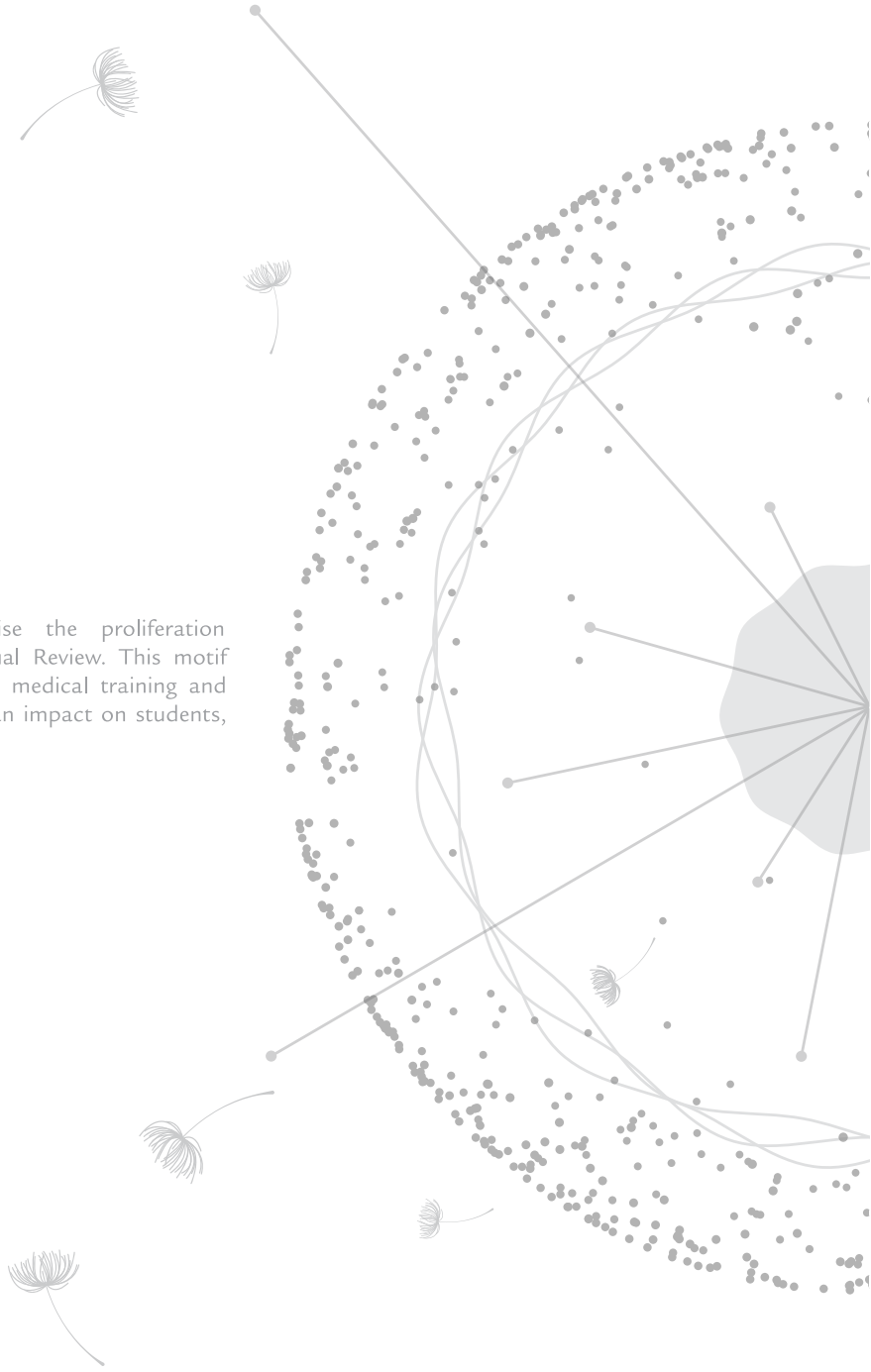
DukeNUS Medical School

TRANSFORMING MEDICINE IMPROVING LIVES

Annual Review 2019

Dandelion flowers symbolise the proliferation of knowledge in our Annual Review. This motif represents how Duke-NUS' medical training and research discoveries are making an impact on students, patients, and society at large.



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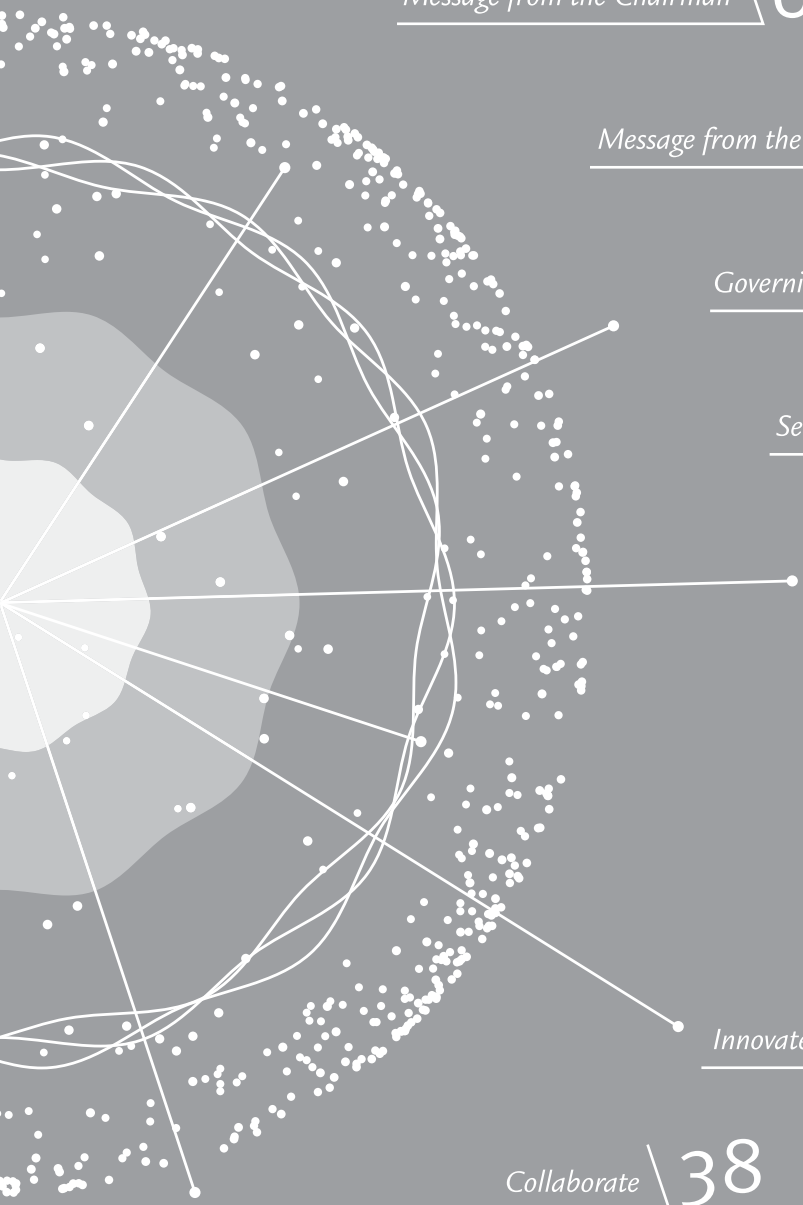

MESSAGE FROM THE CHAIRMAN

A path of innovation

Duke-NUS Medical School (Duke-NUS) was founded to meet the Singapore government's aim to develop the country as a biomedical hub. Through its innovative curriculum, world-class research programmes and strategic partnership with Singapore Health Services (SingHealth) – the country's largest healthcare cluster – it is delivering on its mission to transform medicine and improve lives.

Aside from supplying the country with a steady pipeline of strong, multi-faceted clinicians, Duke-NUS has also delivered cutting-edge research to meet our evolving healthcare challenges. Through our SingHealth Duke-NUS Academic Medical Centre, pioneering research is being translated into tangible solutions to elevate the delivery of healthcare in Singapore and beyond.

The 2019 Annual Review encapsulates our ever expanding list of achievements, while highlighting key developments in our journey this past year. As we look towards moulding exceptional clinicians capable of leading the healthcare industry, as well as building upon our curriculum and partnership with SingHealth, I would like to acknowledge the contributions of our students, staff, faculty and alumni to the School's success.

At the same time, empowering medical students and researchers to raise our academic profile and deliver impactful research would not be possible without the generosity of our donors. I especially thank these philanthropists for supporting our efforts to make greater things happen. All of us at Duke-NUS look forward to continuing on our path of innovation and collaboration for a better shared humanity.

Goh Yew Lin
Chairman, Governing Board

MESSAGE FROM THE DEAN

A groundbreaking year

We have had another remarkable year at Duke-NUS, and we are pleased to share our Annual Review with you.

Since being established as Singapore's first graduate-entry medical school in 2005, we have earned our reputation as a world-class institution nurturing future-ready clinicians, and as a major force in multi-disciplinary biomedical research that impacts clinical medicine. This annual review highlights some of our achievements and milestones in the past academic year.

On the medical education side, we welcomed our largest cohort of medical students in July 2019, a diverse group of 81 individuals with exceptional academic qualifications. As part of our recruiting strategies, we have introduced a series of through-train conditional admissions pathways with Duke University, the Faculty of Engineering at the National University of Singapore, Yale-NUS, Singapore University of Technology and Design, and most recently with Singapore Management University. The curriculum for our MD programme has been reinvigorated with enhanced clinical training and integrated longitudinal learning experiences. Beginning this year, graduates from our Integrated Biology and Medicine PhD programme received joint degrees from Duke University and NUS.

Our research programmes have also continued to shine. Our investigators continued to compete successfully for external funding and a number of them received National Medical Research Council Awards in 2019. Most importantly, they continued to make transformative discoveries that can impact health. For example, a team led by Prof Karl Tryggvason from the Cardiovascular & Metabolic Disorders programme working with Dr Alvin Chua at Singapore General Hospital has developed a new, more efficient method for growing and maintaining skin cells. These cells can be rapidly expanded and used for skin grafts to treat patients with severe burns. Scientists from our Emerging Infectious Diseases programme are leading the fight against infectious diseases such as dengue and Zika. Amid a spike in dengue cases this year in Singapore, their breakthrough findings have brought us closer to developing new vaccines and therapies for these diseases which currently have no effective treatments.

Our robust academic medicine partnership with SingHealth provides an exceptional environment for clinical training and continues to spark impactful translational research. This past year, Singapore General Hospital was ranked as the world's third best hospital by Newsweek magazine, and this rating was based in part on the outstanding educational and research programmes. The continued growth and maturation of the SingHealth Duke-NUS Academic Medical Centre (AMC) has been marked this year by the establishment of two new SingHealth Duke-NUS Disease Centres (SDDCs) in Transplantation and Genomic Medicine, along with the new National Dental Research Institute of Singapore, joining our existing 15 Academic Clinical Programmes, 9 SDDCs and 12 Joint Research Institutes.

