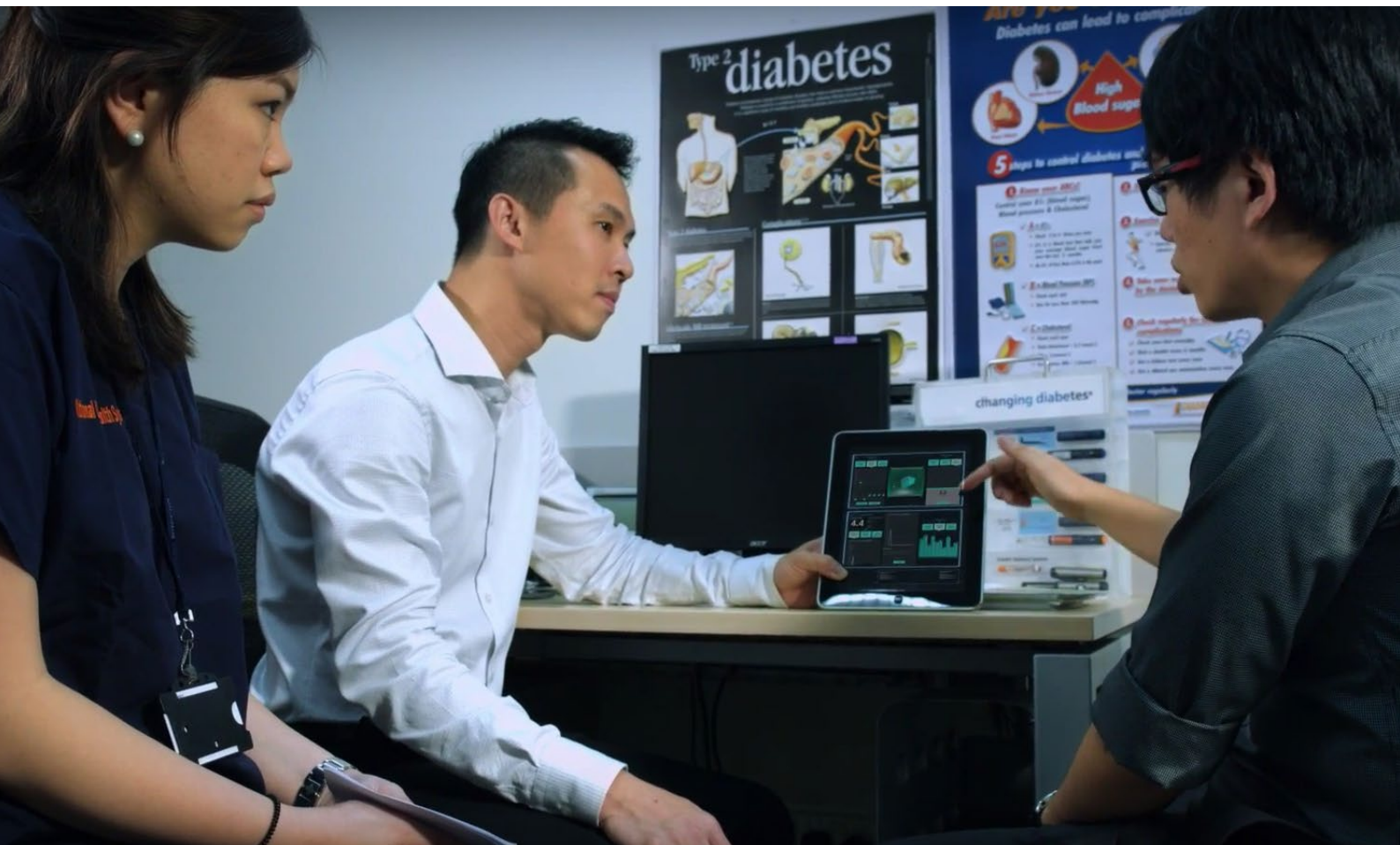
Unfortunately, the cost of cancer vaccines is high – four shots of sipuleucel cost \$100,000. Two promising cost-saving approaches have been proposed. One involves off-the-shelf production of antigen-presenting cells, e.g. a vaccine that can be used generally for Caucasians and another for Asians. These vaccines could target antigens that are present in greater amounts in many cancers, such as the telomerase antigen. The second approach is to generate antigen-

presenting cells in the patients themselves by injecting differentiating factors and tumour protein.

Thus far, the cancer vaccines that have been developed provoke relatively few adverse effects. These tend to be relatively minor, such as reactions at the injection site and flu-like symptoms. Says Assoc Prof Schwarz, "Right now, cancer vaccines are not associated with many side effects, but that could be because they are not very effective. In future, we should see more side effects as the vaccines become more effective."

Although serious side effects are uncommon with current cancer vaccines, one potentially fatal side effect is a cytokine storm, whereby the immune system is so strongly activated that an over-abundance of cell-activating proteins called cytokines is released, wreaking havoc in the body.

Like antibodies and cell therapy, cancer vaccines make use of the immune system to prevent and treat cancers. As more effective and affordable vaccines are developed, this type of immunotherapy will become an even more important weapon in the fight against cancer.



## FIGHTING A HIGHLY PREVALENT DISEASE IN SINGAPORE ON MULTIPLE FRONTS

By Dr Khor Ing Wei, Department of Medicine

In 2015, the Singapore Ministry of Health declared a “War on Diabetes.” However, the reality is that Singapore and the rest of the world had already been battling a growing diabetes epidemic for many years. The numbers are scary and the challenges multi-faceted. More than 11 per cent of Singaporeans aged 18 to 69 years have diabetes<sup>1</sup>, almost 3 per cent higher than the global prevalence for people aged 18 and above.<sup>2,3</sup> Another alarming fact is that Singapore has the highest rate of end-stage kidney failure due to diabetes in the world<sup>4</sup>. What’s more, diabetes as it manifests in Asian individuals is not the same illness that afflicts Westerners. It also tends to develop in Asians at lower BMI levels<sup>5</sup> – emphasising the need to understand the biological basis for diabetes in Asia.

For these reasons, the Metabolic Diseases Summit Research Programme (SRP) brings together experts in fields ranging from molecular biology to the behavioural sciences to tackle diabetes treatment on two main fronts: 1) developing new therapies for metabolic disease, and 2) transforming the delivery of care to optimise outcomes for patients living with diabetes. Led by Professor Tai E Shyong of the Department of Medicine, the Metabolic Diseases SRP also aims to drive academic excellence and train new clinician scientists.

As Prof Tai sees it, “The healthcare system needs to be transformed from the current model, which is primarily designed to provide episodic care, to one that effectively engages patients and optimises outcomes for people with chronic disease.”

### DEVELOPING NOVEL THERAPIES FOR METABOLIC DISEASES

The first aim of this programme will concentrate on developing therapies for three types of conditions that are inadequately addressed by currently available therapies (see Facts Box). Most of the research will focus on the early stages of the drug development process – identifying targets and validating their relevance to the biological mechanism of interest.

Novel biological targets are already being identified through analysing patient cohorts for genetic, metabolomic and

lipidomic (“omics”) changes associated with metabolic conditions such as insulin resistance. By validating these targets in human in-vitro models (e.g. human muscle cell cultures), the researchers can ensure the clinical relevance of the targets and subsequent lead compounds directed at them. Dr Liu Mei Hui, of the Department of Chemistry in the Faculty of Science (FoS), has already established several in-vitro models of human muscle, liver and breast. After this point, researchers in the programme will partner with pharmaceutical companies. The plan is for these companies to optimise the potential lead compounds and develop a drug that can be tested in first-in-man studies.

The drug development work will leverage on several unique shared capabilities at NUS Medicine. These include the Metabolic Phenotyping Core, which provides detailed characterisation of human metabolic parameters. The core is headed by clinician-scientist Khoo Chin Meng, an Assistant Professor in the Department of Medicine who studies different mechanisms of insulin resistance in Asian ethnic groups. Another platform is the Singapore Lipidomics Incubator (SLING), headed by Professor Markus Wenk of the Department of Biochemistry. The incubator can detect and analyse lipid profiles in health and disease. The omics research will generate an enormous amount of data, which the bioinformatics platform in the new Systems Biology Core can translate into useable information about new diabetes targets. Associate Professor Hyungwon Choi, of the Saw Swee Hock School of Public Health (SSHSPH), heads this core.

## TRANSFORMING DELIVERY OF DIABETES CARE

Even as the number of treatment options for diabetes continues to increase, the effectiveness of these therapies is still limited by how well patients adhere to them. The Metabolic Diseases SRP plans to apply behavioural science principles, including the use of incentives, apps, and more meaningful methods of communication, to improve provider and patient engagement. Associate Professors Rob van Dam and Joanne Yoong of SSHSPH, Associate Professor Leonard Lee of the School of Business, and Dr Yew Tong Wei of the Department of Medicine are spearheading these efforts.

Furthermore, as new diabetes prevention and care programmes are expected to be launched in the near future as part of the national war on diabetes, streamlining and coordinating these initiatives will be crucial. Here, applying healthcare data analytics can help to develop predictive algorithms to target care to patients for whom it will be most cost effective, and to improve care and outcomes for those patients who do not respond well to initial treatment.

Research in this area will be performed by Assistant Professor Tan Chuen Seng, Dr Kavita Venkataraman, and Dr Morning Feng (all from SSHSPH), as well as Assistant Professor Wee Hwee Lin (Department of Pharmacy, FoS) and Dr Ngiam Kee Yuan (NUS Academic Informatics Office).

Currently, diabetes robs many people of years of life and health. By tackling key aspects of diabetes treatment using a variety of approaches, the Metabolic Diseases SRP aims to improve outcomes for people suffering from this common chronic disease.

