NMRC National Medical Research Council
Singapore

TRANSFORMING HEALTHCARE WITH RESEARCH AND INNOVATION

Annual Report FY2023–2024

CONTENTS

MESSAGE FROM CHAIRMAN

IMPROVING LIVES THROUGH RESEARCH AND INNOVATION

As I reflect on my journey with the National Medical Research Council (NMRC), I am filled with pride at how far we have come in strengthening Singapore's medical research ecosystem. FY2023–2024 marked a period of meaningful progress, driven by scientific curiosity, collaboration and a shared determination to transform healthcare through research and innovation.

Biomedical research demands patience and perseverance. It often takes years, sometimes decades, before research translates into tangible improvements for patients. Over the years, we have sown the seeds of innovation. Today, we are beginning to see the fruits of these efforts.

The past two years have been especially productive. We surpassed our 1,000th grant review, a significant milestone reflecting the increasing vibrancy and competitiveness of Singapore's research community. More importantly, we are seeing the fruits of our long-term investments. As at end FY2024, we are supporting 154 nationally-funded active clinician scientists, bringing us closer to our target of 176 nationally-funded active clinician scientists by the end of FY2025. This is a three-fold increase compared to the numbers from a decade ago. These accomplishments are the result of years of dedication by our researchers, clinicians, and partners.

What has been equally rewarding is witnessing the cultural shift within our ecosystem. Collaboration across institutions has deepened, breaking down silos and enabling researchers to tackle complex healthcare challenges together. This spirit of cooperation has been one of the most significant enablers of progress.

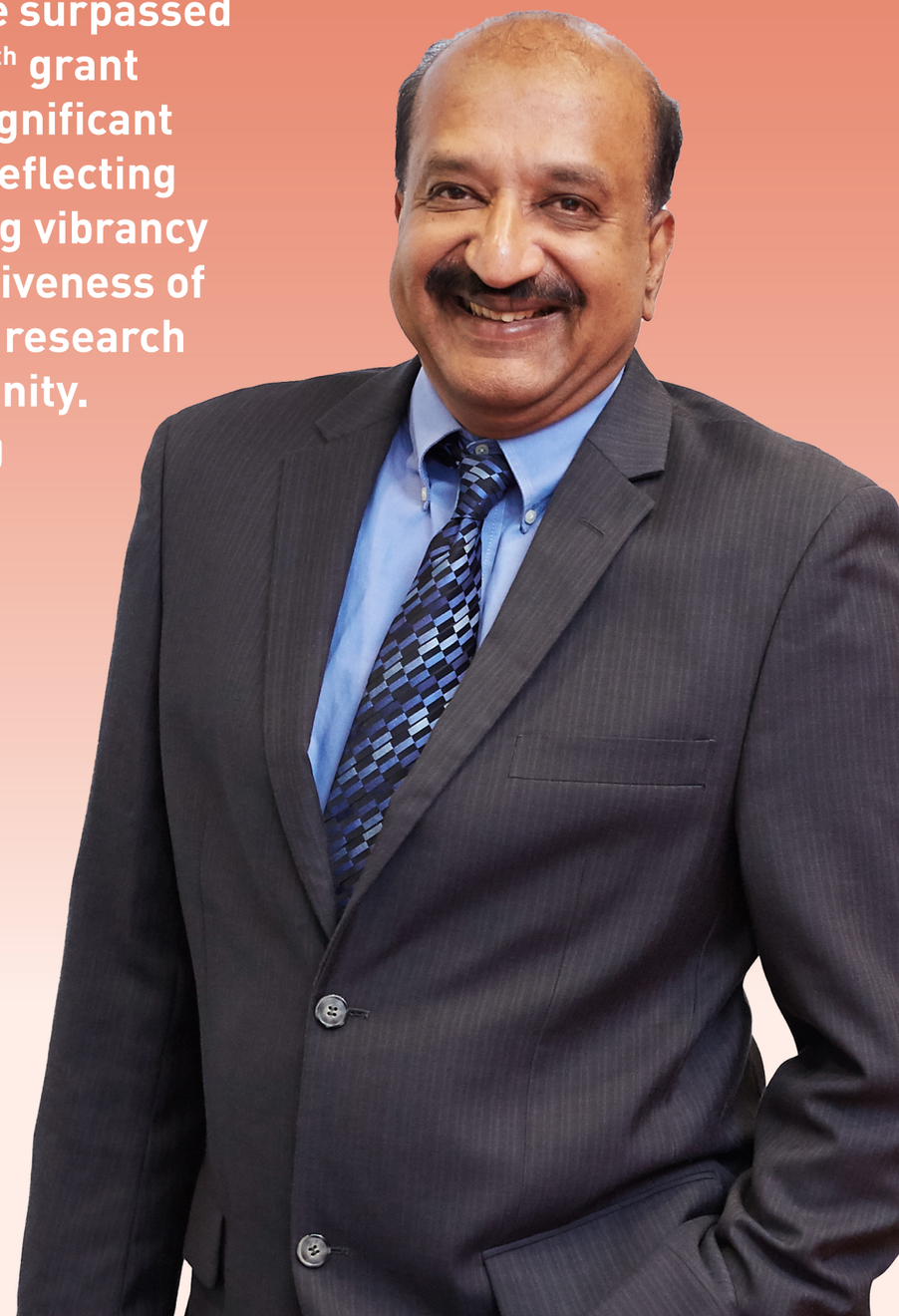
Looking ahead, there is still much work to be done. As we approach the final year of the national Research, Innovation and Enterprise (RIE) 2025 plan, we must prepare for the next chapter. Singapore is well-positioned to lead globally in areas such as population health, healthy longevity, preventive health, precision medicine, and epidemic preparedness and response. These will be the key priorities as we transition into RIE2030 and beyond, especially as we address the evolving needs of an ageing population.

As I conclude my term as Chairman, I wish to express my gratitude to the NMRC, the NMRC Office staff, and our wider research community. NMRC's greatest strength has always been its people. Their unwavering focus on our North Star, which is improving health outcomes for Singapore, will continue to shape the future.

Let us continue to nurture the seeds of innovation. The trees we grow today will provide shade and sustenance for generations to come. Stay curious, stay committed to the cause, and keep moving forward.

Prof Ranga Krishnan
Chairman, NMRC

“The past two years have been especially productive. We surpassed our 1,000th grant review, a significant milestone reflecting the increasing vibrancy and competitiveness of Singapore's research community.”