The achievements summarised in this report represent only a fraction of our accomplishments, made possible through the dedication and hard work of our faculty and staff, and our generous donors, who have helped us to achieve ground-breaking research and nurture our medical students in need of financial assistance. Based on this outstanding team and our record of accomplishment, I am more confident than ever in our ability to transform medicine and improve lives.

Prof Thomas M. Coffman
Dean, Duke-NUS Medical School

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PROF IVY NG SWEE LIAN
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SkillsFuture Singapore

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PROF A. EUGENE WASHINGTON
Chancellor for Health Affairs,
Duke University

President and CEO,
Duke University Health System

A photo from the Duke-NUS Governing Board Retreat 2019

Standing (From left to right):

Prof Thomas Coffman, Ms Karen Chang, Mr Alvin Lim Chng Thien, A/Prof Benjamin Ong Kian Chung, Prof Edward G. Buckley, Prof Raj Mohan Nambiar, Prof A. Eugene Washington, Prof Ian Curran, Ms Ong Mei Ling (Board Secretary), Prof Wong Tien Yin

Seated (From left to right):

Prof Patrick Casey (on armrest), Mr Lee Kim Shin, Mrs Quek Bin Hwee, Mr Kai Nargolwala, Ms Teo Swee Lian, Mr Goh Yew Lin, Prof Ho Teck Hua, Prof Ivy Ng Swee Lian, Mr Lee Ming San

Dr Geh Min and Mr Ong Tze-Ch'in are not in the photo.

SENIOR MANAGEMENT

PROF THOMAS M. COFFMAN

MD

Dean

Professor, Cardiovascular & Metabolic Disorders Programme

Other Affiliations:
James R. Clapp Professor of Medicine, Duke University Medical Centre
Director, Cardiovascular Research Centre, Duke School of Medicine

PROF PATRICK J. CASEY

PhD

Senior Vice Dean, Research

Professor, Cancer & Stem Cell Biology Programme

Other Affiliations:
James B. Duke Professor of Pharmacology & Cancer Biology
Professor of Biochemistry, Duke University Medical Centre

MS KAREN CHANG

Chartered Accountant of Singapore

Senior Vice Dean & Group Director Corporate Services

PROF IAN CURRAN

BSc, AKC, MBBS, FRCA, Pg Dip Med Ed (distinction), FFPMRCA, FAcadMEd, FSSH, FRCP Edin, FAOrthoA, FRCP (London), FAMS

Vice Dean, Education

Co-Director, Academic Medicine Education Institute (AM·EI)

PROF WONG TIEN YIN

MBBS, MMED (Ophth), MPH, PHD, FRCSE, FRANZCO, FAMS

Vice Dean, Academic & Clinical Development

Other Affiliations:
Deputy Group Chief Executive Officer (Research and Education), SingHealth
Medical Director & Senior Consultant Ophthalmologist, Singapore National Eye Centre
Chair, Ophthalmology and Visual Sciences Academic Clinical Programme
Chairman, Board of Directors, Singapore Eye Research Institute

ABOUT DUKE-NUS MEDICAL SCHOOL

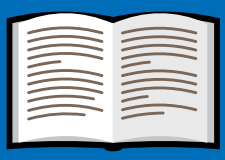
DIVERSE MD student population hailing from **24 COUNTRIES**

44% **OF MD STUDENTS** were working before they started medical training at Duke-NUS

OVER **700** **STUDENTS** admitted since 2007

MORE THAN 1,400 **FACULTY** involved in research, education and patient care

OVER **200** **RESEARCH COLLABORATIONS AND PARTNERSHIPS** with various institutions and organisations



OVER 6,500 **PAPERS** published by our faculty in peer-reviewed journals

The push for Singapore to become a biomedical hub in Asia resulted in the establishment of Duke-NUS — a collaboration between Duke University and National University of Singapore (NUS) and a leading centre for medical research and education, cultivating clinicians who are trained to meet the ever-evolving healthcare needs in Singapore and the region.

Structured around the curriculum of Duke University School of Medicine, our programmes are designed to provide an opportunity for our students to become outstanding clinicians and curious, critical thinkers who will also contribute to the medical field as researchers, educators, leaders, entrepreneurs or policy makers. Duke-NUS graduate-entry students come from a variety of academic disciplines and professional backgrounds, creating a diverse pool of clinician-scientists who will innovate and advance medical science through their prior experiences.

In the area of medical research, we continue to maintain leadership as we push the boundaries of innovation, and our scientists make exciting new discoveries that have a lasting impact on the healthcare landscape in Singapore and beyond. A critical pillar of support, the SingHealth Duke-NUS Academic Medical Centre (AMC) harnesses the strengths of Duke-NUS' medical education and research capabilities, alongside SingHealth's clinical expertise. Through the AMC, clinical care, education and research are integrated, leading to improved healthcare and patient outcomes.

We are encouraged to note the School's remarkable progress in many areas. Besides enrolling our biggest MD cohort ever, our curriculum has also been revamped with an all-new "Clinicians First, Clinicians Plus" philosophy, where we prepare students to look beyond current clinical practice.

Duke-NUS named among the "Top Ten Most Highly Rated Employers"

In January 2019, Duke-NUS was recognised as one of the highest rated employers in Singapore by Glassdoor. The ranking put the School in the same league as employers such as Google, PayPal and SAP. We are very proud of this recognition, accorded based on an organisation's culture and values, quality of senior leadership, available career opportunities, work-life balance, compensation and benefits.


INSPIRE
Inspiring and educating individuals to be outstanding clinicians capable of becoming leaders, innovators, educators, scholars and scientists.

NEW FRONTIERS IN EDUCATION

2019 has been a ground-breaking year for Duke-NUS, as it reached several impressive milestones. The school enrolled its largest ever Doctor of Medicine (MD) cohort. We have established innovative new education pathways, connecting with Singapore's elite universities and building on our links with our parent institutions. We have continued to refresh and refocus our curriculum, to support our mission, vision and values. We are committed to ensuring that our students are nurtured to be kind, capable and compassionate clinicians, all with a pioneering Duke-NUS spirit.

The Doctor of Medicine (MD) Programme

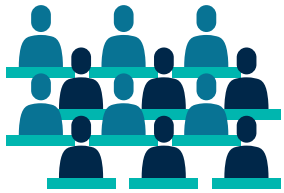
Clinicians First, Clinicians Plus

As a reflection of our burgeoning reputation and ability to attract the finest students, the School admitted its biggest cohort yet in the class of 2023, comprising 81 students with an average age of 26 and an average MCAT score of 513, the highest ever.

Our 2023 class comprises students from a wide variety of academic backgrounds – they have undergraduate degrees in over 10 different majors from across the arts and sciences, graduated from 28 different universities, with 16 holding Master Degrees and two holding PhD degrees.

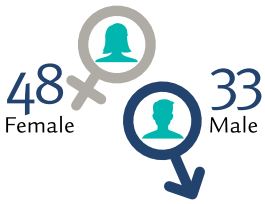
While Singapore citizens and permanent residents make up the majority of the cohort, our students are also from China, various ASEAN nations, the United States and Canada. This diversity is important for the sharing of experiences, as the medical community will be enriched from the input of professionals who bring diverse and global perspectives to the table.

Class of 2023



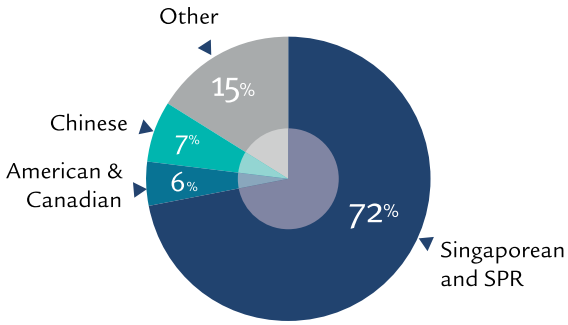
81
Class Size

26
Average Age
(years)



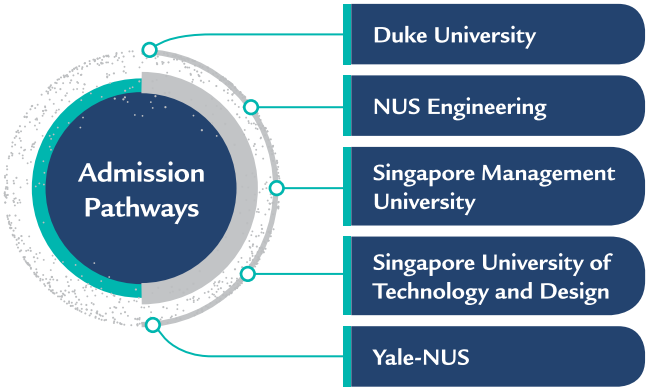
513
Average MCAT

Nationalities



New Admission Pathways

Duke-NUS introduced five new admission pathways for graduates of various backgrounds to complement the Duke-NUS ambition of producing "Clinicians Plus". While it's clear the School is already attracting a diverse group of students, these pathways ensure that the best and brightest graduates have a greater opportunity to enrich the healthcare landscape in Singapore and beyond.