## Facts Box

### In development: novel therapies that address key unmet needs in metabolic disease

#### 1. Glucose-lowering drugs

- To treat insulin resistance (a precursor to type 2 diabetes). Such medications have the potential to control diabetes without causing hypoglycaemia as well as protect beta-cell function and lower CVD risk.
- To treat non-alcoholic fatty liver disease

#### 2. Nutritional therapies to prevent or treat type 2 diabetes

#### 3. Therapies to prevent or slow the progress of diabetic kidney disease

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# VITAMIN E ISOFORM $\gamma$ -TOCOTRIENOL MAY HELP PROTECT AGAINST EMPHYSEMA IN COPD

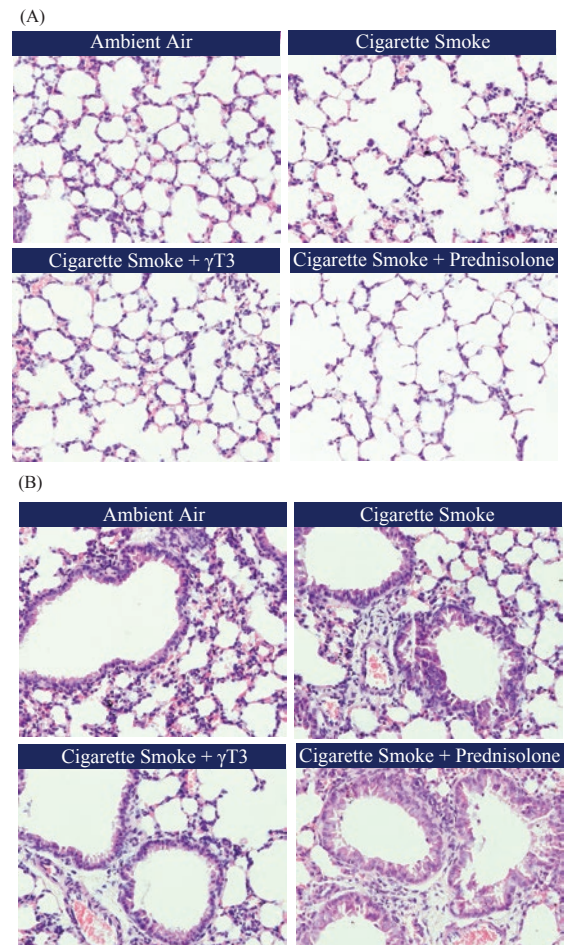
By Dr Peh Hong Yong &  
Associate Professor W.S. Fred Wong  
Department of Pharmacology

Vitamin E can be found in vegetables, fruits and plant oils, and is widely recognised for its antioxidant property. There are a total of 8 isoforms of vitamin E, namely  $\alpha$ -,  $\beta$ -,  $\gamma$ - and  $\delta$ -tocopherol, and  $\alpha$ -,  $\beta$ -,  $\gamma$ - and  $\delta$ -tocotrienol. In its pure form, vitamin E is a yellowish viscous oil that oxidises readily when exposed to light and oxygen. All along,  $\gamma$ -tocopherol is perceived to be the active antioxidant isoform for vitamin E. However, we have found that the  $\gamma$ -tocotrienol form of vitamin E is more effective than  $\gamma$ -tocopherol in neutralising free radicals in the lungs.

Chronic obstructive pulmonary disease (COPD) is characterised by airway inflammation, airway remodeling and emphysema, leading to chronic cough, breathlessness and impaired lung function in patients. The prevalence of COPD is increasing, with a global burden of over 600 million patients worldwide, with approximately three million deaths annually. It is currently the fourth leading cause of death worldwide, with cigarette smoke as the leading risk factor for COPD. Cigarette smoke contains massive amounts of oxidants on its own (~1015 radicals per puff), resulting in oxidative stress and inflammation in the lungs. We hypothesised that the  $\gamma$ -tocotrienol form of vitamin E can mitigate inflammation and oxidative stress in COPD.

Indeed, in a cigarette smoke-induced experimental COPD animal model,  $\gamma$ -tocotrienol was found to be more effective than corticosteroid drug (prednisolone) in reducing neutrophil counts and pro-inflammatory mediators like IL-6, IL-17, G-CSF, and GM-CSF in the lung lavage fluid. MUC5B is the main mucin glycoprotein responsible for mucus production in COPD, and  $\gamma$ -tocotrienol attenuated MUC5B gene expression in the lungs. In addition,  $\gamma$ -tocotrienol was better than corticosteroid drug in relieving oxidative DNA, protein and lipid damage in the airways, by effectively neutralising free radicals and restoring endogenous antioxidant capacities. Moreover,  $\gamma$ -tocotrienol protected against emphysematous destruction of alveolar sacs, and improved lung functions (e.g. total lung capacity and FEV100/FVC) in the COPD model. We reported our findings on June 30 this year in *Free Radical Biology and Medicine*, a top cited journal in its field.

These findings provide new insights into the beneficial effects of  $\gamma$ -tocotrienol form of vitamin E in mitigating lung inflammation and oxidative damage, prevention of



emphysema development, and improving lung function in COPD. The next step of our research is to verify these protective benefits of  $\gamma$ -tocotrienol in COPD patients. If proven effective clinically,  $\gamma$ -tocotrienol may potentially delay disease progression, improve patients' quality of life, and reduce COPD deaths.

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IN VIVO

# HEALTHCARE IN THE HIMALAYAS

JONATHAN LEONG, PHASE IV MEDICINE STUDENT,  
WRITES ABOUT SPENDING A SEASON WITH AN  
INTERNATIONAL MEDICAL TEAM CARING FOR  
VILLAGERS IN THE HIMALAYAS.





A sense of adventure was in the air as I embarked on my first elective. I had wanted an elective experience that would allow me to keep in touch with medicine, take me out of the safe learning environment that is the Singapore healthcare system, and also take me on a journey of self-discovery. With the help of a close friend and some fine Googling skills, I stumbled upon the perfect elective – one that let me achieve the objectives, and then some.

The Himalayan Health Exchange (HHE) Pangri Valley programme transported me to the colossal Himalayan mountain ranges of Zaskar and Pir Panjal in the northern Indian region of Himachal Pradesh. Clinics were held in a number of villages and settlements in the area. The month-long medical and dental expedition gave participants a rare opportunity to not only trek through the beautiful and relatively unknown Himalayas, but also experience the culture of a land visited by so few.

I found myself in the company of 20 Americans, four Brits, two Indians, three New Zealanders and a team of 14 local guides and cooks. This was the group I had the pleasure of spending a whole month with. Our typical day started with an eight-hour clinic session (during which we hiked back and forth from our campsite) and ended with a tutorial given by the doctors or students.

We saw about 200 patients each day. These patients trek anywhere between one to four hours to reach our clinic, which was supported by a huge mobile pharmacy where we had access to a multitude of drugs. Time was not on our side, no thanks to a high patient load. And how could we refuse to see any of these patients who had travelled so far to see us? These villagers have little access to good healthcare due to the remoteness of the region, and the area is impassable during the non-summer months as the snow is too dense.



AS PATIENT AFTER PATIENT SAT BEFORE MY TEAM, I WAS REMINDED OF THE INTIMACY OF A DOCTOR-PATIENT RELATIONSHIP, AND THE POSITIVE IMPACT OUR TREATMENT CAN HAVE ON THEIR LIVES.

The conditions that we saw spanned just about every medical specialty and varied in severity. Senior medical students were assigned to mixed groups and together, we clerked, examined, and presented the cases as well as our proposed management plans to our attending consultants.

It was a struggle to take good histories. The language barrier was a considerable hindrance, even with translators around. We realised the futility of the usual open-ended approach to extract large amounts of information and discarded it in favor of a more efficient questioning

system. We had to formulate new approaches that lent themselves to one-word answers or phrases.

Overall, these clinic sessions proved to be the complete learning experience. The myriad of conditions presented by the patients as well as the questions asked by the first-year students tested my approaches and understanding of medicine. It was also a good opportunity to be taught by doctors hailing from the United States and the United Kingdom. After quizzing me to no end, they provided me with different perspectives and unique insights that I would certainly find useful in the future.

My modest grasp of English will never capture the beauty of the Himalayan mountain region in all its splendor. I woke up to beautiful snow-capped mountain ranges that never seemed to end, trekked through diverse terrain (cliffs, forest trails, even a glacier!), and sat at a campfire underneath a star-lit sky. Practicing medicine amid such marvelous scenery was a wonderful change from the usual four walls of a clinic and the sombre environment of the wards.





Apart from learning more about medicine, I also found out more about both Indian and Nepalese culture from my guides, as well as American and British culture from fellow medical students. It was an inevitable part of being in a multi-national team. Quoting one of the veteran expedition doctors who has done expedition medicine in almost every environment, "everyone who signs up for this sort of trip, is an interesting person". Hearing their life stories broadened my worldview in a way that no other trip could have done.

This trip also reaffirmed my resolve to practice medicine in the future.

A medical expedition does suffer its fair share of limitations. We serve but a fraction of the wider population, we are not able to provide adequate long-term care despite the construction of a few permanent clinics by HHE, we do not have access to advanced medical imaging like CT and MRI, and we are unable to provide possibly life-saving surgery.

Despite this, I still found meaning in what we did, and in practicing medicine. As an average physician or surgeon,

THE TRIP WAS A TIMELY REMINDER THAT AS DOCTORS, WE MAY NOT ALWAYS BE ABLE TO CURE OUR PATIENTS, WE MAY NOT ALWAYS BRING RELIEF, BUT WE CAN ALWAYS BRING THEM COMFORT JUST BY LISTENING TO THEM.

making a difference to society is a tall order, making an impact on the world at large is nearly impossible. Maybe a career in politics or engineering might serve these goals. But as patient after patient sat before my team, I was reminded of the intimacy of a doctor-patient relationship, and the positive impact our treatment can have on their lives.

The trip was a timely reminder that as doctors, we may not always be able to cure our patients, we may not always bring relief, but we can always bring them comfort just by listening to them. We can make a difference to the lives of the patients who come to us, no matter how small their concerns. This is a lesson I will keep close to my heart, whatever the future may hold.

# I. THE FUTURE OF MEDICAL EDUCATION

By Professor Hooi Shing Chuan, Department of Physiology  
Dr Dujeepa Samarasekera, Centre for Medical Education &  
Dr Terry Pan, Department of Anaesthesia

## IMAGINE ....

The year is 2026. It is 7.30am during a typical day in the life of a 1<sup>st</sup> year medical student, somewhere in the world....

“Good morning P.A.T! Tell me what my learning schedule is today...”

P.A.T. stands for Personalised Augmented Tutor and is introduced to us on the first day of medical school. Together with our tutors, P.A.T. ensures an active and seamless medical education for budding medical doctors.