MESSAGE FROM EXECUTIVE DIRECTOR

PLANNING AHEAD, STAYING THE COURSE

The past two years have been a meaningful period for NMRC. With the pandemic behind us, we continued to implement the Research, Innovation and Enterprise (RIE) 2025 plan while also laying the groundwork for the next phase, RIE2030. It has been a busy and productive time, with more than 50 grant calls launched under the various research funding schemes and Human Capital Awards.

More than 440 research projects were supported during this period with the volume and quality of the proposals reflecting the trust that the biomedical research community places in NMRC. It has truly been our privilege to partner with our grant recipients to advance health through impactful research.

We continued to strengthen our research and innovation ecosystem by nurturing a broader and more diverse clinician scientist and innovator talent pool, including doctors, nurses, pharmacists, and allied health professionals. We also built new partnerships both locally and abroad. One example was a visit hosted by Unity Health Toronto's Knowledge Translation Programme (KTP) team in September 2023, where we learned how other organisations used research to support health policy decision making and facilitated the translation of research findings into real impact.

Every crisis brings both challenges and opportunities for growth. While the COVID-19 pandemic did not change the purpose and goals of NMRC, it reshaped the way we work. During the pandemic, we needed to shift grant reviews online and accelerate digitalisation of work processes. Many of these changes and improvements have become part of our standard processes, helping us work more efficiently and responsively.

Another major milestone was NMRC Office's transition from the Ministry of Health (MOH) to MOH Holdings (MOHH) in January 2024. This move has brought us closer to the healthcare clusters and other key stakeholders within the MOHH family. At the same time, we continue to work closely with and support MOH in planning for and administering RIE funding to research performers.

As we enter the final year of RIE2025, our priority is to complete the planning for RIE2030 and ensure a smooth transition. We are focused on maintaining momentum while preparing to support Singapore's next chapter in research that impacts health.

Finally, I would like to thank Prof Ranga Krishnan, who is stepping down as the Chairman of NMRC. Ranga's leadership has made a lasting impact on NMRC and the wider research community. On a personal level, I have greatly valued and benefitted from his wise counsel and guidance.

With the continued support of our partners and the dedication of the NMRC Office team, NMRC remains committed to advancing research that improves lives and strengthens healthcare for all Singaporeans.

Prof Tan Say Beng
Executive Director, NMRC

It has truly been our privilege to partner with our grant recipients to advance health through impactful research. We continued to strengthen our research and innovation ecosystem by nurturing a broader and more diverse clinician scientist and innovator talent pool, including doctors, nurses, pharmacists, and allied health professionals.

ABOUT NMRC

NMRC was established in 1994 to oversee research funding from the Ministry of Health and support the development and advancement of biomedical research in Singapore, particularly in the public healthcare clusters and medical schools. NMRC engages in research strategy and planning, provides funding to support competitive research grants and core research enablers, and is responsible for the development of clinician scientists through awards and fellowships. The council's work is supported by the NMRC Office which is part of MOH Holdings Pte Ltd. Through its management of the various funding initiatives, NMRC promotes healthcare research in Singapore, for better health and economic outcomes.

Executive Committee

Prof Ranga Krishnan
Chairman
National Medical Research Council

Prof Tan Say Beng
Executive Director
National Medical Research Council

Prof Kenneth Mak
Director-General of Health
Ministry of Health

Prof Yeoh Khay Guan
Chief Executive
National University Health System

Prof Ng Wai Hoe
Group Chief Executive Officer[1]
Singapore Health Services

NMRC Members

Prof Chong Yap Seng
Dean
Yong Loo Lin School of Medicine,
National University of Singapore

Prof Thomas Coffman
Dean
Duke-NUS Medical School

Prof Joseph Sung
Dean
Lee Kong Chian School
of Medicine, Nanyang
Technological University

Dr Lisa Ooi
Assistant Chief Executive[2]
Biomedical Research Council,
Agency for Science,
Technology and Research

Prof Benjamin Seet
Group Chairman Medical Board (Research)
National Healthcare Group

Prof Teo Yik Ying
Dean
Saw Swee Hock School
of Public Health,
National University of Singapore

Prof Leo Yee-Sin
Senior Advisor
National Healthcare Group

Prof Edward Holmes
Honorary Senior Fellow
Agency for Science,
Technology and Research

Prof Wong Tien Yin
Chair Professor & Senior Vice-Chancellor
Tsinghua Medicine,
Tsinghua University

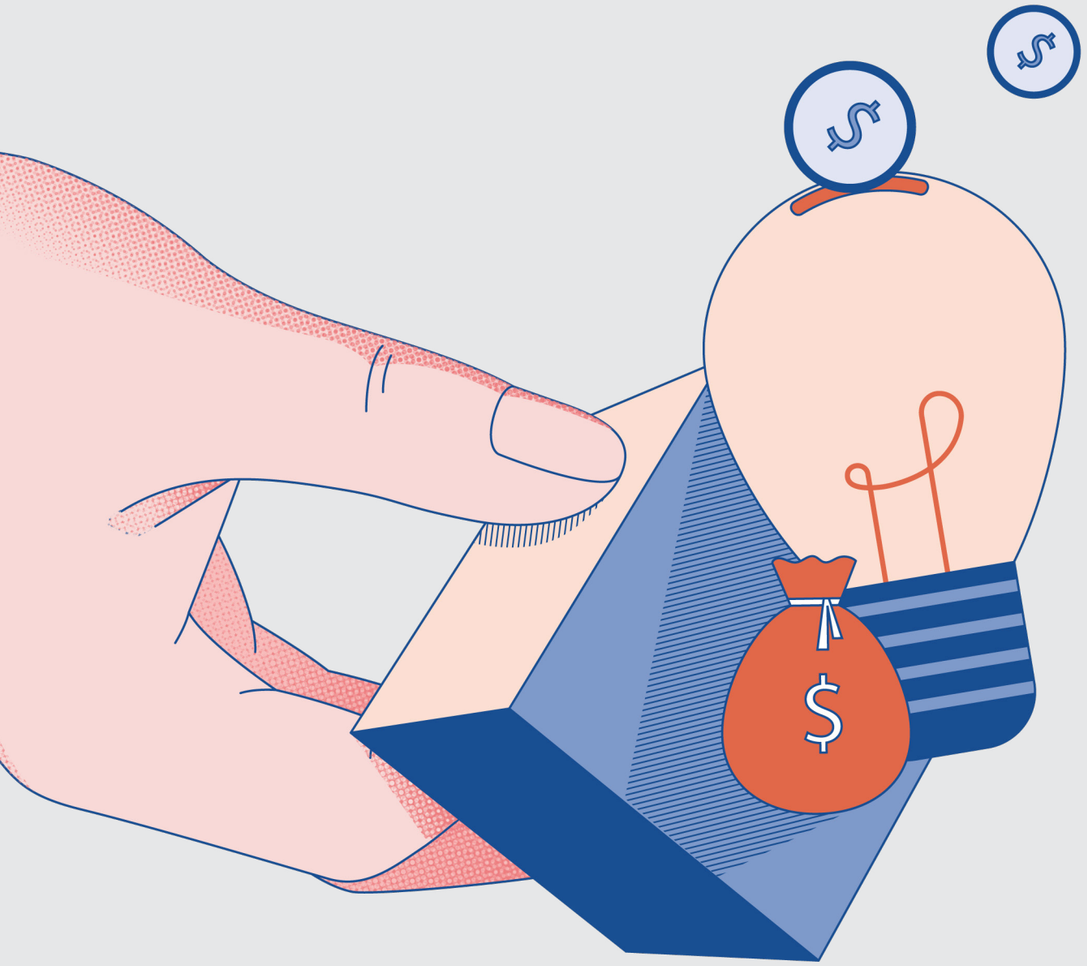
Prof Michael Merson
Wolfgang Joklik Distinguished Professor Emeritus of Global Health
Duke University