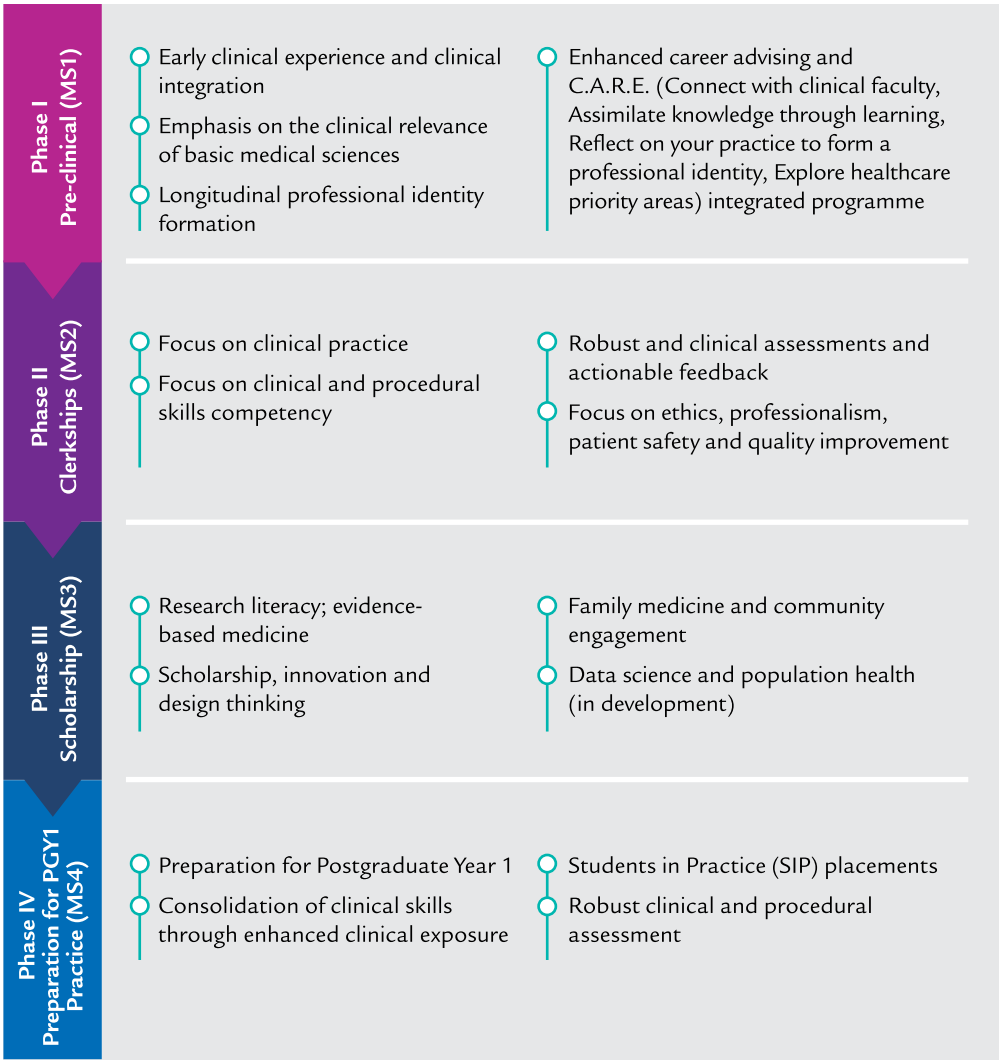
Through these pathways, we support aspiring clinicians by facilitating their participation in advisory sessions, workshops and Duke-NUS community projects before they embark on their medical degree.

These pathways give the medical community in Singapore the benefit of clinicians with different perspectives who have pursued alternative passions and experiences, and help retain Singaporean talents who might otherwise pursue their medical dreams abroad. This effort is also in line with the rationale for our curriculum refresh of producing Clinicians First, Clinicians Plus.

Reimagining Our MD Curriculum

Our MD programme was reinvigorated in 2018 and in 2019 we launched the "Clinicians First, Clinicians Plus" curriculum designed to nurture our students to become outstanding clinicians with broader capabilities such as critical thinking and problem-solving, so as to contribute to medicine as clinician scientists, educators, leaders and entrepreneurs. This stems from the basis that clinicians should not just treat illnesses, but also have a more holistic view of their role in healthcare such as health promotion, health advocacy and disease prevention.

The MD curriculum is structured into four distinct phases with a focus on clinical and academic excellence.



Moving To A Higher Level

Our graduates are also making a name for themselves as clinician scientists. Duke-NUS graduates made up half of the six recipients of the National Medical Research Council Outstanding Clinician Scientist Resident Awards. As further indication of the wide-ranging research ambitions of our students, 43 Duke-NUS alumni published 74 papers last year. More than 70 per cent of respondents of the Duke-NUS graduation survey, indicated that they are interested in research careers.

At present, 18 graduates from the Duke-NUS MD-PhD programme are in clinical training. The future looks bright, with 33 students in the pipeline who are enrolled in the MD-PhD programme and 125 students who have matriculated with Masters or PhDs.

Doctor of Philosophy (PhD) Programmes

Three PhD programmes at Duke-NUS aim to train the next cadre of outstanding scientists in biomedical and translational research.

The **Integrated Biology and Medicine (IBM) PhD Programme** explores disease mechanisms and translational concepts, the **Quantitative Biology and Medicine (QBM) PhD Programme** applies computational and statistical tools to answer questions in biology and medicine, and the **Clinical Sciences (CS) PhD Programme** for clinicians looks for solutions for real-time health concerns in the hospitals.

2019 saw several milestones; the first batch of graduates from the IBM PhD Programme were awarded their joint degree from both Duke University and NUS, the PhD Programme in Integrated Biostatistics and Bioinformatics was renamed the Quantitative Biology & Medicine programme where students can specialise in Bioinformatics or Biostatistics and Data Sciences, and we saw the enrolment of the second cohort in our CS PhD Programme.

Updates

In 2019, 17 students were accepted to the IBM PhD Programme and four to the QBM PhD Programme, bringing the steady state of our PhD student community to 81. Comprised of Singaporeans, Singaporean permanent residents and international students, this new cohort was inducted to the Duke-NUS PhD programmes in a session that saw seniors engaging with the new students to help them integrate into the programme. New students had the chance to engage with future research mentors to better understand their work and vision, and to decide on their lab rotation. This orientation is crucial because PhD students at Duke-NUS conduct their PhD research on a specific disease or health outcome under the guidance of faculty who are renowned in their fields.

The CS PhD programme accepted seven committed clinicians to their programme, bringing its total number of students to 13. This rigorous programme allows practicing clinicians to equip themselves with the tools that will enable them to translate cures from the laboratory to their patients.

Achievements

So far the IBM and QBM PhD programmes can boast that their students have published over 156 papers, with first authorship billing for 62 of those papers. These studies are in renowned publications such as *Science, PNAS, Nature Medicine* and *Nature Genetics*. Our PhD graduates have embarked on successful and diverse career trajectories. While about 55 per cent are making their mark as post-doctoral fellows in research institutions in Singapore, 16 per cent are training as research fellows overseas. Significantly, one-third of our graduates are working in the government sector and in private organisations, such as pharmaceutical and fast-moving consumer-goods firms. The achievements of the programmes in 2019 and before are the result of their access to their unique training, considerable resources and strong mentorship at Duke-NUS.

Alumni Dialogues

The sixth Duke-NUS Alumni Dialogue, *Medical Litigation: A Necessary Evil or a Vital Good* was held on 10 May 2019 with Chief Justice Sundaresh Menon as guest speaker for the session.

The sixth edition of the event was attended by over 70 guests, including Duke-NUS alumni, students, faculty and staff, and distinguished leaders and professionals from the healthcare sector. An array of issues and questions related to medical litigation was raised, including challenges related to delegating and assuming responsibilities, managing human error, and balancing doctors and patients' interests.

The seventh dialogue (pictured) was attended by over 80 guests including Duke-NUS alumni, students, faculty and leaders from the healthcare community. Minister Heng shared his thoughts on healthcare, research, and the future of Singapore's economy. Alumni and students also took the chance to discuss potential challenges and concerns they are likely to face as future doctors and researchers.

The seventh instalment of Alumni Dialogues was held on 1 November 2019. Themed *Optimizing Healthcare Economics*, Deputy Prime Minister and Minister for Finance, Mr Heng Swee Keat, was the guest speaker.

Academic Medicine Education Institute (AM·EI)

A joint effort by SingHealth and Duke-NUS to bring together educational expertise from these two institutions to build a community of healthcare educators, AM·EI is committed to excellence in teaching and learning, and scholarly endeavours. AM·EI provides a range of teaching resources, courses, workshops and conferences to support education excellence across the SingHealth Duke-NUS Academic Medical Centre.

20 Education Grand Rounds

679 Participants

77 Educators Development Workshop (Including nine Essentials in Clinical Education Face-to-face Workshops)

2164 Participants (Including 769 participants who registered for the Online Essentials in Clinical Education)

In April 2019, AM·EI welcomed 29 educators to the annual AM·EI Fellowship in Team-Based Learning (FTBL) programme, a comprehensive fellowship and train-the-trainer programme, bringing the total number of participants to 127 to date. The two-year FTBL programme is designed for educators to learn, develop and implement innovative team-based learning approaches and techniques into their curriculum to enhance their teaching.

In May 2019, the AM·EI Education Leadership (AMLead) Programme, aimed at equipping healthcare professionals in key educational positions with leadership skills, welcomed its fifth cohort. Comprising 22 inter-professional participants, the current cohort is the largest so far. Participants go through a rigorous nine-month long programme with an emphasis on project-oriented learning. They also gain leadership competence while progressing through key initiatives in four full-day seminars, facilitated small group learning sessions, hands-on mentoring and executive coaching.

AM·EI Education Grant serves as a catalyst to stimulate the development, improvement and implementation of healthcare education research initiatives. This year, 36 Letters of Intent were received, and 16 applicants were invited to submit a Full Grant Proposal, of which 11 projects were awarded and funded. Alongside grant-giving, AM·EI Golden Apple Awards (pictured on the opposite page) this year received 67 nominations to recognise and honour outstanding educators. Seven awards were given out at the SingHealth Duke-NUS Education Conference 2019, a biennial landmark healthcare education event organised by the SingHealth Duke-NUS Academic Medical Centre and jointly supported by AM·EI and SingHealth Academy.

Key Education Appointments

The Office of Education welcomed new faculty with important roles that would continue to help shape and usher Duke-NUS' education capabilities to the next level.

Prof Fernando Bello, the new Associate Dean for Technology-enhanced Learning and Innovation, is a computer scientist and engineer working at the intersection of medicine, education and technology. He will bring additional strengths and capabilities to the team to help develop and implement a school-wide Technology Enhanced Learning (TEL) strategy that promotes educational excellence, curriculum enhancement and pedagogical innovation.

Assoc Prof Katharine Boursicot, Associate Dean in the newly established Assessment and Progression Department, is leading the revamp and restructuring of the system of assessment for all phases of the MD Programme. Alongside the new department, her aim is to ensure that Duke-NUS students have a robust assessment system that tests the appropriate skills, knowledge and professional behaviour.

Asst Prof Suzanne Goh is the newly appointed Associate Dean of Student Affairs. Previously the Assistant Dean of Clinical Integration, Dr Goh brings to her role her experience as a teaching faculty for MD students in their first two years and as a practicing paediatric endocrinologist in KK Hospital. In her new role she will support and develop ways to set students up for success, including building resilience, confidence and their ability to identify their areas for improvement and the skills to address them.

DISCOVER

Engaging in world-class research that improves health outcomes and yields tangible impact in the medical sciences.