“Good day TP, today you will continue to learn about the cardiovascular system...”

P.A.T. gives an overview of the learning objectives, key learning points, essential skills and knowledge which I need to acquire (eventually) and a summary of my day’s activities.

“You will start by talking to Mrs Lee in Ward 24. She has a history of heart conditions and was recently admitted because of increasing breathlessness.”

P.A.T: “Would you like me to download your learning material?”

“Yes please...”

I spend the rest of my journey to school re-watching a short interactive video on how I can take a focus cardiac history from a patient.



Arriving at the clinical training site, I meet up with my peer group after seeing Mrs Lee in the ward. For the next two and a half hours, we review our learning materials, which is based on our interaction with our designated patients, together. Each member of the team interacts with P.A.T. which summarises key learning points for us. Based on my scores and the way I enquired and answered the questions, P.A.T. is able to accurately identify areas I need to improve upon. A detailed plan to get me up to scratch is then formulated. During the session, we also clarify our queries and doubts with each other. Throughout this period of time, we know that our tutor is on hand to answer any questions which we may have.

We spend the last half hour answering specially crafted questions together as a group. These questions generally focus on application of knowledge and answering them is a good way for us to know if we have truly grasped the essential concepts. P.A.T. again is with us and easily accessible to provide feedback on our answers. After the peer group learning session, we proceed to join the emergency medical response team as junior team members.

This experiential clinical learning is scaffolded, i.e. scaled to progress from the basics to the complex. Although I would very much like to get into the thick of the action, the focus of the formative years in medical education is to observe and learn as I gather the required knowledge and skills. After the clinical attachment, I then “prove my worth” by demonstrating my competencies in a virtually simulated environment. I can then join the medical team in “real” clinical care as a junior member to gather more experience, something I am very much looking forward to.

The rest of the day is spent on self-study and part-task training. I get to practice my central line insertion on ultra-real simulators and P.A.T. guides me along the process. Throughout the practice, I am shown relevant anatomical information which I need for this skill. I get to practise this skill in my own time and will progress to setting a CVP on a real patient when I have fulfilled the requirements as stated in an Entrustable Professional Activities (EPAs) document (administered by P.A.T.). My first insertion of CVP on a real patient will be supervised by my clinical tutor and I believe I will be able to do a good job with the kind of medical training I am receiving.

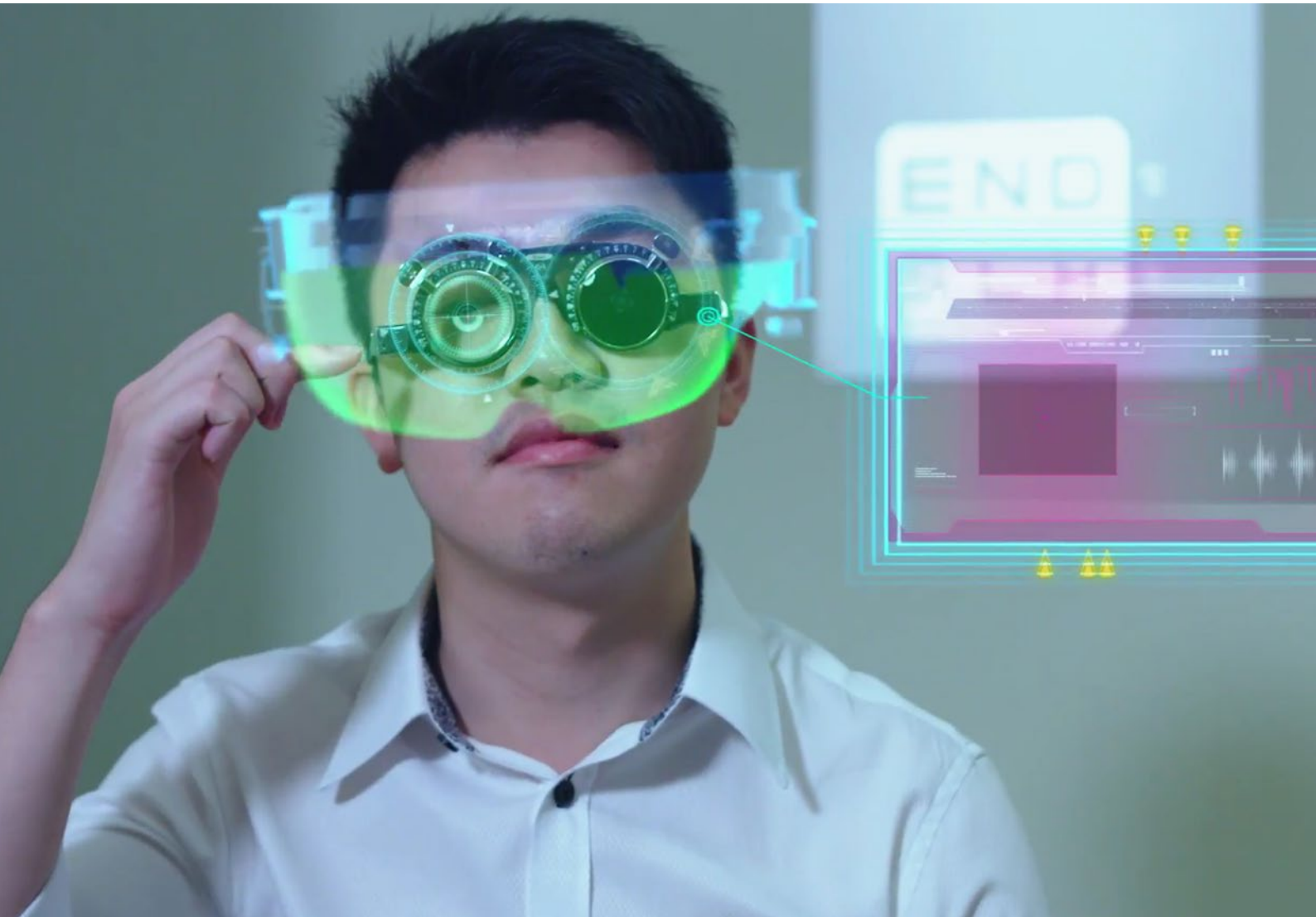
During the evening, as I am doing my self-learning, I get a call from a fellow classmate. He is intrigued by a “discovery” he made of the blood supply to the heart and is keen to show me on a 3D virtual model of the heart. Through my Augmented Reality (AR) glasses, I am able to interact with him and tilt the AR heart model to see exactly what he means, even though we are physically at different locations.

“Time to take a break, TP...” reminded P.A.T.

“It looks like you have had quite a fruitful learning day.”

“Yes, I did... please help me put a mental note on what I need to revise tomorrow. I am also going to write a short reflection before I go to bed.”

“That’s great TP. Have a good rest and we can start afresh tomorrow morning!”



## II. FUTURE PERFECT

*In an article published in Issue 22 of MediCine, we imagined what medicine and healthcare might look like in the not-too-distant future. In this article, we explore the medical education required to complement this future healthcare system.*

### 1. PERSONALISED MEDICAL EDUCATION WITH THE HELP OF ARTIFICIAL INTELLIGENCE

We learn differently. Each of us has our own unique way of learning and acquiring information – how we process information, retrieve prior knowledge, and adding on to them, before embedding them into our long-term memory (cognitive load theory). With the advent of technology, much of the information can be stored in “external hard drives” which may serve as repositories and extensions of our internal memory. We need the relevant triggers and links to draw out this information, which is tailored for the individual. Through the use of artificial intelligence enabled

chatbots, students may have just in time learning via mixed reality portable and mobile devices.

It is now known that machines can be taught to learn. Some disciplines such as Computing and Engineering are already using ChatBots as teaching assistants. (<https://mishtalk.com/2016/05/16/teachers-assistants/>) and students have found it hard to distinguish a virtual tutor from a real one. In such a learning environment, students will no longer be confined to classrooms and will be active through the use of technology that assists them to visualise basic biomedical and clinical entities, while giving access to the best learning material sourced by super computers. Appropriate use of artificial intelligence will ensure that these learning materials are customised to the individual student’s level of understanding.

Faculty tutors, with the help of A.I., will be able to monitor students’ learning development closely as they interact with the material presented with increasing complexity. This would reduce the need to group students in batches as well as conduct hugely resource-intensive examinations.

These concepts align well with constructivist learning principles, where adult learners construct their own learning based on prior experience and interaction with peers and the learning environment. This is a powerful learning approach, which current “mass market” medical training will never be able to achieve effectively.

With personalised medical education, it is important to determine the key roles which define medical doctors and healthcare providers and the core competencies which are required for each role. The recent movement towards Entrustable Professional Activities (EPAs) may be a step towards this. An Entrustable Professional Activity is a set of activities which a qualified medical doctor can be entrusted to perform independently. Clear descriptions of EPAs, with the underlying required competencies, can form the backbone of future medical curriculum. EPAs can be the targets which medical students work towards and also be the assessment criteria for competencies achieved.

## 2. MEDICAL SCHOOL WITHOUT “BORDERS”

With the advent of the internet and the digital age bringing about unparalleled connectivity and digital repository capabilities, which are highly accessible and scalable, a medical school with no borders is a distinct possibility. With such disruptive changes to healthcare, the training of health professionals will also need to evolve and transform. The student or the resident, based on his or her individual capabilities, could transition seamlessly from one phase to the next, ensuring efficiency in time and resource. By being borderless, the learner can collaborate with peers, seniors and teachers not only in his or her locality but globally, tapping into leading edge expertise within that discipline. Already, it is possible for two learners who are physically separate, to interact purposefully with a shared learning medium. In the near future, it is very likely that surgical procedures are undertaken at a particular location, with real-time guidance (verbal and actual tactile guidance through the use of advanced robotics) provided by experts far away.

These are all disruptive changes, which will change the future design of the medical schools as well as specialty training. AI-enabled humanoid robots can help with repetitive training in a safe environment to refine physical examination techniques, procedures (especially the more invasive or painful ones) and difficult communication such as breaking bad news. This deliberate practice will help students and trainees interact effectively and gain confidence with patients at their own pace. With clear outcomes and an adaptive and personalised teaching and accreditation system, future students may truly be able to be free from time-based education and be accredited at different times relevant to their own progress.

We need to rethink how we would design health professional training programs and retrain faculty to add value to 2050 health professional education!