Prof John Lavis
Professor and Tier 1 Canada Research Chair in Evidence-Support Systems
McMaster University

Ms Amy Schulman
Managing Partner
Polaris Partners

Prof Sir John Savill
Executive Director
Melbourne Academic Centre
for Health

[1] was Prof Ivy Ng until 1 February 2024.
[2] was Prof Ng Huck Hui and Prof Tan Sze Wee until 14 August 2023 and 28 February 2025 respectively.



FUNDING PORTFOLIO

TRANSLATING RESEARCH FOR BETTER HEALTH

NMRC's funding portfolio consists of funding programmes that support Talent Development, Competitive Research Funding and Research Infrastructure, with the vision of Translating Research for Better Health.

The NMRC funding programmes in FY2023 and FY2024 are:

Talent Programmes

Human Capital Awards

- Singapore Translational Research (STaR) Investigator Award
- Clinician Scientist Award (CSA)
- HPHSR* Clinician Scientist Award (HCSA)
- Clinician Innovator Award (CIA)

Talent Pipeline Programmes

- Transition Award (TA)
- NMRC Research Training Fellowship (RTF)

Research Grant Programmes (Project-Based)

- Centre Grant (CG)
- Clinical Trial Grant (CTG)
- Clinician Scientist-Individual Research Grant (CS-IRG)
- Clinician Scientist-Individual Research Grant-New Investigator Grant (CS-IRG-NIG)
- Population Health Research Grant (PHRG)
- Population Health Research Grant-New Investigator Grant (PHRG-NIG)
- Healthy and Meaningful Longevity (HML)

Open Fund

- Large Collaborative Grant (LCG)
- Individual Research Grant (IRG)
- Young Individual Research Grant (YIRG)

Research Enablers and Infrastructure Initiatives

- Consortium for Clinical Research and Innovation, Singapore (CRIS)
- National Health Innovation Centre Singapore (NHIC)**
- Programme for Research in Epidemic Preparedness And REsponse (PREPARE)

Enablers and Infrastructure Support for Clinical Trials-related activities

- Bioethics Advisory Committee (BAC)
- Clinical Research Coordinator (CRC)
- Science, Health and Policy-relevant Ethics in Singapore (SHAPES) programme by Centre for Biomedical Ethics (CBmE)
- Investigational Medicine Unit (IMU)
- Institutional Review Board (IRB)
- Singapore Clinical Research Institute (SCRI)**

National Clinical Translational Programmes (NCTPs)

- Advanced Cell Therapy and Research Institute, Singapore (ACTRIS)**
- CArdiovascular DiseasE National Collaborative Enterprise (CADENCE)**
- Precision Health Research, Singapore (PRECISE)**
- Singapore Translational Cancer Consortium (STCC)**

Strategic Datasets and Data-sharing Infrastructure (SDDSI)

- National Cohorts Office (NCO)
- Trusted Research and Real world-data Utilisation and Sharing Tech (TRUST)

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* Health Promotion, Preventive Health, Population Health and Health Services Research

** CRIS Programme

TALENT PROGRAMMES

NURTURING A VIBRANT AND DIVERSE COMMUNITY OF CLINICIAN SCIENTISTS

Talent is one of the seven Research, Innovation and Enterprise (RIE) 2025 Human Health and Potential (HHP) strategic thrusts. Singapore aims to grow, recruit and diversify clinician scientists who will advance its strategic goals in RIE2025's HHP domain.

Clinician scientists play a critical role in Translational and Clinical Research, research in Health Promotion, Preventive Health, Population Health and Health Services Research (HPHSR), and/or Health Technology.

NMRC recognises the need to train and develop clinician scientists who are able to plug knowledge gaps and, over time, develop breakthrough research that will translate into impactful health outcomes.

To help Singapore nurture a vibrant and diverse community of clinician scientists, NMRC has put in place Talent Programmes to support individuals at various stages of their research careers.

The Talent Programmes in FY2023 and FY2024 are:

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- Clinician Innovator Award (CIA)

Talent Pipeline Programmes

- Transition Award (TA)
- NMRC Research Training Fellowship (RTF)

HUMAN CAPITAL AWARDS

Singapore Translational Research (STaR) Investigator Award

STaR Investigator Award is the most prestigious of the Human Capital Awards. It recognises and supports internationally renowned and outstanding investigators in translational and clinical research, HPHSR* and/or Health Technology. The STaR Investigator Award provides up to five years of funding for salary and grant support.

Clinician Scientist Award (CSA)

CSA supports local clinician scientist talent to undertake internationally competitive translational and clinical research. It provides clinician scientists with valuable protected time to focus on their research. The Senior Investigator (SI) tier of the CSA offers up to five years of funding to support senior clinician scientists who are active in highly productive research. The Investigator (INV) tier offers up to three years of funding and targets clinician scientists with the potential to become leaders in their particular fields of research. Both funding tiers provide salary and grant support.

HPHSR* Clinician Scientist Award (HCSA)

HCSA is a new programme introduced in RIE2025 to develop the local research talent in the areas of HPHSR*, bringing about significant and sustainable impact to health outcomes of the nation. There are two tiers of award: the SI tier offers up to five years of funding to support senior clinician scientists who have demonstrated sustained high levels of productivity and leadership in this field, and the INV tier offers up to three years of funding to support clinician scientists with the potential to become leaders in this field. Both funding tiers provide salary and grant support.