EXPANDING KNOWLEDGE THROUGH RESEARCH DISCOVERIES

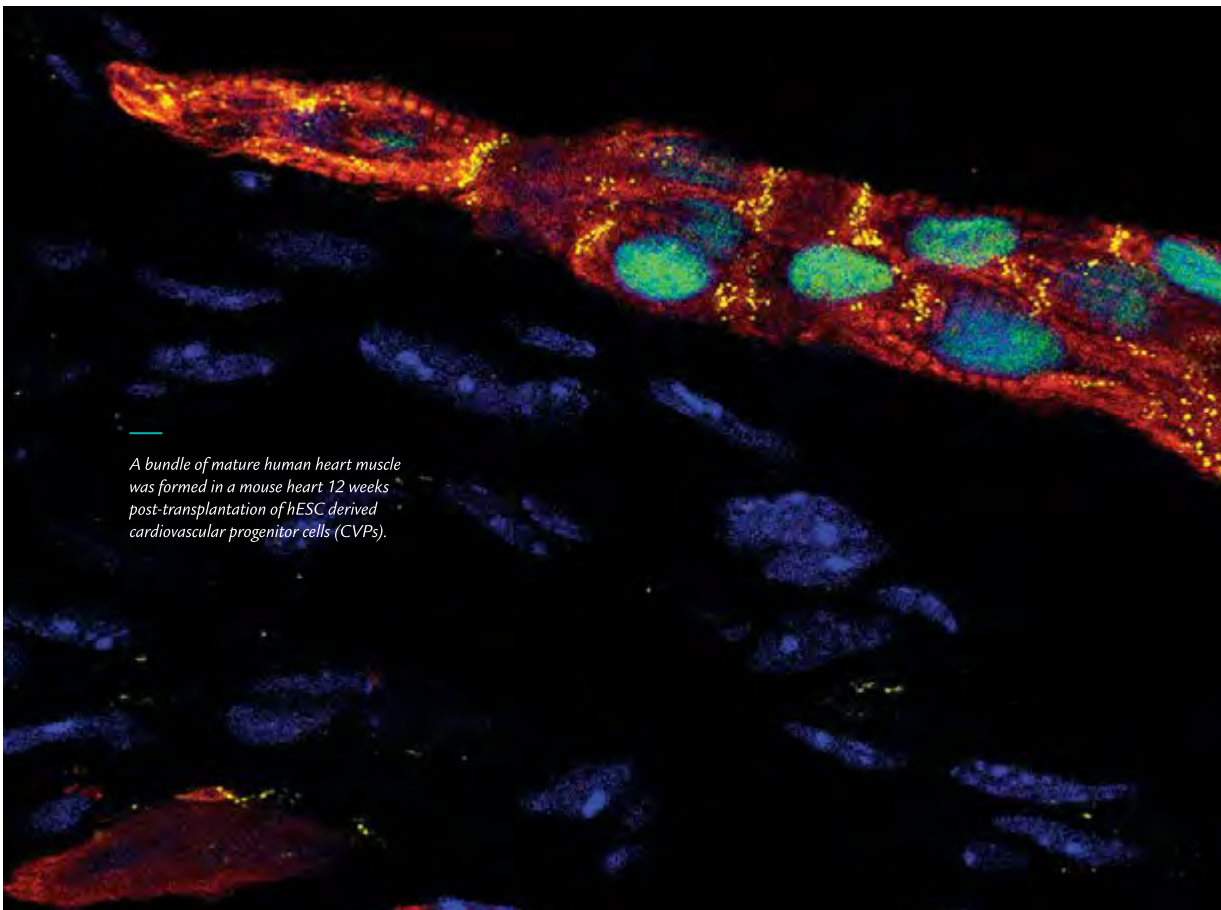
Cardiovascular & Metabolic Disorders (CVMD) Programme

New technique for heart muscle regeneration

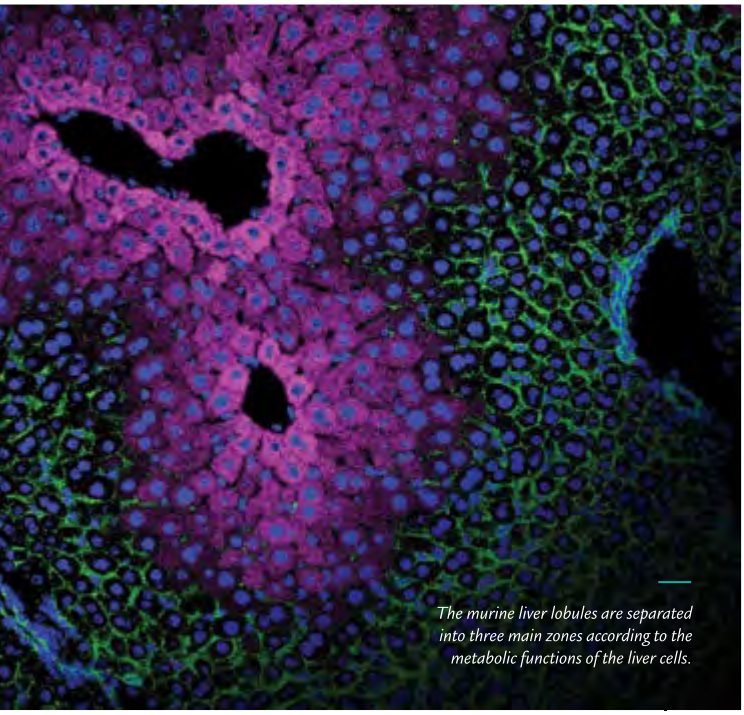
Following lead researcher, Tanoto Foundation Professor in Diabetes Research, Prof Karl Tryggvason's monumental discovery in 2018 that human recombinant laminins can grow human skin grafts, his team found that another similar human recombinant laminins can be used to transform human embryonic stem cells, turning them into heart cell precursor cells *(Cell Reports, March 2019)*. This may allow the rebuilding of the injured heart muscle with cardiac muscle precursors cells made from pluripotent stem cells.

Treating Fibrosis in lungs

Prof Stuart Cook, Tanoto Foundation Professor in Cardiovascular Medicine, and his team of researchers from Duke-NUS and the National Heart Centre Singapore discovered a potential new treatment approach for idiopathic pulmonary fibrosis (IPF), a type of lung disease. They found that by targeting Interleukin 11 (IL-11), a protein critical to fibrosis and inflammation, they can prevent and reverse the effects of inflammation and scarring in a pre-clinical model of IPF, highlighting how vital IL-11 is in driving the development of fibrosis *(Science Translational Medicine, September 2019)*.



A bundle of mature human heart muscle was formed in a mouse heart 12 weeks post-transplantation of hESC derived cardiovascular progenitor cells (CVPs).

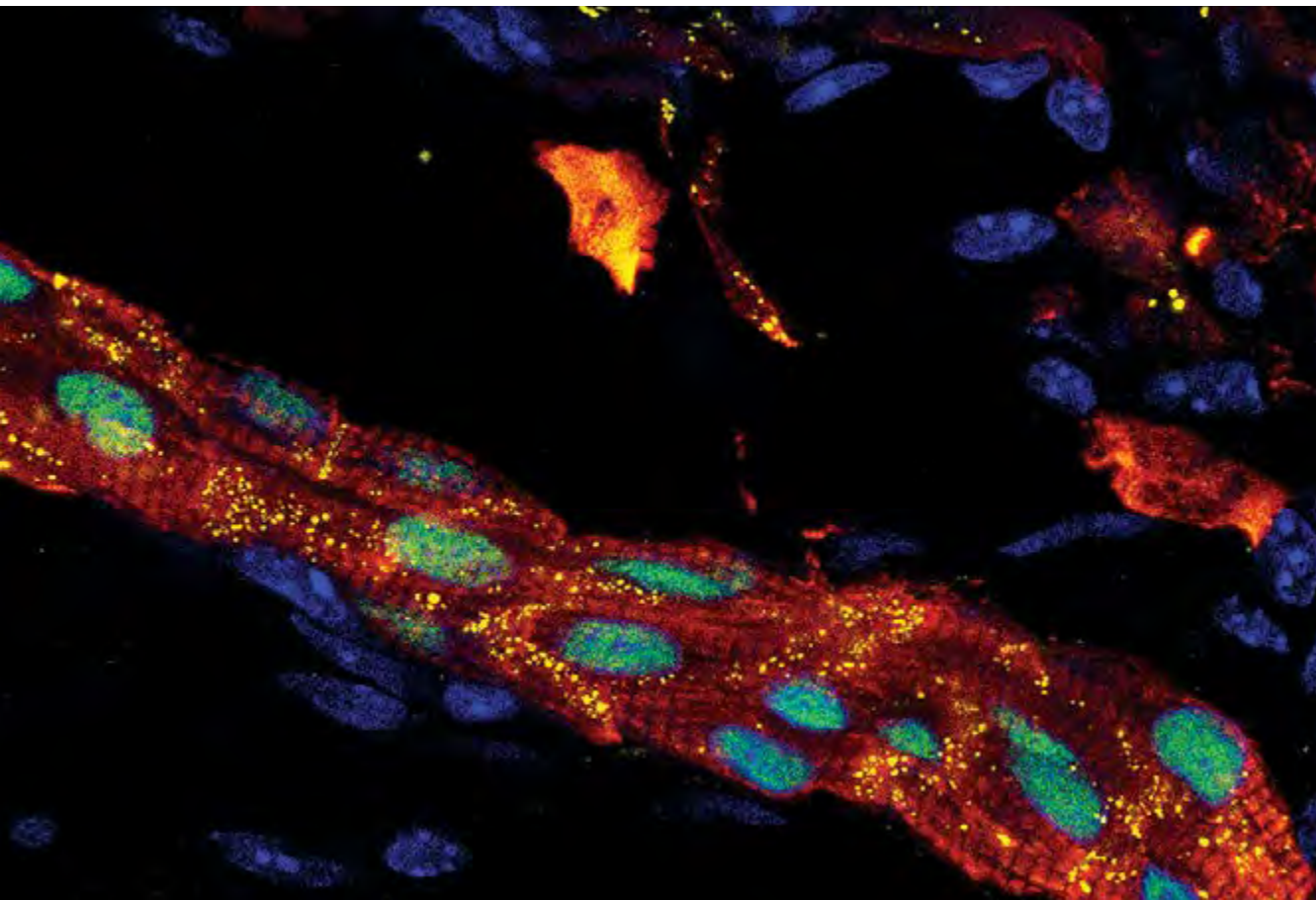


The murine liver lobules are separated into three main zones according to the metabolic functions of the liver cells.

Cancer & Stem Cell Biology (CSCB) Programme

Predicting cancer patient survival

The possibility that novel biomarkers can be explored for predicting the survival of cancer patients, as well as new targets for cancer therapies, was opened up by Prof Patrick Tan in collaboration with scientists from the Genome Institute of Singapore. The research team discovered that many human cancers exhibit widespread alterations in gene activation, and a new specialised software was designed to detect alterations previously undetected by earlier methods of analysis *(Cell, September 2019)*.



The cryo-electron microscopy reconstructed density map of Dengue serotype 2 in complex with Fab 2D22. The reconstructed map shows that 180 copies of Fab 2D22 molecules (colored in light green) bind at full occupancy to all 180 Envelope proteins on the virus surface (colored in purple).