## 3. ROLE OF EDUCATORS – GETTING READY FOR THE FUTURE

Technology will play a major role in future medical education and the adoption of technology in healthcare education needs to be by design. Faculty needs first to review the curriculum and identify current gaps and shortfalls in the current teaching and assessment. Some of these gaps may be addressed by technology adoption. When dealing with large groups of learners, appropriate use of artificial intelligence may help medical educators better tailor their efforts to individual learning, while also helping teachers to predict and identify potential at-risk students and provide necessary guidance. Digital technology may also be helpful in linking prior knowledge to current practice, explain hard-to-understand concepts through visualisation, and providing instant access to curated up-to-date resource material. A blended learning approach ensures that advantages of both face-to-face human interactive teaching and technology-enhanced learning are optimised in the complex healthcare learning. Furthermore, tutors with technological capabilities will develop new material to be uploaded and distributed amongst the learners. This group will have both the domain knowledge and specialist skills in areas such as coding, computing and big data analysis. In essence, the tutor helps the learner “deep dive” into the realms of healthcare practice.

The desire to provide quality and safe healthcare to our patients should always be at the heart of our healthcare education. As educators, we play key roles in training and shaping the younger generation of healthcare providers. This needs to be done with an open and adaptive mind, with genuine and collaborative communication, especially in the face of ever-changing technological advances in healthcare provision. Higher administration within a school also plays a crucial role in providing adequate support and resource in this transformational process. Together we will be able to continuously achieve quality and empathetic healthcare education with the appropriate and purposeful adoption of technology.

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Shanisse volunteering at the annual Neighbourhood Health Service.

## MORE YOUNG SCHOOL LEAVERS DRAWN TO NURSING'S NEW HORIZONS

Shanisse Seah knew she wanted to be a nurse when she was 16. Then a Secondary 4 student at Dunman High School, she and her classmates were asked to research their options for University education during a careers fair.

She narrowed her choices to Nursing and Social Work, as she wanted a career that allowed her to use her skills to help the vulnerable in society.

It was a tough choice, but she picked Nursing over Social Work. "I read the curriculum for Nursing and found that the course equips me with a wider repertoire of skills to help others. Nurses look after patients' physical and mental health, so I'll get to do what social workers do as well," she said.

Shanisse is one of the 2,200 school-leavers who applied to study Nursing at the NUS Alice Lee Centre for Nursing Studies (NUS Nursing) in the latest academic year, an increase from 1,730 applications two years ago. She is also one of the 630 applicants who listed nursing as their first choice, compared to about 375 two years ago.

In August, she joined a cohort of 235 freshmen who started their Bachelor of Science (Nursing) studies at NUS. This is the largest intake of nursing students in the history of the programme, the intake having been increased from 155 students last year to cater to the higher demand for nursing places.

Professor Emily Ang, Head of NUS Nursing, said she is happy to see more school-leavers like Shanisse pursuing an NUS Nursing degree. "The programme provides evidence-based education, inter-professional training, and various aspects of the course that will equip graduates to be competent, confident healthcare professionals," she added.

### THINKING NURSES

The NUS Nursing pedagogy also aims to groom "thinking" nurses and develop future nursing leaders who can take on key roles in hospitals and clinics, said Prof Ang. Student nurses said these expanding roles and the promise of the profession's



wide career horizons are among nursing's biggest draws.

But not all members of the public see nursing as a challenging and fulfilling career. Many students said they had to surmount parental objection and doubts from their peers when they chose to study Nursing, which is still perceived by some as a low-skill, menial job.

Shanisse recounted that when she informed her parents of her intention to take up Nursing studies, she faced resistance as they preferred her to take Social Work instead. "They saw nursing as a tough job and did not want my health to suffer from shift work and exposure to germs and viruses. My father was also afraid that witnessing death would affect me emotionally," she explained.

But her conviction remained strong, and she spent the next two years chipping away at her parents' mindset that nursing was a thankless job without due reward. "I would frequently express my excitement at being able to work in the hospitals, and when I read an article in the newspapers on how the profession has advanced, I would cut it out and read it to them. I told them that nursing is

now different from what they know in their time - we have both autonomy and vertical career progression in our job."

**STRONGER PROSPECTS**

She also brought her parents to the NUS Nursing booth at the NUS Open House earlier this year, so that they could speak to the lecturers and staff about the profession's career progression and salary prospects.

Last year's graduate employment survey saw nursing graduates start off with median monthly salaries of \$3,500 for those with honours, and \$3,400 for those without honours - higher than the \$3,360 median salary for graduates across all degree programmes. Nursing students also have one of the highest employment rates in the market - currently at 95 per cent for students with Honours degrees.

That sweetened the deal and her parents finally gave Shanisse their blessings. Today, she is enjoying her degree studies at NUS Nursing. "I hope to be a competent nurse who is genuine in listening to my patients' stories and who is able to form lasting relationships with them," she said.

# A THIRST FOR HELPING PEOPLE LED SCHOLAR TO NURSING

*Delphine Chen, a Year 2 Nursing student at the National University of Singapore (NUS) Alice Lee Centre for Nursing Studies, and a beneficiary of the Thio Kok Foe and Choo Kim Beng Nursing Scholarship, shares how her journey led her to NUS.*

## **WHY DID YOU CHOOSE TO STUDY NURSING?**

It's interesting how it happened. I chose to study mass communications at Ngee Ann Polytechnic because I like communicating and interacting with people. After I graduated, I worked as a marketing executive. I found the work exciting but I wanted to use my free time to do something meaningful, so I started volunteering at a hospital near my house on weekends. I found myself enjoying the work very much. I volunteer for the mobile library group in which we distribute donated reading materials to patients and interact with them. I felt a kind of meaningfulness when I interacted with them and when they showed appreciation for my service.

I felt like I was making a difference to their time there and I started thinking more about my career choice. I thought long and hard about it and was worried about whether I was making the right decision and if I could handle the finances. But my mother encouraged me and that was when I decided to take the plunge and apply for nursing at NUS.

## **WHY DID YOU APPLY FOR FINANCIAL AID?**

My parents are divorced and I live with my mum. Naturally, finances are very tight. When I was studying at the polytechnic, I worked part-time to cover my expenses and it was not easy as a student. I always knew I wanted to go to university but, after graduation, I had to start working first to pay off my polytechnic tuition fee loan. When I finally decided to apply to NUS, I knew that I needed financial aid to help me with my school fees.

## **HOW HAS THE SCHOLARSHIP HELPED YOU?**

I was really relieved to receive the Scholarship in my second year of study. I didn't have to take an allowance from my mother anymore and I could worry just a little bit less about how the family will cope. It has also further affirmed my decision to come to NUS.

## **WHAT HAS STUDYING AT NUS TAUGHT YOU?**

I learnt the values of empathy and reflection during my course of study. Apart from having to remember a lot of details, we also have to learn to think critically in different situations. There is no fixed rule on how a situation is presented to you and a lot of different factors come into play and not everything will come directly from textbooks.



For example, when a patient refuses treatment, we tend to first make a judgement and think it's the wrong decision because we care for the patient and want the best outcome for them. But if you pause and study the situation, have empathy and put yourself in others' shoes, you realise there could be so many reasons behind certain behaviours. For example, they could be worried about the costs, or about the quality time they can spend with their family after receiving the treatment. After every incident, I reflect on how I handled the matter and how I could have managed it better.

## **HAS RECEIVING THE SCHOLARSHIP INFLUENCED YOUR THINKING IN ANY WAY?**

There must be this one person who thought to give in order for this other person to be able to receive and benefit. In my case, it was Dr Della Lee who set up this Scholarship in honour of her parents. I am very grateful to her and I now realise how important giving is. Giving to receive adds value to our life. I want to do my part one day to help others in the future.

**For information on making a gift to NUS, contact us at 1800-DEVELOP (1800-338-3567) or email [askdvo@nus.edu.sg](mailto:askdvo@nus.edu.sg)**

*This story was first published on January 27, 2017 on NUS Giving at <https://nus.edu/2xotf8f>*



## THE WAY OF THE EMPTY HAND

When Associate Professor Too Heng-Phon slipped and fell over the sidewalk at the NUS Business School more than 10 years ago, he made a life-changing decision to join his friend in a karate class.



“IF YOU LEARN SOMETHING,  
YOU LEARN IT FROM THE  
MASTERS.”



Assoc Prof Too and students.

As a teenager, the biochemistry professor practiced qingwu (a type of Chinese martial arts) from his uncle who was a master back in Malaysia, but stopped after he went to the United Kingdom to further his studies. The slip brought him up short.

“I thought, that’s not me. It’s always one of those things – you think you’re still in condition, but then suddenly you realise, no you’re not. So that’s something of a tipping point,” said Assoc Prof Too.

He joined the Ken Yu Kai Karate Association Singapore to learn the Shitoryu style of karate, one of the four major styles of karate in the world and founded in 1934 by karateka Kenwa Mabuni. Assoc Prof Too belongs to the fourth generation of students learning the Shitoryu karate style from a 75-year-old shihan (master instructor) Ishikawa.

“If you learn something, you learn it from the masters,” he said.

Art imitates life: starting his karate journey was not a breeze as he struggled to muster the moves, just as he battled to get his biotech company off the ground. (The Warrior’s Way to Biotech Success, MediCine, August 2017)

Assoc Prof Too unknowingly infused the moves he picked

up from qingwu into karate, and his sensei had to keep telling him to un-learn the qingwu moves as they were interfering with his progress. It took him months before he was able to adapt to the new style.

After a decade of training, Assoc Prof Too is now a second dan black belt. But he believes he still has a long way to go.

### **BLACK IS FOR BEGINNERS**

“When you get the black belt, that’s when you begin to learn. You start learning to do the little movements correctly, because it will be embarrassing if you don’t know how to do execute them. You are filling the gaps you thought you knew,” he said.

Outside of his teaching and research work, Assoc Prof Too dedicates three days each week to practising and teaching the martial art to children and adults. He is also the vice-president of the Ken Yu Kai Karate Association Singapore. Pressed, he confesses to a preference to learning from other karatekas rather than teaching.