Clinician Innovator Award (CIA)

CIA is a revamped version of the Clinician Innovator Development Award (CIDA) introduced in RIE2025 to develop local research talent with healthcare innovation ideas in fields such as disease diagnosis, medical treatment and/or improvement of human health and quality of lives. There are also two tiers of award: the SI tier offers up to two years of funding to support senior clinician innovators who have demonstrated an excellent track record in healthcare innovation, and the INV tier offers up to two years of funding to support clinician innovators with potential healthcare innovation ideas and require funding to generate pilot data. Both funding tiers provide salary and grant support.

Grant calls for the above programmes are made twice a year, in January and July.

* Health Promotion, Preventive Health, Population Health and Health Services Research

SINGAPORE TRANSLATIONAL RESEARCH (STaR) INVESTIGATOR AWARD RECIPIENTS

T Cell Receptor (TCR) Mediated Immune Therapy in Chronic Hepatitis B (HBV) and Hepatocellular Carcinoma (HCC)

Adoptive T cell therapy against solid tumours is based on the concept that engineered T cells can kill tumour cells directly. As part of our project to develop T cell therapy targeting HBV-related liver tumours (HBV-HCC), we observed that in HBV-HCC patients treated with messenger ribonucleic acid (mRNA) HBV-specific TCR-T cells, partial response to the treatment was instead associated with the triggering of an inflammatory reaction and not proportional to the quantity of TCR-T cells infused.

In this extension of the research project, we want to demonstrate that the efficacy of TCR-T cell therapy is linked to its capability to trigger inflammation and to expand an endogenous tumour recognising T cell response. This demonstration is essential to support the use of mRNA TCR-based T cell therapy, which is based on the adoptive transfer of an increasing number of T cells with a short-lived ability to recognise HBV-HCC cells.

Furthermore, characterising the functional profile of endogenous HCC-specific T cells (i.e. whether they are more prone to tolerance or exhaustion) will be crucial to guiding whether the effectiveness of this treatment approach can be enhanced through combination with checkpoint inhibitors or cytokines aimed at rejuvenating these endogenous HCC-specific T cells.

PROF ANTONIO BERTOLETTI

Professor
Signature Research Programme in Emerging Infectious Diseases, Duke-NUS Medical School

Elucidating the Pathogenic Mechanism and Evaluating Management Strategies of "Pachychoroid Disease Spectrum"

"Pachychoroid" is a recently described eye condition that is linked to several common blinding clinical conditions. The common feature in these eye diseases is that blood flow gets congested in the back of the eye, leading to damage in the retina. Despite recognising this condition, the mechanism leading to pachychoroid remains unclear. Two pivotal questions currently prevail: What are the underlying causes and mechanisms leading to choroidal alterations? And how can we best manage its visual-threatening complications?

Our proposal will provide answers to these vital questions through a combination of clinical and animal studies running concurrently. First, we will conduct an international clinical study following patients over three years to understand how the disease progresses over time. Second, we will develop a model that simulates the eye's blood vessel congestion and observe how these vessel changes evolve and identify the underlying mechanisms. Third, we will run a clinical trial comparing different treatment approaches to see which works best for patients. The findings from our research will be crucial in developing scientific knowledge in this novel entity and importantly, in the development of therapies targeting the root cause in pachychoroid disease spectrum.

PROF GEMMY CHEUNG

Professor
Duke-NUS Medical School

Head and Senior Consultant
Medical Retina Department, Singapore National Eye Centre

Head
Retina Research Group, Singapore Eye Research Institute

Making Further Inroads into High-Risk Myeloma

Multiple myeloma is the second most common cancer of the blood system, and the number of new patients continue to rise in Singapore. Much improvement has been made in the treatment of myeloma over the last decades with average survival rate of patients increasing from four years to about 10 years now.

However, about 20% of patients who have high-risk disease still have poor outcomes despite the improvement in treatment. We can identify these high-risk patients with the use of genetics but the reasons behind such poor outcomes is not understood, making it difficult to develop more effective treatments for these patients. We have made some headways in our previous research.

In this proposal, we will test treatment strategies based on our understanding. At the same time, we will deepen our understanding of the remaining high-risk groups using new technologies, which we will also deploy in our proposal. This will be a key next step to improve the outcome of myeloma patients.

PROF CHNG WEE JOO

Senior Consultant
Division of Haematology, Department of Haematology-Oncology, National University Cancer Institute, Singapore

Professor
Department of Medicine, Yong Loo Lin School of Medicine, National University of Singapore

Vice President (Biomedical Sciences Research)
Office of the Deputy President (Research and Technology), National University of Singapore

Group Director
Research Office, National University Health System

The Impact on Population Health Arising from Alterations of the Gut Microbiome Associated with Bile Acid Homeostasis in the Development of Hepatocellular Carcinoma (HCC)

HCC is a deadly cancer because in its early stage when cure is possible, there are no symptoms. As a result, HCC is frequently diagnosed late. Patients with chronic hepatitis B and C who are at risk of developing HCC are routinely offered half-yearly surveillance. However, an increasing number of cases are now being seen in patients without viral hepatitis (NBNC) because of population changes in diet and lifestyle. There is thus an urgent need to identify NBNC patients at high risk of developing HCC who can benefit from surveillance.

Two discovery cohorts in Singapore, the NMRC Large Collaborative Grant (LCG)-funded PLANet and the Agency for Science, Technology and Research (A*STAR) Industry Alignment Fund – Industry Collaboration Project (IAF-ICP) funded ELEGANCE, have identified dysregulated bile acids as a significant risk factor for the development of HCC and have found that this is associated with changes in the gut bacteria.

This proposal plans to discover the exact mechanism by which dysregulated bile acids cause HCC and to develop a method to measure bile acid in the population that can identify patients at increased risk of developing HCC. In addition, we will conduct a study in patients with dysregulated bile acids to determine if dietary and lifestyle modifications can be possible interventions to correct gut bacteria profiles to prevent the development of HCC.

PROF CHOW KAH HOE PIERCE

Professor and Programme Director
Duke-NUS Medical School

Senior Consultant
National Cancer Centre Singapore

Senior Consultant
Singapore General Hospital

ExTrACT – Establishing an eX vivo Tumour infiltrating lymphocyte programme for Adoptive Cell Therapy

Most solid tumours are believed to contain a small number of immune cells that have the capability to kill the cancer cells that are growing adjacent to them. Unfortunately, these immune cells have either been blocked by the cancer or persist in such small numbers that they are ineffective in exerting any control.