Emerging Infectious Diseases (EID) Programme

Links found between Mengla and Ebola viruses

The EID Programme had a bumper year for new discoveries. In his ongoing research on bats and diseases with his colleagues in China, Prof Wang Linfa found that the Mengla virus, classed in the same family of filoviruses as the deadly Ebola virus, can exist in common bats *(Nature Microbiology, March 2019)*. This breakthrough discovery is critical to health authorities in their efforts to stem the spread of the disease, worldwide.

Discovery of communication signal between cells in the immune system

On flaviviruses, Asst Prof Ashley St. John's team may well influence the future design and testing of dengue vaccines, through their discovery of a communication signal between mast and T cells in the immune system *(Journal of Clinical Investigation, March 2019)*. The discovery also describes the role of mast cell chymase in encephalitis caused by the Japanese encephalitis virus *(Nature Communications, February 2019)*.

New approach in vaccine development and treatment strategies

Prof Lok Shee Mei and her team devised a new approach in vaccine development and treatment strategies to effectively target dengue infection across disease stages. The discovery, on how the virus changes shape to evade vaccines and therapeutics, is instrumental to understanding the way dengue adapts to the host's immunological defences *(PLOS Pathogen, September 2019)*.

Health Services & Systems Research (HSSR) Programme

Pan-Asian Resuscitation Outcomes Study: Improving Survival from Out-of-hospital Cardiac Arrest

The Pan-Asian Resuscitation Outcomes Study (PAROS) clinical research network, led by Prof Marcus Ong, is an international collaborative group that conducts research on prehospital emergency care (PEC). One of its main focuses is Out-of-Hospital Cardiac Arrest (OHCA), which is associated with low survival rates. In Singapore, the survival rate has improved significantly over the years, owing to research on PEC interventions such as telephone cardiopulmonary resuscitation (t-CPR), community CPR training and First Responder Apps on a national level. The PAROS network has also increased research capacity and improved the EMS systems of participating low-middle income countries such as Thailand and the Philippines.

Fall prevention programme for elderly persons

The SAFE intervention is a meticulously defined fall prevention programme based on established principles of tailoring, progressing and focus on balance. Prof David Matchar's randomised trial demonstrated that victims of falls with no more than one major medical illness (i.e., the pre-frail) benefitted from the SAFE programme in terms of reduced risk of falls and injurious falls, and reduced healthcare costs. Subsequently, Prof Matchar's team submitted a proposal to the Ministry of Health and National Integration Council (NIC) to explore implementing the programme sustainably in the broader community, and were awarded a grant to pursue an on-going study. They are also collaborating with ETH-Zurich on a NSF-funded project to use innovative technologies to predict risk of falls and thus identify ideal candidates for intensive prevention efforts.

Migraines costing billions

A study led by Prof Eric Finkelstein found that migraine places a substantial economic burden on Singapore, costing the city state SGD$1.04 billion in 2018. The study revealed that 80 per cent of the total estimated cost was due to a loss of productivity, while the remaining 20 per cent was attributed to healthcare expenses, which cover medical tests and consultations. Knowing the estimated total costs of migraine, both in terms of monetary value and productivity levels, would drive further research into this health issue, catalyse conversations and address a problem that impacts our society as a whole.

High quality diet reduces risk of cognitive impairment

Findings from the first local study, the Singapore Chinese Health Study, led by Prof Koh Woon Puay, have shown that adherence to high quality diet at midlife could be associated with reduced risk of cognitive impairment at older age. The research suggests that maintaining a healthy dietary pattern is important for the prevention of onset and delay of cognitive impairment. Such a pattern is not about the restriction of a single food item but the composition of an overall pattern that recommends cutting back on red meats, especially if they are processed, and including fish and lots of plant-based foods, such as vegetables, fruits, nuts, legumes and whole grains *(American Journal of Clinical Nutrition, August 2019)*.

Developing Equations for Early Identification of Individuals at Increased Risk of Incident Chronic Kidney Disease

Using data on more than 5 million individuals from 34 multi-national cohorts, Prof Tazeen Jafar and colleagues developed and validated equations for the five-year risk of incident Chronic Kidney Disease (CKD)

reduced estimated glomerular filtration rate (eGFR). The equation uses factors such as age, sex, race/ethnicity, history of cardiovascular disease and body mass index to estimate the five-year risk of incident CKD. This information would be invaluable to risk stratification of individuals at high risk of CKD, and institution of prevention measures. *(Journal of the American Medical Association (JAMA), Dec 2019).*

HSSR Symposium: Person-Centred Population Health

On 6 May 2019, the HSSR programme organised the "Person-Centred Population Health" symposium. It was attended by over 300 participants comprised of clinicians, researchers, policy-makers and educators from various organisations across Singapore, including the Ministry of Health (MOH), Duke-NUS and SingHealth. Experts shared their insights on how population health can be defined and measured, as well as showcased strategies to improve population health and care integration.

Neuroscience & Behavioural Disorders (NBD) Programme

Avenue for treating chronic epilepsy

Following the successful application of stem cell therapy for Parkinson's disease in a preclinical model, Prof Zhang Suchun and colleagues developed a new nerve cell, from human stem cells, that following transplantation into the epileptic mice, rebalances the brain circuits and attenuates episodes of recurrent seizures, opening an avenue for treating chronic epilepsy *(PNAS, January 2019).*

Longitudinal decline in brain network integrity

In related study on cognitive ageing, the team of Assoc Prof Helen Zhou and

Prof Michael Chee from the Centre for Cognitive Neuroscience, gleaned new insights on the longitudinal decline in brain network integrity linked with ageing. The study found that functional regions within the brain become less distinctive and efficient in information transfer, and are more vulnerable to disturbance in the elderly over time, particularly among networks related to attention span and cognition *(Journal of Neuroscience, July 2019).*

Stimulating neurons for neurodegenerative diseases

Neurodegenerative diseases such as Parkinson's and Alzheimer's were the focus of the next ageing-related study, specifically on brain injury or neuronal loss seen in these diseases. Assoc Prof Wang Hongyan and colleagues' discovery could stimulate new neurons to compensate for injury by applying the mechanism behind the activation of neural stem cells in humans - replicating findings from a study on stimulating the generation of new brain cells in fruit flies *(PLOS Biology, July 2019).*

Link between autism and antidepressants use during pregnancy

An international team led by Assoc Prof Shawn Je has found a potential link between autistic-like behaviour in adult mice and exposure to a common antidepressant in the womb. This study offers a compelling case for a link between autism and antidepressant exposure in the womb in an animal model, and a possible mechanism that could potentially be exploited for future therapies *(Molecular Brain, April 2019).*

Such findings are critical in helping researchers better understand brain functions and develop new therapeutic strategies to enhance care for patients suffering from neurodegenerative diseases.

HIGHLIGHTS FROM OUR CENTRES

Prof Koh Woon Puay
Director, Centre for Clinician-Scientist Development

Prof John Lim
Executive Director, Centre of Regulatory Excellence

Centre for Clinician-Scientist Development

The Centre for Clinician-Scientist Development (CCSD) was established with the mission of nurturing clinician-scientists across the SingHealth Duke-NUS Academic Medical Centre. CCSD provides guidance and training through its key programmes, including research career planning, mentorship programmes, research seminars, leadership development programme and grant-writing coaching & workshops. Several Duke-NUS grants funded by the Estate of Khoo Teck Puat are also administered by the Centre to support clinician-scientists in the generation of pilot data to promote their research career development. The centre's clinician-scientist managers currently actively follow up with more than 140 clinicians across all 15 Academic Clinical Programmes.

In 2019, the Centre saw the graduation of the first batch of the year-long Women in Science (WinS) Leadership Programme. In July, the Centre organised a national scientific writing workshop and the third Research Skills Workshop for junior clinician-scientists to learn research and management skills from Duke University faculty and successful local senior clinician-scientists. The third annual Khoo Pilot Award (Collaborative) grant call held by CCSD culminated in a grant award ceremony in October, where the awardees presented their winning projects.

Many SingHealth clinicians applying for National Medical Research Council (NMRC) grants have tapped into CCSD's ACE-in-Grants grantwriting support programme, which has seen a success rate of more than 50 per cent of participants winning an NMRC grant. CCSD hosted the Dean's celebration lunch in August 2019 to recognise the achievements of 11 recipients of the Transition Award and Clinician Scientist Award (first-time winners of the Investigator category) from NMRC's 2018 grant calls.

The Centre for Clinician Scientist Development team

Centre of Regulatory Excellence

The Centre of Regulatory Excellence (CoRE) celebrated its first five years of capacity building and promotion of regulatory excellence for health products and systems in Singapore and the Asia Pacific with a graduation ceremony for the inaugural cohort of its well-received Graduate Certificate Programme in Pharmaceutical Regulation in October 2019.

With support from the Ministry of Health, the Health Sciences Authority, the Economic Development Board and international stakeholders, CoRE offers a wide range of programmes in health product regulation and regulatory science, including emerging and potentially disruptive areas such as new clinical trial approaches, the use of real-world evidence, digital health, Artificial Intelligence (AI), cell and gene therapies, precision medicine and patient engagement. Beyond the topic of health product regulation, the Centre has also addressed broader issues in health systems and policies, including through its involvement in the SingHealth Duke-NUS Global Health Institute (SDGHI).

Increasingly recognised for its thought leadership and ability to convene diverse stakeholders to address challenging issues, CoRE continues to work both locally and internationally through platforms such as APEC, ASEAN and the WHO to advance regulatory capability, scientific excellence and health in the region.

Prof Steve Rozen

Director, Centre for Computational Biology

Centre for Computational Biology

Every corner of biomedical research now depends on computational analysis and data mining. The Duke-NUS Centre for Computational Biology comprises five faculty whose research depends heavily on computational analysis, and who also conduct laboratory experiments. The Centre faculty led research projects that have substantial scientific impact, and have published over 250 scientific papers since 2013. In 2019, *Nature* accepted a paper by Centre Director, Prof Steve Rozen, that provides an encyclopedic compendium of the fingerprints of DNA mutation-causing agents seen in 23,000 tumours. The results of this study open new doors for identifying and studying environmental causes of cancer, which then will illuminate new opportunities for cancer prevention. Besides driving research, the Centre also collaborates across Duke-NUS, SingHealth, and the rest of Singapore. Faculty anchor the quantitative biology concentration in the Duke-NUS PhD programme in Quantitative Biology and Medicine. The Centre sponsors the Bioinformatics Seminar Series and a bi-annual week-long RNA-seq and ChIP-seq analysis workshop. In 2019, the workshop had 35 attendees. Other high-profile research from Centre faculty includes a machine learning algorithm to predict how to transform human cells from one type to another and the study of chemicals in some plants that cause urinary tract and liver cancers in Singapore and across Asia. Through research, collaboration, and education, the Centre aims to create a vibrant ecosystem of computational biology expertise across Duke-NUS, SingHealth and Singapore.