“When you teach a class, you teach (the students) your style. When you follow (other teachers), you learn new styles. To me, there are always endless things to learn,” he said. It’s this endless quest for knowledge and understanding that draws the man to karate and keeps him practising. Its



**The Sensei is no match for his students.**

philosophy has influenced and shaped all aspects of his life. “When you take up karate, it’s not a matter of trying to hurt somebody. In fact, you don’t want to hurt anybody. We have a lot of moves to stop people from attacking. It’s a good philosophy, which we are trying to teach young people to do the same – don’t fight. It’s a good thing to instil in the young ones to know their strengths and abilities, and yet choose not to hurt,” he said.

### **KARATE IS GOOD FOR YOU**

Assoc Prof Too is now a changed man because of the virtues karate instilled in him.

“Karate taught me discipline, in work, in life, and in play. Sometimes you make a lot of excuses for a lot of things. There are a couple of times I am totally taken in by work, and I come to class and we have kumite (freestyle fighting), and I get hit many times. Then I realise I have to focus. This focusing power is good, it helps you to put things away. In karate, you basically live the moment. It’s not just fighting alone, the discipline calms me down, gives me perspective, and it centres me. To me, this is very valuable,” he said.

Assoc Prof Too’s love for karate extends beyond his dojo (karate school).

Since his only child Zackaria Tusqa Too was eight years old, Assoc Prof Too has been coaching him in karate. Now, the 13-year-old has progressed to a brown belt.

“At home we do a lot of katas, and I teach him kumite. My wife always complains about the grunts and yells that accompany our moves,” he said.

Assoc Prof Too believes that karate is a sport for everyone, even senior citizens.

“The good part about karate is that there are many levels, so you don’t have to learn to do all the fancy moves. Senior citizens can learn it in their own way. So I will encourage everyone to pick it up and just do what they can. It’s not doing something good for your heart alone, you learn a skill. For older folks, that’s very important,” he said.



## TRANSFORMING HEALTHCARE – THE ROLE OF FAMILY PHYSICIANS AND THE PRIMARY CARE SECTOR

By Dr Tham Tat Yean, Adjunct Assistant Professor  
Department of Medicine

In a speech addressing medical students at the 1st National Medical Students Convention on August 26, 2017, Associate Professor Benjamin Ong, Director of Medical Services (DMS), Ministry of Health, spoke about the evolution of our healthcare system, our country's changing healthcare needs and healthcare models, and its relevance to medical students today<sup>1</sup>.

### THE PAST, PRESENT AND FUTURE

Assoc Prof Ong highlighted that the push for medical specialisation in our country started from 1970 onwards. From that time, hospital infrastructure and sophisticated medical equipment have progressively been introduced and developed. Today, the presence of a hospital-centric healthcare system is obvious to many of us, even though

our government has also invested in public polyclinics (the primary care arm of the public healthcare system).

The disease burden has gradually evolved over decades from the predominantly communicable disease patterns to increasing numbers of chronic diseases like diabetes mellitus, ischaemic heart disease, chronic kidney disease, stroke and dementia. With a rapidly ageing population and the projected increase in chronic disease burden, Singapore faces a serious challenge in meeting the growing health needs. It is now well established that the solution cannot be based on a hospital-centric model of care.

Assoc Prof Ong further stated the “need to shift our healthcare delivery model from one that is centred around the hospital, to one that provides holistic and patient-centric care in a more sustainable manner, in the community”. This means primary care and family physicians will play increasingly important roles in the country's healthcare transformation journey.

In addition, a press report<sup>2</sup> of an interview with the deans of the three medical schools here reported that “Singapore needs more doctors who are “generalists” rather than specialists”. By “generalists”, the deans were referring to physicians trained in family medicine, internal medicine, geriatrics and palliative care. Clearly, these disciplines are essential in Singapore's ageing population where the elderly are likely to be afflicted with multiple health issues. In future, we need more physicians who can deal with a

wide range of medical conditions in a patient and who can focus on treating the patient as a whole.

## **THE IMPORTANCE OF PRIMARY CARE - WHAT DOES THE EVIDENCE SHOW?**

Increasingly, primary care is viewed as playing a crucial role in providing holistic care for the patients even as we try to shift healthcare beyond hospitals into the community.

In a landmark paper by Barbara Starfield et al<sup>3</sup>, the authors listed the four main features (or characteristics) of primary care that were internationally accepted by the Institute of Medicine, the World Organization of Family Doctors (WONCA) and the World Health Organisation. These features are first-contact access for each new need; long term person- (not disease) focused care; comprehensive care for most health needs; and coordinated care when it must be sought elsewhere. In addition, Starfield also emphasised the importance of an orientation towards the family and community. I can identify easily with the features of primary care that were listed by Starfield and her co-authors. These features have been a tremendous source of meaning and professional satisfaction in my 20 years of clinical practice as a family physician.

Firstly, Starfield et al cited evidence from studies that showed a correlation between primary care physician supply and better health outcomes – these include total and cause-specific mortality, low birth weight, and self-reported health. Secondly, the authors were mindful that a greater number of primary care physicians does not necessarily mean that all people in the area have greater access to primary care services. So they studied analyses that considered people's relationships to or experiences with a primary care practitioner to determine the association between primary care and health outcome. In other words, they compared the health of people who do or do not have a primary care physician as their regular source of care. The findings from studies of the impact of actually receiving care from a primary care source consistently showed benefits for a variety of health and health-related outcomes. Thirdly, tools have been developed to assess the adequacy of health delivery characteristics that define the practice of primary care. Using these tools, it was possible to do international comparisons and the authors cited several studies that showed the positive contributions of primary care to health in the United States and other countries.

## **TRAINING THE NEXT GENERATION OF DOCTORS**

As a medical educator, I have always been impressed by the intellect and energy of our medical students. We owe it to them and to society to train and prepare them adequately for the tsunami of healthcare challenges that will hit us in the coming years. If we do it right and optimally, we will reap the rewards of a well-trained and well-prepared physician workforce.

The appropriate training of medical students and junior

doctors, plus the appropriate siting and organisation of the physician workforce in the coming years will be a crucial piece of the strategy to cope with the healthcare challenges.

A recent article by Elizabeth Newbronner et al<sup>4</sup> highlighted the results of their study on the impact of primary care-based undergraduate medical education on the development of medical students and new doctors as clinicians, and on students' preparedness for practice.

The results showed that "primary care placements play an important part in the development of all 'apprentice' doctors, not just those wanting to become GPs. They provide a high quality learning environment, where students can gradually take on responsibility, build confidence, develop empathy in their approach to patient care and gain understanding of the social context of health and illness." The study was not large – it involved only two medical schools in the UK. Nevertheless, my view is that if we believe that the direction is to shift healthcare delivery to the community in the coming years, it is essential that we consider providing longer primary care placements in our undergraduate medical education.

## **MOVING FORWARD**

As we emphasise more on primary and community care in our healthcare transformation journey, with concurrent shifts in healthcare policy thinking, we need to articulate clearly our expectations of the role of family physicians and the primary care sector.

We should see the characteristics of primary care as strengths to be tapped, and leverage on these to help us meet the healthcare challenges in the coming years. Beyond policy formulation at the Health Ministry level, how we train our medical students and junior doctors is going to be an important game-changer, and it could well spell the difference between a successful healthcare transformation journey or a dysfunctional painful stagnation.

*Dr Tham Tat Yean is a Family Physician and CEO of the Frontier Healthcare Group. He is also Adjunct Assistant Professor at NUS Medicine and Visiting Consultant Family Physician, Department of Medicine, National University Hospital.*

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## TEACHING PALLIATIVE CARE

By Dr Noreen Chan  
*Head & Senior Consultant, Division of Palliative Care,  
National University Cancer Institute, Singapore (NCIS)*

World Hospice and Palliative Care Day falls in October each year, which would explain the increased number of newspaper articles, radio segments and public activities from late September to early November. All of which is important and necessary of course. But if the positive publicity was so compelling that everyone started asking for Palliative care, our specialist services would not be able to cope with the demand. There are, after all, so very few of us. And to quote Dr Chong Poh Heng of HCA Hospice Care, "This little group of us cannot look after all the people who are dying in Singapore, and we need to engage the society at large."

That engagement includes not only awareness building, but also education. Of the public, patients and their families, and healthcare professionals. About what palliative care is, and is not, who could benefit, and what we can do, individually and as a community, to support people living and dying with chronic progressive illness. My colleagues from Taiwan and Hong Kong have commented about the dearth of "death education" in Singapore, and the paucity of national conversations about the one thing that all of us will face one day.

But we can all start somewhere, and undergraduate medical education is as good a place as any. It may surprise readers to know that Palliative Medicine has been part of the undergraduate medical curriculum of the NUS medical school since 2002, when it started as a modest one-day posting. It reached its present 4-day form in 2010, as part of the Family Medicine posting. More information about its evolution can be found in a special issue of the Singapore Medical Association (SMA) News Dying Well.

## WHEN AND WHAT?

When and how to teach Palliative care to medical undergraduates, depends on when in their five-year training we receive them, and what we would expect them to learn. That in turn is related to what is expected of graduating doctors, and their role in the Singapore healthcare system.

As the Palliative Medicine posting occurs in the third year in NUS, when students are having their first intensive exposure to patients and to clinical care, the approach is to build awareness and foundational knowledge. It is expected that they will continue to acquire skills and understanding during their postgraduate years, as part of lifelong learning.

In contrast, I learned from a colleague at a medical school in Malaysia that a short time after graduation many doctors will be working independently in district hospitals or clinics, so the training at university emphasises practical aspects such as the use of opioids.

## HOW?

There is a lot about Palliative care education in cyberspace, including excellent websites like PCC4U (Palliative Care Curriculum for Undergraduates), so the problem is not a shortage of information. Rather, it is the quality and quantity of information, and how to apply that knowledge to practice. So the teacher's role is to "curate" the information sources, stimulate students to think about what matters to patients, guide them to apply the palliative approach, and encourage self-reflection.

Exposure to "daily practice" and interacting with patients and healthcare teams, is essential for students to appreciate the realities of Palliative care. This is a bit of a doubled-edged sword, because exposure to suffering in all its harsh aspects, witnessing pain, loss and all the emotions that come with it, can bring up uncomfortable emotions. But that is part of the learning too; understanding ourselves and our responses, helps us in our personal growth, and enables us to better support patients and families going through difficult times.