We intend to harness the power of these cells by conducting a clinical trial where we will take these cells out of patients, expand them to large numbers and re-inject them back into the same patients where these cancer-specific immune cells can flood the tumours and specifically destroy cancer cells.

In this study, we intend to find new ways to identify patients who are likely to respond to this tumour infiltrating lymphocytes (TIL)-therapy and patients who may develop side effects from various steps in this treatment. We will also develop newer and more robust ways to identify and expand only the activated or effective tumour-targeting TILs using different approaches, including one that is personalised to the individual using peptide vaccines. Ultimately, we want to establish a national resource that can consistently manufacture more effective TILs across all cancers in Singapore.

PROF NARAYANAN GOPALAKRISHNA IYER

Professor
SingHealth Duke-NUS Oncology Academic Clinical Programme

Senior Consultant
National Cancer Centre Singapore

Singapore Oral Population Health Initiative (SOPI): Hypothesis-Driven Research to Inform Policymakers and Health Professionals and Improve the Oral Health of Singaporeans

SOPI seeks to advance understanding of the intricate connections between oral health and major non-communicable diseases (NCDs), including diabetes, cardiovascular conditions, and other systemic disorders. By mapping the current burden of oral diseases in Singapore, SOPI will evaluate how existing health policies, public health interventions, and models of dental care delivery influence oral health outcomes across the population. The programme will also examine how new or strengthened policies can help reduce key modifiable risk factors, such as poor diet, tobacco use, and limited access to preventive care.

Beyond disease prevention, SOPI will investigate the relationship between oral health and physical frailty in older adults, explore potential causal pathways linking tooth loss to cognitive decline and brain health, and assess the health and economic value of interventions targeting these outcomes. Furthermore, it will quantify the cost effectiveness of different dental service models in Singapore to inform optimal resource allocation.

By generating robust, locally relevant evidence, SOPI will equip government bodies and non-governmental organisations with the knowledge needed to set research priorities, reform education and policy, and guide strategic investments. Ultimately, the initiative aims to reduce the burden of oral diseases, enhance population health, and promote healthy ageing in Singapore.

PROF MARCO PERES

Deputy Chief Executive Officer (Research & Education)
National Dental Centre Singapore

Professor and Director Health Services and Systems Research Programme
Duke-NUS Medical School

Investigating Therapeutic Targets in Parkinson's Disease (PD)

PD is a common neurodegenerative disorder. Leucine-rich repeat kinase 2 (LRRK2) mutations can cause both familial and non-familial forms of PD. Identifying the proteins interacting with LRRK2 may lead to identifying new drug targets.

We have identified a protein that binds to LRRK2. Leveraging this discovery, we aim to study the biological consequences of its interaction with LRRK2. We will test a monoclonal antibody and drug inhibitors we have identified, using both animal and human models that we will develop.

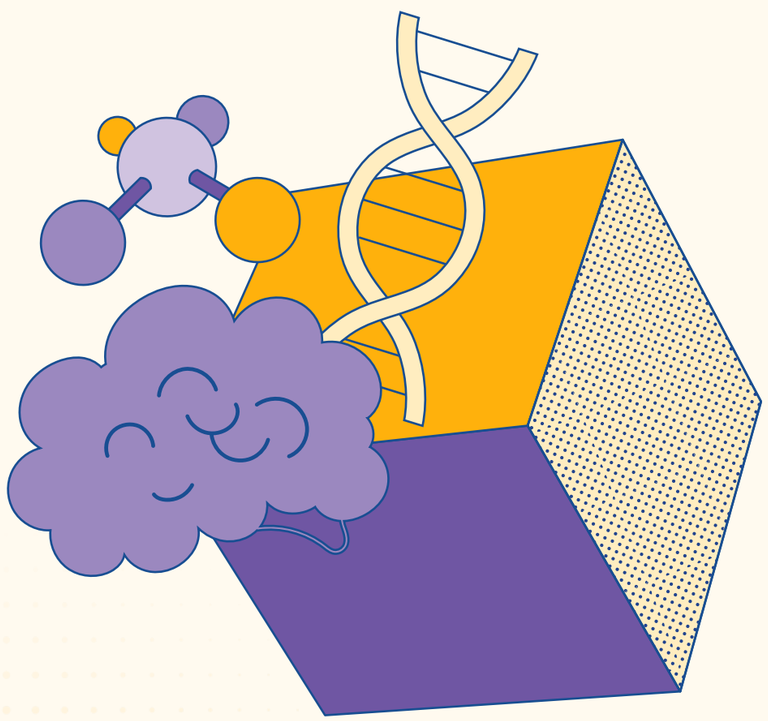
The biological effects of the interaction between LRRK2 and the protein will be examined using mammalian and human models. We will test the therapeutic efficacy of a customised monoclonal antibody that we have developed, and also specific inhibitors targeting the autophagic protein (identified from a screen of 12,000 compounds) in both mice and human models.

Our proposed study will unravel new pathophysiological clues and can potentially lead to the identification of blood biomarkers and new drugs that can monitor and treat PD.

PROF TAN ENG KING

Deputy Chief Executive Officer (Academic Affairs)
National Neuroscience Institute

Professor
Duke-NUS Medical School



CLINICIAN SCIENTIST AWARD – SENIOR INVESTIGATOR (CSA-SI) RECIPIENTS

Antenatal Myo-inositol supplementation in pre-existing diabetes to promote healthy neonatal outcomes (AMulet study)

Women with pre-pregnancy diabetes comprise 2-3% of the Singapore pregnant population. They have an exceptionally high rate (40%) of infant complications such as small or large babies, premature delivery, traumatic births, infant breathing problems, low blood sugar, jaundice, neonatal unit admission, and infant death. Very little has changed in the treatment of this group of women over the past two decades to improve this situation.

Myo-inositol is a naturally-occurring carbohydrate that improves blood sugar regulation. We propose to conduct a clinical trial to test if myo-inositol supplementation in pregnant women with diabetes, taken in addition to existing treatments, could promote healthy infant outcomes.

We will also collect blood and placental samples from trial participants to perform experiments that can help us understand how myo-inositol could be helping. If myo-inositol is found to be beneficial, information from this initial trial will be used to design a larger trial that can confirm and prove myo-inositol's effectiveness. Once proven, myo-inositol supplementation can be rolled out as part of standard care. This could have a substantial impact on women's motherhood journeys, and infant health outcomes, and could ultimately lower healthcare and societal costs considerably.