Assoc Prof Angelique Chan

Executive Director, Centre for Ageing Research and Education

Centre for Ageing Research and Education

Since its inception in 2015, the Centre for Ageing Research and Education (CARE) has established a strong presence in the ageing and healthcare sectors in Singapore. CARE generates knowledge for real world applications to address one of the major challenges of the twenty first century. CARE's foundational surveys answer questions to facilitate national planning. On the ground, CARE evaluates and implements initiatives to spearhead innovative approaches to engaging and empowering older persons. Efforts to develop tools and guides to replicate these innovations have also begun.

Recognising the need for a consolidated, long-term approach towards longevity, CARE invests in educational programmes to build competencies in ageing. So far CARE has trained almost 5000 persons in academia, policy and practise across over 20 countries through multifaceted education platforms.

Papers by CARE in the last year have investigated the two major impediments faced by older Singaporeans – loneliness and social isolation A paper in the *International Journal of Epidemiology (August 2019)* addressed the associated health risks of older Singaporeans who live alone while the Transitions in Health, Employment, Social Engagement and Inter-generational Transfers in Singapore Study (THE SIGNS Study) report *(June 2019)* described the links between work, lifelong learning and volunteering among older persons with depressive symptoms and loneliness.

Prof Eric Finkelstein

Executive Directer, Lien Centre for Palliative Care

The Lien Centre for Palliative Care

The Lien Centre for Palliative Care (LCPC), an institute specialising in research and education on lifelimiting illnesses and guiding the implementation of palliative care initiatives in Singapore, marked a decade of improving the end-of-life experience for patients in the region. The Centre commemorated ten years of its inception with a 10th anniversary magazine and a one-day conference featuring research highlights over the past 10 years. Titled "Delivering Value at End-of-Life", it saw centre faculty and three international speakers sharing their expertise on relevant topics with an audience of more than 200 stakeholders, partners, collaborators and practitioners.

The Centre is now a globally recognised centre of palliative care research and education, and some of its accomplishments include over SGD$5 million in research grants, a portfolio of research projects, its own courses, online e-book and the training of thousands of healthcare professionals.

AWARDS

President's Science Award (PSA) 2019

The President's Science and Technology Awards are the highest honours bestowed on exceptional research scientists and engineers in Singapore for their excellent achievements in science and technology. The SingHealth Duke-NUS Academic Medical Centre (AMC) is proud that a team from its EYE ACP has clinched the President's Science Award 2019 (Team). Lauded for their pioneering work in the field of myopia research, the team comprising Prof Roger Beuerman, Prof Saw Seang Mei, Assoc Prof Audrey Chia and Adj Prof Donald Tan, was recognised for their contributions to decrease the prevalence and severity of myopia in children over the last three decades.

Widely recognised as an international leader in myopia research, the team was the first to identify low-dose atropine eye drops as a viable treatment option that is both safe and effective for long-term use in children, which led to many other interventional trials globally. Together, these researchers have impacted education, clinical care, optometry guidelines, clinical interventions and preventive measures.

National Medical Research Council (NMRC) awards

Duke-NUS researchers Prof Karl Tryggvason, Prof David M. Virshup and Prof Antonio Bertoletti were awarded the prestigious Singapore Translational Research (STaR) Investigator Award, while Prof Ooi Eng Eong and A/Prof Ong Sin Tiong bagged the esteemed Clinician Scientist Award – Senior Investigator (CSA-SI) presented by the Singapore Ministry of Health's National Medical Research Council (NMRC) in 2019.

In total, 17 clinician scientists and researchers won talent development awards such as; the Singapore Translational Research Investigator Awards (STaR), among the highest accolades by NMRC, and Clinician Scientist Awards and Transition Awards. These awards are presented to outstanding researchers who engage in internationally-competitive translational and clinical research, and bear testament to the high quality of research conducted at Duke-NUS Medical School, to transform medicine and improve lives.

Adding to the award list, nine budding clinician scientists were also recognised under the NMRC Research Training Fellowship and MOH Healthcare Research Scholarship programmes. The full list of award recipients include:

Singapore Translational Research (STaR) Investigator Award

1. Prof Antonio Bertoletti *(Duke-NUS)*
2. Prof David M. Virshup *(Duke-NUS)*
3. Prof Karl Tryggvason *(Duke-NUS)*

Clinician Scientist Awards – Senior Investigator (CSA-SI)

4. Assoc Prof Ong Sin Tiong *(Duke-NUS)*
5. Prof Ooi Eng Eong *(Duke-NUS, SingHealth)*

Clinician Scientist Awards – Investigator (CSA-INV)

6. Asst Prof Melvin Chua *(NCCS, Duke-NUS)*
7. Asst Prof Calvin Chin *(NHCS, Duke-NUS)*
8. Asst Prof Donny Hoang *(SNEC, SERI, Duke-NUS)*
9. Asst Prof Dr Iain Tan *(NCCS, Duke-NUS)*
10. Assoc Prof Andrea Kwa *(SGH, Duke-NUS)*
11. Asst Prof Angela Koh *(NHCS, Duke-NUS)*

Transition Awards

12. Asst Prof Dawn Chong *(NCCS, Duke-NUS)*
13. Asst Prof Tan Hong Chang *(SGH, Duke-NUS)*
14. Dr Pua Yong Hao *(SGH)*
15. Asst Prof Tiffany Tang *(NCCS, Duke-NUS)*
16. Asst Prof Shweta Singhal *(SNEC, SERI, Duke-NUS)*
17. Dr Adeline Ng *(NNI, Duke-NUS)*

NMRC Research Training Fellowship

18. Dr Troy Puar Hai Kiat *(CGH)*
19. Asst Prof Liu Yu Chi *(SNEC, SERI, Duke-NUS)*
20. Dr Diana Chan *(SGH, Duke-NUS)*
21. Dr Nei Wen Long *(NCCS, Duke-NUS)*

MOH Healthcare Research Scholarship – Master of Clinical Investigation (MCI) Programme

22. Dr Wang Fuqiang *(NCCS, Duke-NUS)*
23. Dr Clement Wu *(MOH Holdings Pte Ltd (SGH), Duke-NUS)*
24. Dr Sue-Ann Ng *(SGH, Duke-NUS)*
25. Dr Judith Wong *(KKH, Duke-NUS)*
26. Dr Vincent Tay *(MOH Holdings Pte Ltd (SGH), Duke-NUS)*

National Medical Excellence Awards (NMEA)

On September 2019, two individual winners and one team, with members from our AMC, were presented this national award, for their significant contributions in advancing healthcare, improving the standards of patient safety and quality of care, which ultimately improves patients' lives.

National Outstanding Clinician

Assoc Prof Chua Yeow Leng
Group Director, International Collaboration, Cardiovascular Sciences ACP (CVS ACP)

National Outstanding Clinician Mentor

Prof London Lucien Ooi
Associate Dean (Recruitment, Admissions, Financial Aid), Duke-NUS, Surgery ACP (SURG ACP)

National Clinical Excellence Team Award

Asst Prof Gavin Tan and Ms Haslina Binte Hamzah, *EYE ACP forming a team with National Healthcare Group (NHG)*

INNOVATE

Translate Duke-NUS innovations into commercial applications and nurture an ecosystem of entrepreneurship and impact.

2019 IN REVIEW

Duke-NUS continues to grow as a significant anchor of Singapore's health and life sciences sector. Its Centre for Technology and Development (CTeD), a component of the Office of Innovation and Entrepreneurship, protects discoveries made by Duke-NUS scientists, brings critical know-how and resources to the ecosystem, and helps turn these unique ideas into new products that will help patients. Startup companies and multinational corporations are developing ideas from Duke-NUS researchers that create significant enterprise value and job growth for Singapore.

17 Invention disclosures received from Duke-NUS inventors

7 Number of startups developing Duke-NUS inventions

11 Patents filed

Singapore's biggest biotech deal gives new hope to patients with diseases of organ inflammation and scarring

A variety of chronic diseases in the lungs, liver, heart, eye, skin and kidney exert their harmful effects because of inflammation and scar formation (fibrosis) in the affected organs. Prof Stuart Cook, Tanoto Foundation Professor in Cardiovascular Medicine, and Asst Prof Sebastian Schafer, from Duke-NUS' Cardiovascular and Metabolic Disorders programme and the National Heart Centre Singapore (NHCS), discovered the role of interleukin-11 (IL-11), a molecular messenger in our immune system, in the development of these diseases.

Enleofen Bio, a startup company that CTeD helped to launch, has been developing biotherapeutics (called neutralizing antibodies) that target and block the effects of IL-11 to reverse inflammation and fibrosis in diseased body organs. Enleofen Bio, in collaboration with Duke-NUS, NHCS, and the SingHealth Duke-NUS Academic Medical Centre conducted much of the early validation and development of these potential drugs. In December 2019 Boehringer Ingelheim acquired exclusive, worldwide rights to the programme, and has committed to taking its development into the clinic. In addition to its continued focus on fibrotic lung diseases, the company will also target fibrosis and inflammation in multiple new areas, starting with liver disease.

This deal, which could be worth more than USD$1 billion per product, is the largest biotech deal in Singapore's history and launches an alliance that may result in improved outcomes for diseases that are major health problems in Singapore and beyond.

CTeD initiatives, such as Intangible, a digital publication that equips researchers and students with knowledge on intellectual property, are helping to build a sustainable biomedical technology ecosystem in Singapore.

Delivering drugs to the brain may get easier because of Duke-NUS startups, Travecta and Vanteres

Most of our tissues and organs are constantly exposed to components of our blood, including oxygen, nutrients, and drugs. But certain organs, particularly the brain, are selectively protected from compounds in the blood. This protection, known as the blood-brain-barrier, protects the brain from dangerous substances that might accidentally get into our system. Yet it also makes it hard to deliver drugs to the brain. Diseases of the central nervous system are among the most difficult for which to develop drugs.

Prof David Silver's lab, within Duke-NUS' Cardiovascular and Metabolic Disease programme, has developed a technology, called TRANSPORT, that uses a cell surface protein called MFSD2a, for the targeted delivery of therapeutic and nutritional agents to the brain. The technology caught the eye of SPRIM Ventures, who started Vanteres Pte Ltd and Travecta Therapeutics and licensed the TRANSPORT technology in the fields of nutrition and drug delivery respectively.

Travecta has developed molecules for pain relief and other indications that could potentially be transported across the blood-brain barrier using the Duke-NUS TRANSPORT technology. In their first partnership with a global pharma company, Travecta successfully reached all project milestones and is now awaiting results of the final in-vivo transport, proof-of-concept study. Travecta recently executed another research collaboration agreement and now has ongoing research with two leading pharma companies.