## THE HIDDEN CURRICULUM

There is a significant amount of learning that takes place outside formal teaching activities, and this is sometimes called the "hidden curriculum". Education, in many respects, is a form of socialisation, and it is said the hidden or informal curriculum is where beliefs, values and certain behaviours are transmitted, which learners absorb as they become part of the profession culture.

Students will observe what their teachers and seniors say and do, so we are all role models for everyone around us. Not only modelling positive or desirable behaviour e.g. good hand hygiene, but also pointing out the behavior - "let's all stop and use the hand-rub before we approach

the patient" - can be a powerful teaching tool. By the same token, there can be negative role models, such that the students might think "my goodness I should avoid being like that".

## THE TEACHERS

Students will encounter many teachers during their undergraduate and postgraduate training, and some of the most important teachers in this respect will be the patients. Medical students have more time to spend with patients and get to know them as people, so it is not surprising that their stories may have a lasting impression.

What about doctors as teachers, why do we do it? Some are passionate about it, others are naturally gifted teachers, yet others see it a way of paying forward the guidance they received from their seniors. There is something about teaching that also forces the teacher to learn as well, to reflect on what is to be taught, on how to connect with the learners and to light the spark within them.

For myself, it is also a way to see my field of practice through fresh eyes, and to understand my students' aspirations, hopes and worldview. Palliative care is ultimately about caring for people (not merely their diseases or organ systems), and as long as students appreciate our shared humanity and the ethical duty to respond to suffering in all its forms, and recognise that everyone has the power to make a difference... then I would have done my job as a teacher.

### *Love, Teach and Be Gentle*

*A person will not attain Knowledge  
Unless he seeks refuge with God  
From the crudeness of distractions  
And from an ignorance so blind  
That he makes much of the little that he sees in himself  
And belittles the much and great which is in others,  
And admires himself for that self-conceit,  
Which God would never approve.*

*But it is good for one who has knowledge  
And is seeking  
That he should learn whatever he does not know,  
And teach others what he knows already,  
And deal gently with those of weak intelligence,  
And neither be made conceited by the stupidity of the stupid  
Not harshly rebuke one who is dull of understanding.  
Such were you were before, but God has been gracious to you.*

Rumi



## PUTTING SINGAPORE ON MAP OF MEDICAL ADVANCES

*By Professor Lee Eng Hin  
Department of Orthopaedic Surgery*

It has been exactly a decade since my colleagues and I wrote about the need for more clinician scientists – or doctors who do research – in our healthcare ecosystem and the challenges faced by our young doctors who aspire to do so.

The national goal was to have 160 clinician scientists by 2015. We achieved two-thirds of our goal at the end of 2016.

Since the turn of this century, Singapore has invested heavily in biomedical research. This has led to the establishment of numerous world-class research institutes in the Buona Vista research hub Biopolis, and research centres of excellence at the institutes of higher learning,

as well as the formation of academic medical centres such as the National University Health System (NUHS) and SingHealth.

We have been able to nurture a pool of home-grown scientists, as well as attract good scientists from abroad.

It is, however, not enough to do good science. It is essential to translate our research into better health outcomes.

Clinician scientists play a pivotal role in this. Because of their clinical and research training, they form an important bridge between scientists and clinicians. They are able to identify clinical problems through their contact with patients and formulate insightful scientific questions which can then be taken to the laboratory to find appropriate solutions.

The most obvious changes in the past 10 years have been the creation of a distinct path to train clinician scientists and the growth of a nurturing research environment for them. We have put in place residency training programmes specifically tailored to groom clinician scientists while they are doing their speciality training after completing their medical degrees.

There are now scholarships, research funding and salary support available for those who choose this career path.



# INSIGHTS

The last decade has also seen the addition of two new medical schools here. Having three medical schools within the public healthcare clusters has provided greater opportunities to produce clinician scientists.

The explosion of biomedical knowledge in recent years has brought new technologies that will take us closer to the goal of more personalised medicine, new developments in disease biomarkers and therapeutics, the use of biologics such as stem cells, and even the ability to edit genes to modify the manifestation of rare diseases.

Coupled with these developments is the need for new models of care and transforming population health behaviour, banking on innovation and technology. The susceptibility of Asians to certain diseases and their response to treatments differ from those of Caucasians. With our current capabilities in biomedical research, we have the opportunity to delve deeper into diseases that affect Asians, as Singapore is a microcosm of three major Asian ethnic groups – Chinese, Malays and Indians – which represent the Asian characteristics or phenotype in almost half of the world's population.

Pharmaceutical and biotech companies have recognised this and are coming to Asia to partner with scientists and clinicians to look for new solutions for Asian phenotypes.

We are living longer and the prevalence of chronic diseases is on the rise. More patients are surviving cancers in Singapore, but even more have been diagnosed with cancer, and at younger ages. Obesity rates are rising fast and diabetes has been identified as an endemic disease. Heart disease patients are getting younger and tuberculosis still affects about 1,500 people a year.

These huge medical challenges provide opportunities for our clinician scientists, academic medical centres and healthcare institutions to come up with impactful solutions.

To this end, NUHS set up its Summit Research Programmes (SRPs) in late 2016, focusing on six key areas: cancer, metabolic disease, tuberculosis, cardiovascular disease, synthetic biology, and a programme on the developmental origins of health and disease. These were chosen as they have a critical mass of excellent scientists and clinician scientists who are performing cutting-edge research on some of the most pressing healthcare challenges. These programmes are fertile ground for nurturing and growing our young clinician scientists.

For example, the cancer programme's main focus is on advancing the development of immunotherapy treatments in Singapore. Eight ongoing immunotherapy trials target a wide variety of cancers ranging from

childhood malignancies to adult blood and solid cancers. Two of these studies – in breast and lymphoma cancers – have demonstrated good safety and seen promising patient responses.

The metabolic disease programme targets a key factor in battling diabetes by empowering diabetics to lead better lives using new therapies and drugs, and encouraging a lifestyle change.

Singapore's academic health systems are the perfect training ground for our clinician scientists. They provide an integrated value chain that allows them to seamlessly innovate, discover and apply their findings to patients. Apart from state-of-the-art laboratory equipment and facilities, clinician scientists must continue to be provided with dedicated time and space to be able to balance taking care of patients with research.

Having good role models and mentorship is equally important. Programmes such as NUHS' SRPs have a strong mentorship culture where budding clinician scientists are given the opportunities to learn from the best.

Finally, clinician scientists must be appropriately recognised and rewarded for the important work they do. This can come in many forms and include promotion and tenure, an equitable salary structure that does not discriminate unduly against them, as well as special awards or bonuses for impactful research work. Clinician scientists also stand to reap rewards from the intellectual property and technology revenue that could follow the discoveries that they make.

With such positive developments since 2007, I firmly believe that we are on the right trajectory to achieve our goal of nurturing the required number of clinician scientists to further our biomedical initiative and put Singapore on the map as a leader in impactful medical innovations and therapies.

The challenge then is for our talented young people to take on the clinician scientist role and lead the charge in building a healthier future. All it takes is courage and conviction; results and recognition will follow.

After all, our clinician scientists are our healthcare leaders of the future.

*This article was first published in The Straits Times, on August 25, 2017.*



A street in Wallaroo, a port town in South Australia.

## A COUNTRY PRACTICE

*Husband and wife team has cared for residents in rural Australia for three decades*

Dr Daniel James and Dr Mei Wee met at NUS Medicine in the 1970s when they were young undergraduates and active in the Varsity Christian Fellowship. They have come a long way since. Literally.

After graduating from medical school in 1977 and getting married in 1979, the couple and their two daughters Davina and Deborah emigrated to Australia in 1988.

For four years, Dr James worked as an emergency resident medical officer, Obstetric and Surgical registrar, at a hospital in a frontier mining town in the Australian outback at Broken Hill, New South Wales, while Dr Wee joined a family clinic there.

In 1993, they moved to Port Augusta, a small city in South Australia. There, Dr James joined the Pika Wiya Aboriginal Health Service, serving hospitals on call, and frequently travelling to the remote clinics of other towns overnight by car to treat patients in need. Meanwhile, Dr Wee worked at the Port Augusta Medical Centre, and travelled to and

from Adelaide to take her young daughters to school.

It was while both doctors were in Port Augusta that their next opportunity came knocking at their door in early 1997.

A general practitioner whose child went to the same school as the James' daughter, asked if they would like to take over his practice at Wallaroo, a port town in South Australia. He invited them to visit and showed them the town, hospitals and nursing homes. A few weeks later, husband and wife accepted the offer and have been there ever since.

For two decades, the doctors have served the Wallaroo community of 3,000 people at their Owen Terrace Medical Practice, attending to a wide range of conditions. The community is mainly Australian, though more Asians have migrated there in recent years.

"We see a lot of patients with chronic illnesses such as diabetes and hypertension. We also treat a lot of children – (handling) anything from childhood infection, asthma, teething or growth problems, to even otolaryngology issues. We do see the elderly too. We don't refer (our patients) to specialists that quickly, so we have to learn to do a few things ourselves, things like shared care, obstetrics and simple incisions," said Dr James.

"It's more all-rounded in country practices than in the

## ALUMNI VOICES



**Dr Daniel James and Dr Mei Wee at their clinic**

city,” added Dr Wee. She explained that in Australia, most people will visit a general practitioner first, before getting referred to a specialist if the doctor deems necessary.

When referrals are needed, Dr James connects his patients to specialists, like orthopaedic surgeons, plastic surgeons, otolaryngologists, obstetricians and gynaecologists. These visit Wallaroo once or twice a month to treat patients.

Since arriving in Wallaroo in 1997, Dr James and Dr Wee have grown the practice, which now has a total of six doctors and three nurses. They also host medical students who are there on clinical attachments. “I remember one of my lecturers at medical school said you should not only heal and learn but also teach, so I share my knowledge,” Dr James said.

The NUS Medicine alumnus works six days a week, including public holidays. He sees about 30 to 40 patients a day, with consultations lasting between 10 and 15 minutes. Once a week he visits nursing homes and does house calls when called.