A/PROF CHAN SHIAO YNG

Senior Consultant
Division of Maternal Foetal Medicine, Department of Obstetrics & Gynaecology, National University Hospital

Associate Professor
Yong Loo Lin School of Medicine, National University of Singapore

Nanoparticle Mediated Complete Synthesis of Biological Therapeutics

Recombinant proteins are common in today's pharmaceutical industry, but producing them with modifications using cell-based systems, whether prokaryotic or eukaryotic, is inherently difficult and costly. Chemical synthesis is becoming a viable alternative to cell-based systems for producing small to medium-sized proteins on demand. It allows for the fine-tuning of biological activity via small but significant changes in amino acid chirality and side chains. Technologies for ligating small peptides together to make larger peptides or small-to-medium sized proteins have been around for decades, but problems like misfolding and aggregation due to high cysteine concentrations can reduce yields, rendering this process unsuitable for protein manufacturing at the scale required for biologic production.

Our revolutionary thermostable exoshells (tES) have the unique property of preventing protein aggregation and misfolding. We will focus first on a class of proteins that is both potent and relevant in therapeutic settings: antibodies and cysteine knot mini proteins.

In addition, we will investigate the role of various amino acid modifications in improving the molecule's therapeutic potential. The modular feature provides quite homogeneous and pure constructs, and there will be no frameshift mutations, as is common with recombinant proteins.

A/PROF CHESTER LEE DRUM

Senior Consultant
Department of Cardiology, National University Heart Centre, Singapore

Associate Professor
Yong Loo Lin School of Medicine, National University of Singapore

Target Prioritisation and Molecular Insights from an iPS CellPlatform for Cardiometabolic Disease

Heart failure has a big impact on society because it leads to a lot of deaths, illnesses, and hospital visits. Even though we have made progress in treating it, we still need to find new ways to target different aspects of the disease in the heart. To do this, we are using a combination of analysing disease pathways and studying the genetics of a large group of people to find new targets for treatment.

We have created a diverse group of stem cells from patients called an iPSC panel to study heart failure. By using advanced genetic analysis techniques and specialised sensors in the DNA, we aim to identify specific genes related to heart failure and prioritise them for further study. In the future, we plan to combine data from these stem cells with information about the health and lifestyles of donors to create models that can predict an individual's risk of heart failure and how they might respond to treatment based on their genetics, lifestyle, and environment. This could lead to new insights and tools for managing heart failure.

PROF ROGER FOO SIK YIN

Vice-Dean (Research)
Yong Loo Lin School of Medicine, National University of Singapore

Zayed bin Sultan Al Nahyan Professor of Medicine
Yong Loo Lin School of Medicine, National University of Singapore

Director
Cardiovascular Research Institute, National University of Singapore and National University Heart Centre, Singapore

Clinical and Biological Significance of Oncogenic Co-expression in Diffuse Large B-Cell Lymphoma (DLBCL)

Imagine being able to predict how well a cancer patient will respond to treatment with remarkable accuracy. Our project aims to achieve just that for patients with DLBCL, a common and aggressive blood cancer. By studying a specific group of cancer cells that overexpress certain protein combinations, we have found a strong link to poorer patient outcomes. Our goal is to define the clinical relevance of these cells and identify them from tumour samples taken from patients, allowing doctors to predict patient outcomes more accurately and tailor treatments accordingly.

We will explore how these specific cancer cells develop and their impact on the patient's immune system. By understanding their distribution in tumours, we can provide insights into why some patients respond better to treatments than others. Ultimately, we will validate our approach with data from DLBCL patients with different treatment approaches, ensuring its applicability.

This research promises to revolutionise DLBCL treatment by offering a precise, easy-to-use tool for doctors, eventually improving survival rates and quality of life for patients. Our findings could also apply to other cancers, broadening the impact of our work and paving the way for more personalised cancer therapies.

DR ANAND DEVAPRASATH JEYASEKHARAN

Assistant Professor
Yong Loo Lin School of Medicine, National University of Singapore

Consultant Medical Oncologist
Department of Haematology-Oncology, National University Cancer Institute, Singapore

Insights into the Pathobiology of Cerebral White Matter Disease in Mild Cognitive Impairment and Prevention Strategies with Pharmacological and Digital-Artificial Intelligence

Mild cognitive impairment (MCI) is an important disease stage along the cognitive continuum, as interventions at the MCI stage could result in lower incidence and prevalence of dementia. Findings from our group have demonstrated a high burden of cerebral white matter disease (WMD) among our subjects with MCI, with 80% having some amount of WMD, and 40% of these having moderate to severe WMD.

In this study, we will classify 600 subjects with MCI having WMD based on their cardiovascular risk profile status. We will study the contribution of endothelial dysfunction, blood-brain barrier dysfunction, neuroinflammation, and cerebrovascular amyloid to the onset and progression of WMD over a three-year period. We will also evaluate how these various pathologies contribute to clinical outcomes including cognitive performance, behaviour, and progression to dementia.

From an interventional perspective, two proof-of-concept studies will be carried out. The first will be a study with a novel antidiabetic medication and the second intervention will include an artificial intelligence-driven multi-domain digital lifestyle intervention study. Together, the longitudinal neuroimaging biomarker study and the proof-of-concept intervention studies would result in new knowledge into the pathomechanisms of vascular MCI, and potentially pave the way for novel interventions for MCI.

A/PROF NAGAENDRAN KANDIAH

Associate Professor of Neuroscience
Lee Kong Chian School of Medicine, Nanyang Technological University

Heart Failure (HF) Screening in Primary Care Using Digital Tools

Despite advancements in treating HF, challenges remain in early detection and accurate diagnosis, which have hindered efforts to reduce hospitalisations and death rates with available treatments. The need for effective screening and diagnostic methods is particularly pressing in primary care settings, where most early HF cases are first identified.

However, misdiagnosis is more common in these settings compared to hospitals, and there is often a lack of resources for systematic screening. Digital health tools offer great promise in improving HF screening and detection in the community before severe complications, hospitalisations, and fatalities occur. The main goal of this proposal is to create and validate a new HF screening process, supported by digital health tools, that can be used in both primary care and general community settings.

This project has several goals: (1) identify who to screen, we will look at existing data for insights, and test an artificial intelligence (AI)-enabled pathway going forward; (2) define how best to screen, we will test a new HF screening method in outpatient settings in Singapore using AI-enabled mobile diagnostic tools; (3) test the AI-enabled HF screening, we will perform a global clinical trial in primary care and community-based settings.