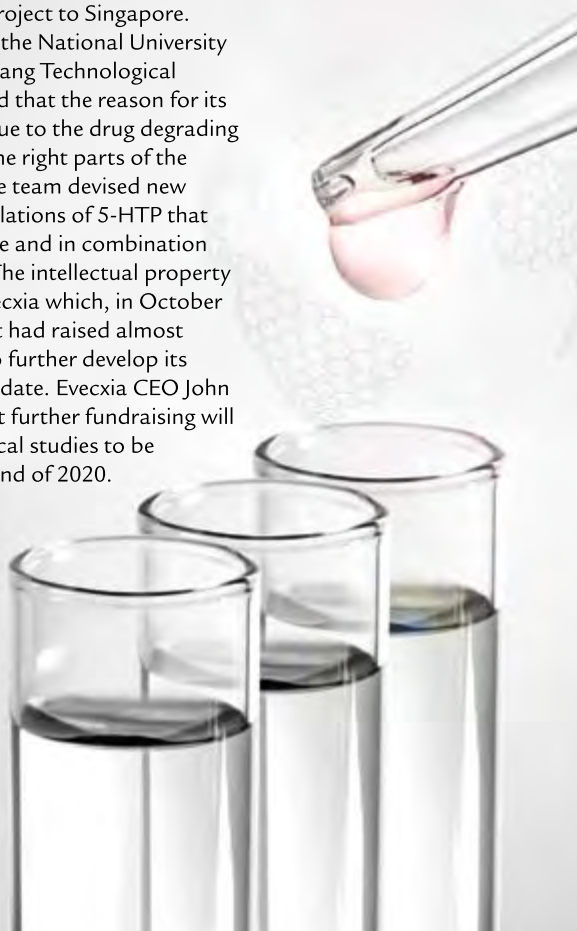
Prof Silver's lab has the ability to identify and categorize other small molecules able to cross the blood-brain barrier and CTeD continues to work to explore possibilities to position Duke-NUS and Singapore as a leader in new drug development to treat diseases of the brain.

New approaches to treating depression and other neurological disorders get a boost in Singapore

Serotonin is the "feel-good" brain chemical that contributes to wellbeing and happiness. It has long been known that boosting serotonin can combat certain types of clinical depression. While serotonin itself is difficult to deliver as a drug, its precursor, 5-hydroxytryptophan (5-HTP), can cross into the brain and be converted into serotonin (also called 5-hydroxytryptamine or 5-HT). Evecxia is a startup company headquartered at Research Triangle Park in North Carolina that is developing 5-HTP as a treatment for depression and other neuropsychiatric and non-psychiatric disorders. However, they found that when taken orally, 5-HTP does not reach sufficient levels in the blood.

Dr Jacob Jacobsen, one of Evecxia's founders and its chief scientific officer, was also a faculty member at Duke-NUS and brought this project to Singapore. With colleagues at the National University Hospital and Nanyang Technological University, he found that the reason for its poor uptake was due to the drug degrading before it reached the right parts of the intestinal tract. The team devised new slow-release formulations of 5-HTP that could be used alone and in combination with other drugs. The intellectual property was licensed to Evecxia which, in October 2019, announced it had raised almost USD$2.3 million to further develop its lead product candidate. Evecxia CEO John Kaiser has said that further fundraising will enable several clinical studies to be completed by the end of 2020.

Evexcia's story highlights the unique partnership that Duke-NUS and other Singapore institutions play in global health innovation.



COLLABORATE

Collaborating to channel the collective strength of medical education, research capabilities and clinical expertise, and blazing the trail to improve healthcare and patient outcomes.

GROWTH OF SINGHEALTH DUKE-NUS GLOBAL HEALTH INSTITUTE (SDGHI)

SDGHI has continued to grow from strength to strength after its launch in 2018.

Appointment of Faculty and Affiliates

In March 2019, SDGHI appointed 35 faculty members and 18 affiliates from across SingHealth and Duke-NUS. Candidates were selected based on their current experience and interest in global health.

Ensuring a Focus on Global Health

In order to raise awareness and develop an understanding of how global health issues impact the practice of medicine, SDGHI is working with Duke-NUS Office of Education to introduce global health modules in the curriculum for medical students. Concurrently, it is developing a global health introductory programme for residents.

Six Academic Clinical Programmes (ACPs), namely Emergency Medicine, Medicine, Obstetrics & Gynaecology, Ophthalmology & Visual Sciences, Paediatrics and Surgery are participating in the pilot phase of this programme.

Training on Bat Borne Virus Surveillance.

Member of World Health Organisation (WHO) Asia Pacific Observatory (APO) Research Consortium

SDGHI is a member of the consortium of research institutes/centres led by Saw Swee Hock School of Public Health that was selected by WHO as an APO research consortium beginning in 2020.

SingHealth Duke-NUS Education Conference 2019

The biennial SingHealth Duke-NUS Education Conference, themed "Building Resilience and Well-being in Healthcare Education through Interprofessional Collaborations," was held on 27 and 28 September 2019 at Academia.

The conference emphasised the importance of education and training in helping healthcare professionals to develop mindfulness and resilience to ensure safe and sustainable healthcare.

The development of these capabilities fundamentally begins with competent educators who are equipped with the right skills to develop effective educational programmes.

The conference was attended by close to 900 healthcare educators and learners from Singapore and around the region, with a broad itinerary consisting of 4 plenaries, 23 symposia and 22 workshops (including Pre-Conference Workshops) by more than 140 interprofessional speakers.

Supporting Academic Talent Development

The Duke-NUS Medical Student Fellowship (Duke-NUS MSF), an initiative under the Academic Medicine – Enhancing Training, Healthcare, Outcomes & Standards (AM-ETHOS), provides support for Duke-NUS medical students pursuing their research and scholarly projects with a mentor from an Academic Clinical Programme (ACP).

The aim of the fellowship is to encourage Duke-NUS medical students' academic interest and experience, as well as strengthen engagement between them and their ACP mentors. This is key part of developing a pipeline of talent within an academic medical centre.

For 2019, the Fellowship was awarded to 39 Duke-NUS medical students and ACP mentor dyads. For the very first time, some awardees will be embarking on research projects with the SingHealth Duke-NUS Global Health Institute (SDGHI).

In 2019, 11 Duke-NUS medical students and ACP mentors earned the FY2017/18 AM-ETHOS – Learning Enhancement and Progress (LEAP) Award. This award is given in conjunction with the AM-ETHOS Duke-NUS Medical Student Fellowship. The LEAP award is the top honour given to student awardees and ACP mentors who achieved top honours in their research projects. The awards were given at the Medical Student Fellowship Engagement Event.

Two New SingHealth Duke-NUS Disease Centres

In April 2019, the SingHealth Duke-NUS Transplant Centre was launched, consolidating solid organ, tissue and cellular transplantation services under one roof. These include kidney, liver and heart transplants; corneal tissue, ovarian tissue and umbilical cord blood transplants; and homograft, cornea and cord blood tissue banks. This new Centre was launched in an effort to improve transplant care and increase access to organs, while also providing a focus for research and education in the area.

The SingHealth Duke-NUS Genomic Medicine Centre was launched in October 2019, bringing the total number of SingHealth Duke-NUS Disease Centres to nine. The Centre will provide highly-specialised genetics care and facilitate genomics research and education across the SingHealth Duke-NUS Academic Medical Centre to advance care for patients and families with genetic diseases. In addition to enhancing diagnosis and treatments of genetic disease, another goal of the Centre will be research and education to advance genomics care.

Academic Medicine

Promoting outstanding patient care through excellence in academic medicine.

Cancer ImmunoTherapy Imaging (CITI) Programme

Asst Prof Ann-Marie Chacko from the Cancer and Stem Cell Biology Programme joined forces with Assoc Prof Daniel Tan from National Cancer Centre Singapore (NCCS), and collaborators from A*STAR, NCCS, NUS, NUH and SGH, to launch the Cancer Immunotherapy Imaging (CITI) Programme. This first-of-its-kind global initiative creates a fully integrated platform that identifies and validates novel imaging biomarkers for cancer immunotherapy. The CITI programme is funded by a SGD$22 million Health and Biomedical Sciences (HBMS) Industry Alignment Fund Pre-Positioning (IAF-PP) grant, and has gained interest from industry leaders, including Merck and J&J, as well as local biotechs, Tessa Therapeutics, LionTCR, and Epitoire.

Asst Prof Ann-Marie Chacko

Cancer and Stem Cell Biology Programme, Duke-NUS Medical School

Making vision care possible

Assoc Prof Marcus Ang was awarded the American Academy of Ophthalmology's 2019 Artemis Award, in recognition of his tremendous work in helping disadvantaged communities obtain vision care. Assoc Prof Ang initiated the Mobile Eye Clinic Project in 2013, under the auspices of the Singapore Society of Ophthalmology. This programme offers free eye care including cataract surgery to the elderly in underprivileged communities in Singapore. Since its inception, more than 5,000 people have benefitted from this programme. Assoc Prof Ang is also the founding director and head of the Global Clinic's Vision Team, a Singapore-based non-profit organisation that delivers free specialised healthcare to less privileged communities with little or no access to healthcare across Asia.

Assoc Prof Marcus Ang

SingHealth Duke-NUS Ophthalmology & Visual Sciences Academic Clinical Programme

Consultant, Singapore National Eye Centre

Engineering cells to treat cancer

Prof Antonio Bertoletti and Dr Anthony Tan, from the Emerging Infectious Diseases Programme, headed a team in collaboration with Singapore General Hospital and LION TCR, to engineer Hepatitis B virus (HBV) specific T cells, a type of immune cells found in the body, to treat HBV-related Hepatocellular carcinoma (HCC), a commonly occurring liver cancer. The treatment is personalised, as the engineered HBV-specific T cells recognise the specific HCC cells present in the individual patient. The approach was successfully performed on two liver transplant patients who had HBV-related HCC relapses, with one patient seeing a reduction in size of the tumor lesions *(Gastroenterology, May 2019)*.

Dr Anthony Tan

Senior Research Fellow, Emerging Infectious Diseases Programme, Duke-NUS Medical School

GIVING

As the centerpiece of the Duke-NUS community, giving enables progress and innovation.

GIVING TO DUKE-NUS

Meaningful contributions, unlocking endless possibilities

Every bit counts. Every contribution enables deserving students to have access to quality medical education so that they can contribute to healthcare in Singapore and beyond. Our benefactors' steadfast support has allowed Duke-NUS to continue to strive towards its vision of *Transforming Medicine, Improving Lives*. The gifts bestowed upon the school are greatly amplified, as new discoveries and possibilities are realised, leading to the betterment of humanity.

"In Medicine, experience is pivotal in shaping our understanding, but the training is often very costly. The bursary has provided me with greater confidence and freedom in pursuing my ambition."

DUKE-NUS BURSARY

SHAW FOUNDATION SCHOLARSHIP

Cassandra Chan

Sivanesh Sivarajan

"I am very grateful for the scholarship. It has helped me manage the mounting psychological load by reducing financial anxiety, allowing me to stay focused on the course."