Dr Wee works thrice a week, and spends the other days in Adelaide helping their two daughters to babysit four grandchildren, who are between the ages of two and four. “We see our patients from the cradle to the grave,” said Dr

James. “In the city, conditions like terminal illness are seen by specialists, oncologists or palliative care experts, but in the country we need to manage all these things. We see our patients in their homes, or in the nursing homes. We take care of their end stage. It’s very rewarding.”

Being the longest serving doctors in Wallaroo, Dr James and Dr Wee have taken care of entire families, and generations, and have formed close friendships with their patients.

“I think we’ve grown old with our patients and others have grown up with us,” Dr Wee said.

“Daniel looks forward to seeing people, not just as patients, but as friends. We’ve been there for 20 years, and we know a lot of them personally. His patients come to see him, share a joke, and then they are well and off they go,” she added.

However, the husband and wife pair say they find the practice of medicine increasingly challenging today.

“Medicine has changed a lot. When we first started, I mainly did anaesthesia, but I felt that it was more rewarding and less worrying then, because there is a lot of legality attached to it now. You have the idea of being sued at the back of your mind, though in the past when we practised medicine 40 years ago, people were grateful to see a doctor. But I am quite certain it is going the same way throughout the world. We change as the system changes,” Dr Wee added.

“We live in a litigious society now,” Dr James noted.

Still, both continue to do their best for their patients, and they constantly upskill their medical and technological knowledge whenever medical experts and specialists visit Wallaroo.

Aside from medical work, Dr James has spent three weeks every year since 2010 visiting Armenia with the Armenian Christian Mission to provide medical advice and follow up on support for poor families in that country. In 2016, he also visited the Republic of Moldova with the Christian Missions International, and he is on the board of both missions.

For his contributions to the community, which also include being a founding member of the Australian College of Rural and Remote Medicine as well as lay preacher for the Uniting Church in the Ardrossan / Goyder parish, Dr James was awarded the District Council of the Copper Coast Australia Day 2016 Citizen of the Year award. While some of their peers in Singapore have retired, the couple is not ready to call it a day.

“We need to make sure the right people take over (our practice). It is very tempting to want to give everything up and go, but we want to make sure it is a smooth transition, with continuity of care, so that nobody is penalised,” said Dr James.



# REASONABLE PATIENT STANDARD AND INFORMED CONSENT

By Dr Voo Teck Chuan, Centre for Biomedical Ethics

The recent Singapore Court of Appeal (CA) decision in *Hii Chii Kok v Ooi Peng Jin London Lucien and another* has greatly shifted the legal standard for medical advice and information disclosure. Previously, what information needed to be disclosed to patients depended on what reasonable doctors would find relevant. The CA has endorsed a modified version of the test set out by the UK ruling in *Montgomery v Lanarkshire Health Board*, where disclosure depends on what a reasonable patient would find material, or what the doctor knows is important to that particular patient. Notably, the 2016 Singapore Medical Council's Ethical Code and Ethical Guidelines endorsed a similar position.

### TOWARDS PATIENT-CENTRISM

Healthcare institutions and practitioners now face the question of the extent of change they need to implement to their informed consent processes to meet this new legal standard. It is a move towards "patient-centrism" and as such, "dumping" information on patients – disclosure of all risks and their probabilities, types and nature of complications, possible alternatives and letting them figure it out on their own – would be contrary to its spirit. As the CA pointed out, this would only engender confusion and uncertainty in patients rather than support them in their decision-making.

### WHAT IS A REASONABLE PATIENT?

There is a degree of uncertainty on how much information a 'reasonable person' in a patient's position would need to know if she should not be regarded as needing to know everything, in both the quantitative and qualitative (understanding) senses. As Beauchamp and Childress (*Principles of Biomedical Ethics*, 6th edition) said, "Whatever its merits, the reasonable person standard encounters conceptual, moral and practical difficulties... its abstract and hypothetical character makes it difficult for them [doctors and other healthcare professionals] to use because they have to project what a reasonable patient would need to know." (p. 123). This should be taken as a practical challenge of the reasonable patient standard rather than an ethical flaw insofar as it meets the ethical goal of consent, i.e. properly balance patient autonomy and beneficence and (plausibly) demonstrate an improvement over the reasonable doctor standard in doing so.

It would appear that healthcare professionals need to pay more attention to the values, preferences and goals of patients, both in general as well as in specific situations, to make more accurate projections of the reasonable patient's informational needs and expectations.



## **SHARING DECISION-MAKING BETWEEN DOCTOR AND PATIENT**

Hii Chii Kok calls for a “collaborative process involving the doctor and the patient” in treatment decisions although what ‘a collaborative process’ means is not well-defined. In the wake of the Montgomery decision, articles have been published to argue for the necessity of shared decision-making to meet the reasonable patient standard. For example, Coulter et al. argue that “The effect of the Montgomery decision is to require shared decision-making between a doctor and patient” (“Montgomery v Lanarkshire Health Board: Transforming Informed Consent”, *RCS Bulletin* 2017;99:36-8; at p. 37). They used this example: “... a small risk of injury to a little finger may not be of much significance to most patients but may be highly important to a musician. This can only be established by discussion and the sharing of information between a doctor and patient” (p. 37).

IT WOULD APPEAR THAT HEALTHCARE PROFESSIONALS NEED TO PAY MORE ATTENTION TO THE VALUES, PREFERENCES AND GOALS OF PATIENTS, BOTH IN GENERAL AS WELL AS IN SPECIFIC SITUATIONS, TO MAKE MORE ACCURATE PROJECTIONS OF THE REASONABLE PATIENT'S INFORMATIONAL NEEDS AND EXPECTATIONS.”

## **PATIENT'S RESPONSIBILITY TO DISCLOSE PERTINENT INFORMATION**

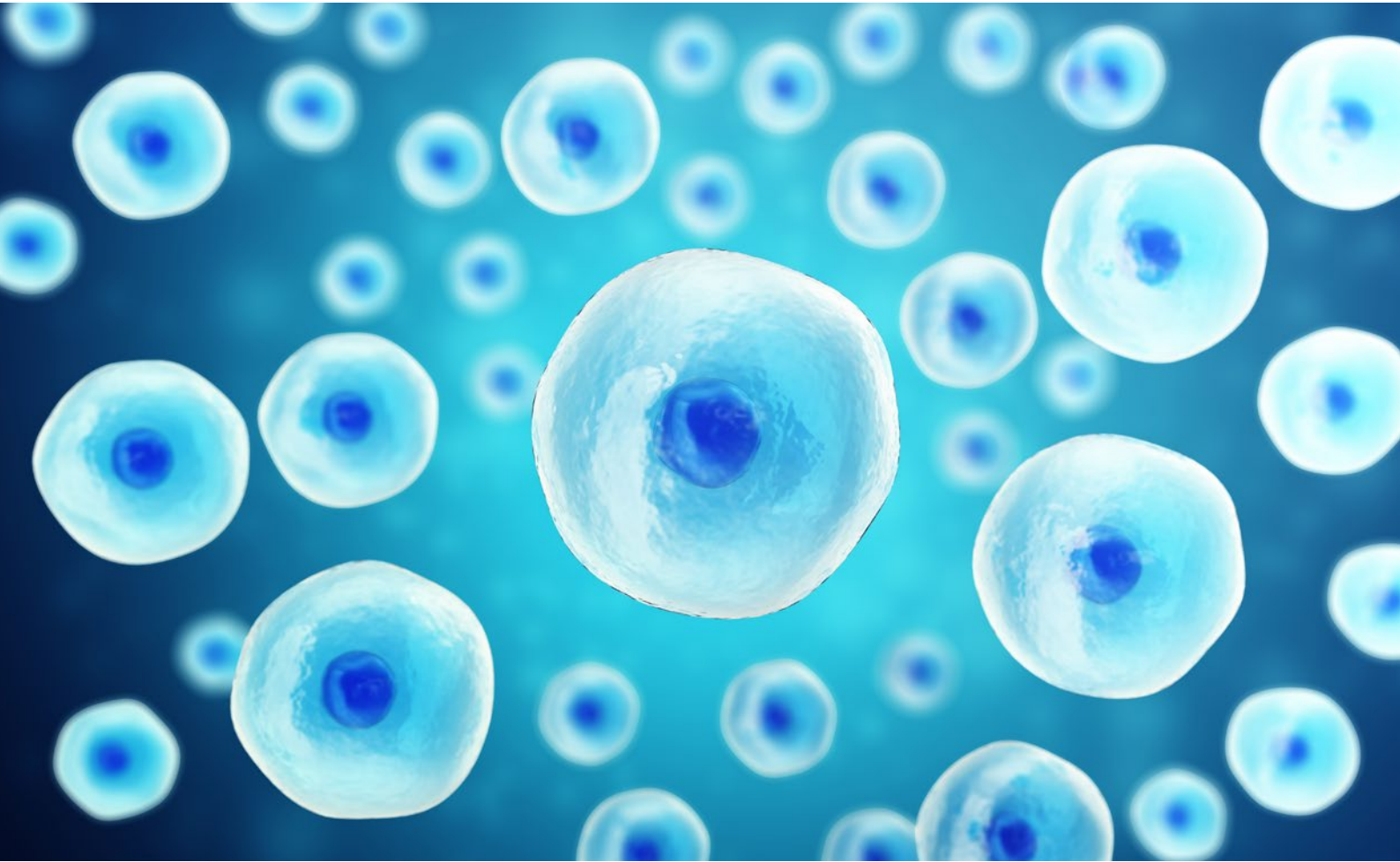
Certainly, Hii Chii Kok does not prescribe an “open-ended duty to proactively elicit information from the patient”. The ball is in the patient's court to raise particular questions or concerns, following “baseline” disclosure and advice i.e. a non-personalised set of information provided to all patients in a given situation that is necessary but may not be sufficient for materially informed decision-making. Let us assume that the small risk of little finger injury is not within this baseline information for the above musician patient. If this patient did not inform the doctor that she is a musician before or after baseline disclosure, or after

the doctor asked her if she had any specific concerns, then the doctor would not have failed in her standard of care in omitting to disclose the injury risk. There is no duty to conduct extensive background or character analyses in day-to-day patient encounters under Hii Chii Kok. (Things might be different if the doctor had seen the patient playing air guitar – is there a duty to ask at least circumstantial questions e.g. whether she likes music, her job, the instrument she plays, to ascertain the materiality of the finger injury risk?)