PROF CAROLYN LAM

Senior Consultant Cardiologist
National Heart Centre Singapore

Professor
SingHealth Duke-NUS Cardiovascular Sciences Academic Clinical Programme, Duke-NUS Medical School

Adipocyte Browning by Near Infrared or Alternating Magnetic Field Exposure on Subcutaneously Implanted Nanomaterials Containing Chemical Agents (ANTENNA)

The rising prevalence of obesity and metabolic syndrome proves difficult to curb with present existing medications. Apart from drugs inducing appetite suppression and malabsorptive bariatric surgery, there is presently no treatment paradigm that capitalises increasing metabolic rate via the conversion of white fat to brown fat.

Our present proposal aims to develop a novel yet practical method of browning using remotely activated heat instead of cold stimulation. We will first establish a protocol based on localised heat generated by shining low energy near-infrared laser onto subcutaneously injected copper sulfide nanodots into abdominal fat. This will be followed by a second protocol based on alternating magnetic field exposure of subcutaneously injected superparamagnetic iron oxide nanoparticles. Both these methods will be optimised in mice experiments before we adopt them for human studies.

Following a pilot human study using obese patients scheduled for bariatric surgery to assess the degree of browning in human fat tissues, we will plan to execute two separate randomised placebo-controlled clinical trials on obese people. These trials will study the magnitude of browning achievable by both methods, and the degree of metabolic improvements associated with browning of white fat.

PROF LEOW KHEE SHING MELVIN

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Professor
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Deep Phenotyping and Multi-Omics in a Large Prospective Asian Type 2 Diabetes Cohort to Understand Diabesity Associated Cardiorenal Failure

Type 2 diabetes (T2D) or diabesity (diabetes & obesity), partly driven by unhealthy lifestyle (dietary practice and physical activity (PA)), is a major cause of cardiorenal failure. We reported that certain metabolites-patterns were strongly predictive of cardiorenal failure. However, how much lifestyle factors (which are culturally sensitive and modifiable) have contributed to similar metabolites-patterns, is unknown.

We hypothesise that lifestyle (e.g. healthy versus unhealthy) is associated with differential metabolites and proteins patterns, and can predict cardiorenal failure.

From our large diabetic cohorts (SMART2D & DORIS), in about 3,000 individuals, we will study: (1) the relationship between lifestyle and proteins/metabolites-patterns using state-of-the-art methods (mass-spectrometry), followed by advanced bioinformatics to clarify the underlying biology; (2) the prospective relationship between lifestyle patterns and cardiorenal failure over around 10 years. PA has been objectively assessed by wearable devices (AX3). Dietary practice has been assessed by web-based tools. Subsequently, to study the relationship between proteins/metabolites biomarkers and cardiorenal outcomes for biological insights; and (3) whether these biomarkers may cause cardiorenal failure by advanced genetic-methods.

Our study may unravel the biology between modifiable lifestyle factors and long-term cardiorenal failure. This may inform therapeutic targets for Asians with T2D.

A/PROF LIM SU CHI

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Elucidating ImmuNe ReprogrammIng in NasopharynGeal CarcinoMA – Resolving an ENIGMA

Epstein-Barr virus (EBV)-associated nasopharyngeal carcinoma (NPC) is common in Asia. Resistance to treatment is not well understood. We think that the way cancer and immune cells communicate with each other and organise themselves within the cancer, also known as tumour immune microenvironment (TIME), may enable this treatment resistance to develop.

With this study, we hope to understand how the cancer organises itself to become resistant to treatment and in doing so, we can identify better ways to treat NPC. We will achieve this by using serial tumour biopsies and blood samples taken from patients treated with immunotherapy. These biopsies will be investigated using leading edge scientific tools to help understand the reasons for resistance.

We will compare differences in TIME across disease stages and treatments, and in patients who have relapsed or become resistant to treatment. In addition, we will grow these tumours in genetically-modified mice which have a human immune system (HuMice). These HuMice will allow us to further understand the biology of resistance better and test new drugs to target cancer growth. This proposal provides opportunities to study NPC from basic immune biology to translational science, synergise with ongoing research programmes, and keep Singapore competitive in NPC research.

PROF DARREN LIM WAN-TECK

Senior Consultant
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Professor
Centre for Clinician-Scientist Plus Development, Duke-NUS Medical School

A Novel Isolation Room Model Based on Culture-Independent Hi-C Metagenomics for Tracking Antimicrobial Resistance Transmission between Patients and Hospital Environmental Reservoirs

The spread of antibiotic-resistant bacteria is a major health problem worldwide, causing millions of deaths each year. Hospitals can unknowingly help spread these resistant bacteria because their surfaces are covered in many types of germs that can share their resistance traits. We do not fully understand how these bacteria interact on hospital surfaces and with patients, which hinders infection control, even in high-resource settings like Singapore.

To address this, we plan to use an advanced method that does not rely on culturing specific bacteria and instead will detect all kinds of bacteria. This will help us see which bacteria carry resistance genes and how these genes move between bacteria on hospital surfaces and in patients. We will set up a special isolation room to control outside influences and carefully monitor the movement of these genes. By understanding how antibiotic resistance spreads in hospitals, we can improve infection control strategies. Our research could lead to better ways to clean hospitals and prevent the spread of these dangerous bacteria, ultimately saving lives.

A/PROF NG OON TEK

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Tan Tock Seng Hospital

Associate Professor
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Long-Term Outcomes of Post-Tuberculosis (TB) Lung Disease Following Doxycycline Intervention

TB is a global pandemic that despite successful treatment and mycobacterial eradication can cause post-TB lung disease. This Phase 3 double-blind randomised-controlled trial aims to determine if adjunctive doxycycline with standard anti-tuberculous treatment will improve long-term lung function, decrease tissue destruction and affect long-term cardiovascular outcomes in two years. The results will positively impact clinical practice and international guidelines for the treatment of pulmonary TB.