DUKE-NUS DEAN'S SCHOLARSHIP

GOH FOUNDATION SCHOLARSHIP

"I am really humbled to be the recipient of Duke NUS Dean's Scholarship. The scholarship has gone a long way in alleviating my family's financial situation. Consequently, this has allowed me to focus on my goal towards becoming a competent clinician."

NGEE ANN KONGSI DISTINGUISHED SCHOLARS PROGRAMME

KWAN IM THONG HOOD CHO TEMPLE SCHOLARSHIP

Lee
Jing Kai

"As Duke-NUS is a post-graduate programme, many of us are at the stage of our lives when we are expected to bring home the bread. The generous bursary and scholarship made available to us largely alleviate our financial burdens. As a clinician in the future, I resolve to bridge the science and humanity aspects of medicine in my practice."

Ivory Yeo
Ching Yee

LEE FOUNDATION SCHOLARSHIP

"I am very grateful to receive the scholarship as the tuition and other costs are huge financial burdens. I am committed to using this scholarship to enhance the quality of my medical training so that I can contribute to the society in the future."

"At 17, I underwent an investigation to rule out malignancy. While it was an ordeal plagued with both uncertainty and anxiety, I always found solace in the comforting words of my doctor during every consultation. I was inspired to pursue medicine as a career to provide the same care and comfort to future patients.

As the breadwinner in my family, I greatly appreciate the Duke-NUS Bursary for alleviating financial concerns of postgraduate students, and plan to emulate my mentors in assuaging patients' uncertainty and anxiety as a physician."

Lee
Jing Kai

"I developed an interest in Biology during my secondary school days. As I continued to learn more about the intricate workings of the human body, I was amazed at how the seemingly independent body parts come together to provide form and function, and this cemented my desire to pursue medicine.

The support from the Goh Foundation Scholarship allows me to focus on learning how to become a competent clinician, I hope to channel my efforts towards translating biology research into treatments and illness management in the future."

Selene Lee
Joon Yan

"My interest in medicine grew organically from my interest in biomedical science. I decided to pursue medicine in order to better understand the healthcare needs of individual patients, and in so doing, improve the quality of my science research.

During my interactions with patients, I've always kept in mind that patients are more than their conditions, who have rich life stories that we can learn from, as well.

The Lee Foundation Scholarship has allowed me to make the most out of my training, and I look to pay it forward in the future by improving the healthcare scene and integrating the fields of science and medicine."

"I was diagnosed with hypertension during my teenage years and had to make regular visits to hospitals for diagnosis and treatment. My time spent in hospitals contributed greatly to my goal of becoming a physician to help people. I understand that having a supportive and empathetic doctor is invaluable in helping patients to live through difficult experiences.

I am really humbled to be the recipient of Duke-NUS Dean's Scholarship. The scholarship has gone a long way in alleviating my family's financial situation. Believing in the adage of "to cure sometime, to relieve often, to comfort always", I am committed to becoming a competent clinician."

Hilary Toh Si Yin

Kelvin Wirawan

OUR FUNDRAISING EFFORTS

Engaging a wide range of individuals, businesses, foundations and organisations, we believe in making a difference through all our activities.

President's Challenge

Duke-NUS is proud to have been involved in the fundraising efforts from August to October for the SingHealth President's Challenge 2019. The Challenge is an annual fundraising campaign for patient beneficiaries.

SingHealth Duke-NUS Gala Dinner 2019

A dinner was held on 14 September 2019 to celebrate the dedication of clinicians, researchers, educators, healthcare professionals and donors in improving the outcomes of our patients and the health of our community. Also a fundraising platform for SingHealth's Academic Clinical Programmes, the dinner was graced by Guest-of-Honour Mr Teo Chee Hean, Senior Minister and Coordinating Minister for National Security.

Project DOVE

Since 2010, the student-led Project Duke-NUS Overseas Volunteering Expedition (DOVE) provides sustainable medical care and health education to underserved communities in South-east Asia.

Winning the Merit Award for Student Life Awards in 2019, the team successfully reached out to 1,010 participants in Quang Tri, Vietnam, collaborating closely with local doctors and partners to conduct mobile clinics and health education.

Estate of Khoo Teck Puat Appreciation Lunch 2019

The Development team hosted an appreciation luncheon for the Trustees of the Estate of Khoo Teck Puat, Mrs Mavis Khoo-Oei and Ms Elizabeth Khoo. It was inspiring to see the impactful research, as well as the efficient engagement of our young talent presented during the luncheon.

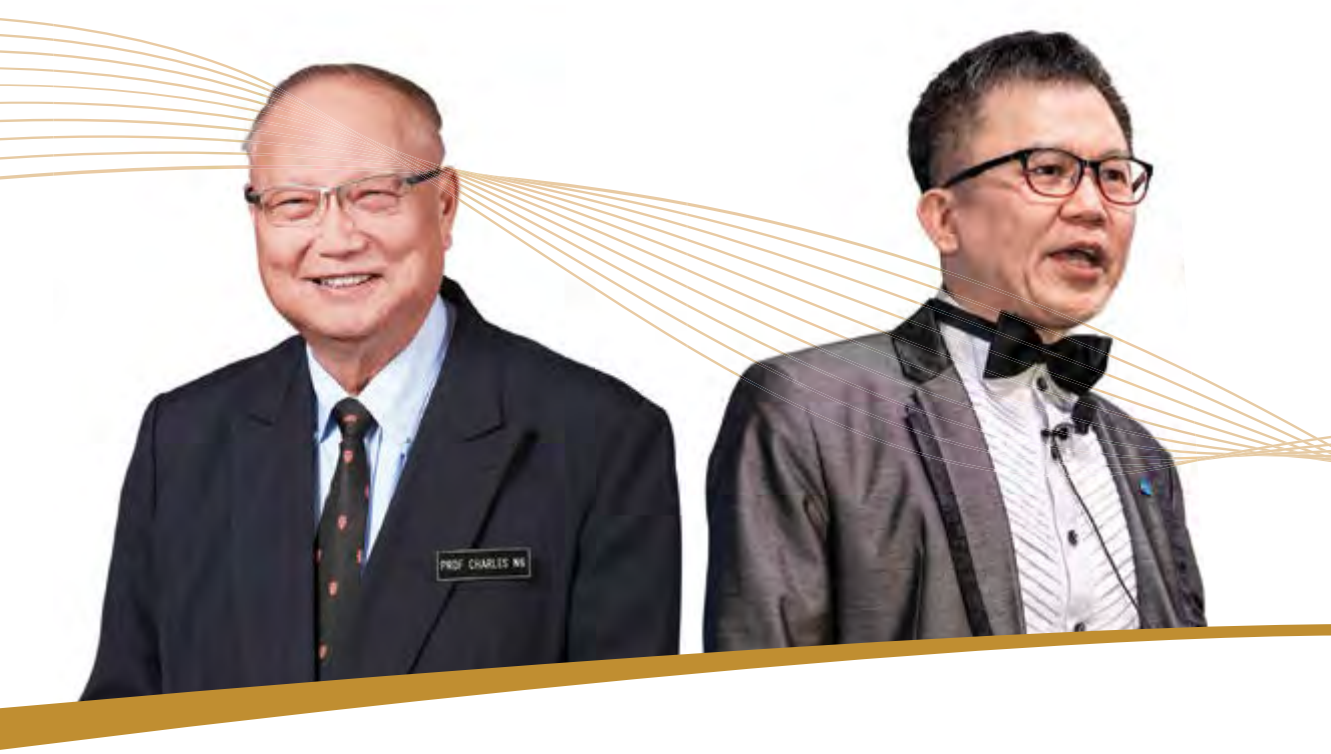
Bake-off Fundraising

The inaugural Great Duke-NUS Bake-off raised funds for Duke-NUS causes such as student financial aid and community initiatives.

A special shout-out to dedicated 'bakers' – Dean Thomas Coffman, Ms Karen Chang, Prof Ian Curran, Assoc Prof Silke Vogel, Asst Prof Suzanne Goh, Asst Prof Mara McAdams, Asst Prof Shan Koh Bundgaard, Dr Ng Wy Ching, and Ms Gina Lee.

Shave-a-thon

Collaborating with the annual IHS Markit Shave-a-thon in support of the St. Baldrick's Foundation, Duke-NUS students, alumni and staff supported this event. All proceeds were channelled towards Duke-NUS Paediatric Cancer Research Fund.



Charles Ng Bursary

PROF CHARLES NG

Inspired to make a significant and lasting impact on his 80th Birthday, Prof Charles Ng set up a bursary to help students to focus on their studies even in moments of financial need. He also exhorted students to give back to society and help others like themselves once they are in the position to do so.

MHC Asia Group Bursary

DR LOW LEE YONG

Having grown up in a kampung, Dr Low knows what it is like to be in need. To fund his medical education, he had to borrow money from the church, obtain bank loans and give tuition lessons. Looking to ease the financial pain of needy students, he reminded future doctors of their moral calling, and to always aspire to make an impact in the lives of others.

Dhun Nargolwala Bursary

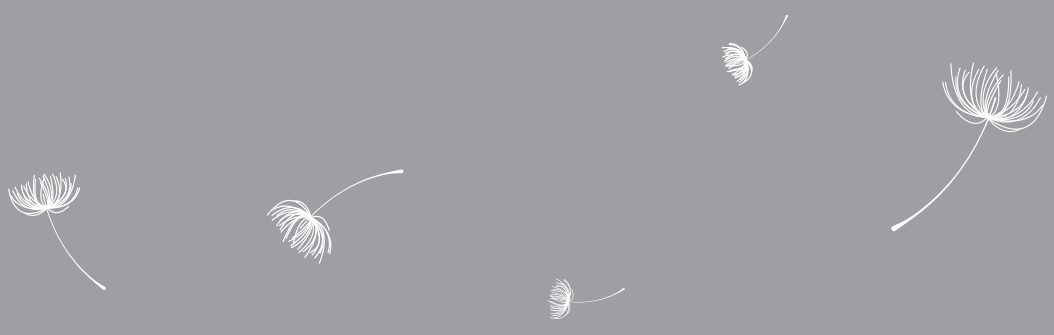
MR KAI NARGOLWALA

With a firm belief that no one should ever be denied the opportunity to education due to financial hardship, the Dhun Nargolwala Bursary was also set up to ensure that Singapore attracts the best talent both regionally and internationally. In this noble and satisfying calling, future students are encouraged to never lose sight of humanity amid a climate of technological advancement.

Special Gift from Dr Mary Tsao

DR MARY ANN TSAO

Special thanks to Dr Mary Ann Tsao, who made a substantial donation to Duke-NUS' Centre for Ageing Research and Education (CARE). CARE recognises the need for a consolidated and long-term approach towards longevity, spearheading educational programmes to build competences.



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