It is important to distinguish, as Beauchamp and Childress argue, between “informational exchanges through which patients elect medical interventions from acts of approving and authorising those interventions” (*Principles of Biomedical Ethics*, 6th edition, p. 119). Shared decision-making could assist with obtaining “reasonable/particular patient” informed consent, particularly in situations of high risk or uncertainty with treatment choices of similar therapeutic aims but different risk profiles or invasive characters. However, it is not always necessary or appropriate – not every treatment or patient requires the doctor to “deliberate with the patient” for the patient to provide materially informed consent.

## **THE WAY FORWARD TO BETTER UNDERSTANDING OF PATIENT NEEDS AND CONCERNS**

What might be necessary and appropriate is to make the reasonable patient less abstract and hypothetical and more ‘empirical’ and evidence-based. Yek et al. conducted a cross-sectional study to find out what patients in Singapore would regard as material risk for undergoing anaesthesia, and found that they ranked heart attack (59.3 per cent), death (53.8 per cent) and stroke (52.7 per cent) as the most significant risks that they wanted to know more in detail (“Defining reasonable patient standard and preference for shared decision making among patients undergoing anaesthesia in Singapore”, *BMC Medical Ethics* 2017;18: 6). There are certainly limitations to the empirical approach in establishing the “reasonable patient” but it points the way forward in making this standard more objective and responsive to patients’ actual informational needs.



# REGULATING THE STEM CELL INDUSTRY: NEEDS AND RESPONSIBILITIES

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Emerging biotechnologies pose public health challenges<sup>1</sup> because of both the known and unforeseen risks they carry, the uncertain medical benefits they offer, the speed at which they have been disseminated and their unproven mode of application.<sup>2</sup> The development of therapies from advances in stem cell science reveals the need to pay critical attention to stem cell treatments. Stem cells have attracted scientific, clinical and public interest because they are self-renewing and have the capacity to develop into specific cell types, depending on the source of stem cells and their biological plasticity. The hope is that stem cells could be used either to replace damaged cells or to create an environment for cellular regeneration to treat several conditions, including osteoarthritis, diabetes, macular degeneration and Parkinson disease.

Although promising in theory, so far very few stem cell therapies have proven to be safe and effective in clinical trials. Yet, despite the absence of evidence to support their use, there has been a global proliferation of clinics and associated businesses offering stem cell-based interventions to patients having serious medical conditions.<sup>3</sup> These clinics operate mostly in the private health-care sector and typically market their interventions directly to patients over the internet. The emergence of these clinics has not only created domestic markets in

# ETHICALLY SPEAKING

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many high income countries,<sup>3</sup> but has also fomented stem cell tourism – the movement of people across international boundaries to access putative stem cell treatments. The global reach of this expanding industry exploits weaknesses and differences in national regulatory infrastructures<sup>4</sup> and has revealed the need for an international approach to report and monitor the harms and benefits of these putative treatments.

Although once limited to low to middle income countries with weak regulatory infrastructure, providers of unproven stem cell therapies are operating in high-income countries that have sophisticated biomedical regulatory systems.<sup>5</sup> In these otherwise highly regulated jurisdictions, providers of such therapies operate in an under-regulated domain – the grey zone between clinical practice, research and innovation. In some cases, these grey zones emerged because regulators introduced risk-based frameworks that excluded or exempted certain uses of stem cells from the mechanisms that regulate other biological and non-biological therapies. Regulators also accepted stem cell interventions as part of the standard practice of medicine.

These regulatory weaknesses constitute a public health issue in at least three ways. First, many patients may be harmed by unproven stem cell therapies. While patients have the right to choose or refuse medical therapies that may carry significant risk, the validity of these choices depends on the information they have been given about the therapies and on their capacity to make informed choices. However, patients who seek stem cell interventions are often vulnerable and may be desperate for any treatment that they believe will save their life or improve its quality. They may also assume that such therapies are safe and effective, and trust not only that their medical providers are competent and have their best interests at heart, but also that these stem cell therapies are appropriately regulated.

Second, because the industry is poorly regulated, it is subject to little public scrutiny and accountability. This lack of transparency enables clinicians to offer unproven and potentially unsafe therapies and to set their fees according to whatever the private health-care market will bear, without any form of regulatory or medical control. The interventions offered by stem cell providers can cost from 5000 United States Dollars (US\$) to over US\$ 100 000, not including travel expenses or follow-up care.<sup>6</sup> For many patients unable to afford the high service fees, funding is sought through debt financing (e.g. mortgaging their house) or community and charity fundraising, among others. This may make patients financially vulnerable, have significant psychosocial consequences and deprive individuals and communities of resources that could be spent elsewhere. Additionally, in some countries, the costs of adverse health effects caused by stem cell interventions are borne by public health-care systems, not by stem cell clinics or patients.

Third, regulatory failure not only enables unscrupulous providers to operate with little oversight, but also means that adverse effects are likely to be under-reported, as patients who are harmed by failed stem cell interventions rarely seek legal redress. Because of this lack of oversight, patients harmed by these interventions – and their families – may also be affected financially; as well, objective data on the impact of this industry on patients and on public health systems may be incomplete.

Therefore, failure to effectively regulate the stem cell industry may have a range of detrimental effects on patients, their families, public health systems, research and public trust in stem cell science and biomedical science in general. Given the local and global significance of these threats, it is important to consider the role of global organisations, particularly the World Health Organization (WHO), in regulating and containing the stem cell industry.

The ethical, social and public concerns raised by stem cell interventions have prompted the International Society of Stem Cell Research (ISSCR), an international non-profit organisation of stem cell scientists, to issue the Guidelines for stem cell research and clinical translation.<sup>7</sup> While such voluntary guidelines are useful, they lack the political, legal and moral authority that guidelines from WHO may offer. Furthermore, if WHO were to adopt stem cell product regulations under Article 21 of its Constitution, all Member States would be required to take the corresponding legislative steps unless they expressed reservations.<sup>8</sup> This move would also help to strengthen national regulatory landscapes<sup>9</sup> and assist sovereign governments to face potential political opposition to such regulation.<sup>10</sup>

While some may question whether it is appropriate for WHO to engage in what might seem a highly specific scientific and clinical concern, Article 4 of the United Nations Education, Scientific and Cultural Organization (UNESCO) Universal Declaration on Bioethics and Human Rights<sup>10</sup> recognises that “In applying and advancing scientific knowledge, medical practice and associated technologies, human vulnerability should be taken into account. Individuals and groups of special vulnerability should be protected and the personal integrity of such individuals respected.”<sup>11</sup>

The Declaration does not impose a positive duty on governments to mitigate every kind of human vulnerability. It does, however, emphasise the need for governments and the global community to be aware of the contexts where vulnerability arises and could be exploited, and to take measures to mitigate such exploitation. Article 14 of the Declaration also provides that “The promotion of health and social development for their people is a critical purpose of government that all sectors of society share.” In regulatory context, this means that national governments should regulate biomedical research and prevent fraud; this

should be coupled with a coherent international response to promote the regulation of the clinical application, global production, sales and marketing of proven and unproven stem cell therapies.

There is precedent for such action because WHO has previously addressed regulatory, governance and health issues associated with other health industries that run parallel to, or counter, established health systems and clinical practices. For example, following WHO Guidelines on developing consumer information on proper use of traditional, complementary and alternative medicines,<sup>12</sup> some Member States have chosen to regulate practices and products of traditional, alternative and complementary medicines.

If the adoption of regulations under Article 21 proved politically challenging, WHO could instead develop a code of practice drawn from the ISSCR guidelines. This would encourage sharing and gathering of evidence on safety and efficacy before the commercial provision of stem cells, and clarify the ethical principles that should underpin national laws and regulations regarding clinical practice.

Other possible roles for WHO might be to: provide much-needed technical guidance to resource-poor countries; use its mechanisms to gather and disseminate expert advice; convene expert advisory panels and committees on issues regarding the manufacture, licensing, regulation and proper use of stem cells; provide a platform for crossjurisdiction information sharing; and establish a global governance framework for monitoring countries' progress in

regulating the stem cell industry. Such a platform may encourage cross-country learning and help identifying and aligning best practices in the standards of care across jurisdictions.

To tackle the issues associated to the national and international underregulation of the stem cell industry, a global strategy needs to be put in place. This strategy, which could be developed by WHO, should moderate the global stem cell industry, protect global health and public safety and promote future research to increase the evidence base of the stem cell industry.

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**Competing interests:** Ian Kerridge is a bone marrow transplant physician, chair of the New South Wales Bone Marrow Transplant Network Long Term Follow-Up Working Group, board member of the New South Wales Stem Cell Network and member of the National Health and Medical Research Council's Xenotransplantation Committee.

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## SCHEDULER

# November – January

Date	Event & Venue
Nov 2	<b>Singapore Brain Modulation Symposium &amp; 4th NUS Academic Psychiatry Meeting</b> Auditorium, Level 1, NUHS Tower Block
Nov 2	<b>Dialogue 2017</b> Lecture Theatre LT37, Level 3, Tahir Foundation Building (MD1), NUS
Nov 5	<b>Go Red @ Clementi</b> Clementi Community Centre
Nov 9	<b>Pressurised Intraperitoneal Aerosol Chemotherapy (PIPAC) 1st Asia-Pacific Symposium &amp; Hands-on Course</b> Advanced Surgery Training Centre, Level 2, Kent Ridge Wing, NUH
Nov 14	<b>Biology of Ageing II: Impactful Interventions</b> Grand Copthorne Waterfront Singapore
Nov 16	<b>NUS-Cambridge Joint Symposium</b> Clinical Research Centre (CRC) Auditorium, NUS
Nov 20	<b>AAHCI Southeast Asia Regional Webinar</b> For more information, visit <a href="https://nus.edu/2ygiIMo">https://nus.edu/2ygiIMo</a>
Nov 23	<b>Graduate Students Symposium</b> Lecture Theatre LT35, Level 3, Centre for Translational Medicine (MD6)
Jan 10	<b>15th Asia Pacific Medical Education Conference (APMEC)</b> NUS & Resorts World Convention Centre, Sentosa
Jan 11	<b>Association of Academic Health Centers International (AAHCI) Southeast Asia Regional Meeting</b> Meeting Room T06-03, Level 6, NUHS Tower Block



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