A/PROF CATHERINE ONG

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Role of Glucagon-Like Peptide 1 Receptor Agonist (GLP1 RA) Dulaglutide on Cerebral Hemodynamics in Patients with Severe and Symptomatic Stenosis of Intracranial Internal Carotid Artery or Middle Cerebral Artery with Impaired Cerebral Vasodilatory Reserve—an Open-Label Randomised Clinical Trial

Narrowing of blood vessels inside the brain is very common among Asian stroke patients, which carries a high risk of stroke recurrence despite standard medical treatment. Putting stents and bypass surgery for stroke patients are associated with high procedural risks and not recommended routinely. Recently, newer glucose lowering drugs (Glucagon-like peptide-1 receptor agonists (GLP-1 RA)) showed additional benefits in the form of reducing the risk of ischemic stroke. These drugs were safe even in patients without diabetes. In this trial, we aim to use the GLP 1RA agent (Dulaglutide) for patients with severe blocks in brain arteries in patients after recent minor or non-disabling stroke.

Comprehensive clinical evaluation and advanced (but safe) diagnostic non-invasive tests of blood flow in the brain will be conducted. Study participants will be randomly allocated to receive standard medical therapy or Dulaglutide plus standard medical therapy for a year. All patients will undergo brain scans at baseline and at one year to evaluate the benefits of Dulaglutide in improving blood flow parameters. All patients will be closely monitored for two years for clinical events. We anticipate significant improvement in blood flow in the brain as well as a reduction of stroke recurrence in patients receiving Dulaglutide.

A/PROF VIJAY KUMAR SHARMA

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Senior Consultant
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Elucidating the Evolutionary Drivers of Resistance to Kinase Inhibitors

Tyrosine kinase inhibitors are now widely used in the treatment of solid tumours. In lung cancer, there is a collection of druggable molecular subtypes including EGFR and cMET. However, drug resistance often develops over time through a variety of mechanisms. Emerging data suggests that resistance seems to share common features across various molecular subtypes.

Although different drug combinations of treatments have been explored, response has been modest and often short-term. In lung cancer patients with EGFR mutations who do not respond well to treatment, signs of inflammation are observed, suggesting that the tumour microenvironment may play a role in this setting.

We hypothesised that by analysing tumour samples over time using advanced and high-resolution profiling tools, we can gain deeper insights and identify markers that help predict how the disease will progress, understand why resistance occurs, and design better treatment combinations.

A/PROF DANIEL TAN SHAO WENG

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Associate Professor
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Developing and Delivering Topical Ribonucleic Acid (RNA) Therapeutics for Inflammatory Dermatoses: Focusing on Atopic Dermatitis

About 30% of people worldwide have skin conditions, with inflammatory diseases like atopic dermatitis (AD, also known as eczema) being the most common. RNA therapeutics can revolutionise dermatological care. We have recently commercialised a bio-dissolvable microneedle patch that releases silencing RNA (siRNA) in the skin. Our early studies on other RNA therapeutics (antisense oligonucleotides) have also shown good results.

We aim to develop and validate topical RNA therapeutics that inhibits the TH2 pathway in inflammatory diseases through cellular, tissue, and animal studies. We will focus on AD in this project, and the therapies will comprehensively address all the components in the disease—inflammation, itch, and skin dryness.

The specific aims of the project are: (1) develop dissolvable microneedles containing nanoplex-encapsulated siRNA to silence specific inflammatory genes associated with AD, and (2) create a novel RNA therapeutic using liposome-complexed anti-sense oligonucleotides in a moisturising lotion to inhibit specific genes related to AD.

The proposed therapies for AD, a very common inflammatory skin disease, can create a significant positive impact for patient care in the clinics and healthcare in the population.

A/PROF TEY HONG LIANG

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Associate Professor and Co-Director of Skin Research Programme
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Senior Consultant
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Development, Validation, and Testing of Diabetic Retinopathy (DR)-GPT—A Multi-Model Generative Artificial Intelligence (AI) Agent for Diabetes Eye Care in Primary and Tertiary Eye Care Settings

Diabetes mellitus (DM) is a fast-growing health problem that could affect 780 million people by 2045, an increase from 171 million in 2000. In Singapore, the Singapore Integrated Diabetic Retinopathy Program (SiDRP) checks about 100,000 patients each year for DR, an eye disease caused by diabetes. Advances in artificial intelligence (AI) are helping doctors in many ways.

Our team created SELENA+ and DR-PREDICT, AI tools that can detect DR and predict its progression. Now, we propose DR-GPT, a new AI system to manage diabetes-related eye care. DR-GPT will use electronic medical records (EMR) and imaging data to help doctors decide patients who need urgent eye care, who can wait, and who does not need a referral.

We aim for DR-GPT to be more than 90% accurate. We also created IMAGE DR-GPT to find severe DR using eye photos, and a multi-language tool, Vision Language Model (VLM) DR-GPT, to teach patients about eye care in different languages. This project supports Singapore's Smart Nation 2.0 plan to use technology to solve health problems. This is in alignment with NRMC's vision of using novel technology to improve healthcare and help patients worldwide.

A/PROF DANIEL TING SHU WEI

Senior Consultant
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Associate Professor
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Detection and Optimisation of Treatment of Severe Cases of Dry Eye Disease

Dry eye is a common problem in the community that causes irritation and difficulty performing activities such as driving. In severe cases, it can require a change of job, frequent hospital visits, or lead to blindness. In order to improve efficiency of care and allow appropriate use of specialist resources, we need an effective way to detect and treat more severe cases of dry eye, while managing most mild cases by primary carers.

Working with computer scientists, we developed a way to use an image of the eye to determine referral using artificial intelligence. This will be further evaluated in this proposal, including its performance in non-Asian eyes with different iris colours, and use in combination with simple questions on symptoms of dry eye.

We have obtained good preliminary results using umbilical cord plasma eyedrops to treat severe dry eye. We will explore whether tweaking these eyedrops with platelet lysate, a component not used previously, will benefit the cells on the eye surface. We will also determine the optimal component of plasma for such treatment, to increase the predictability and efficacy of future therapy.

Together, these project aims will enhance both the quality of life and sustainability of dry eye care.

PROF LOUIS-MARIE GRIGNION TONG HAK TIEN

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Arthralgia, Muscle Strength and Menopausal Origins of Health and Disease (MOHaD)

During the menopause transition, many women suffer from debilitating joint pain and muscle aches (arthralgia), vaginal dryness, urinary incontinence, poor sleep, hot flushes which give rise to anxiety, depression, weight gain, and muscle loss, leading to physical and mental exhaustion and general ill-health.

The overarching aim of this proposal is to use the existing Integrated Women's Health Program (IWHP) cohort to: (1) identify the key modifiable risk factors responsible for poor post-menopausal health, with a focus on arthralgia; (2) develop targeted interventions such as estrogen replacement and curated exercises for menopause-associated arthralgia; and (3) use novel technologies developed by our laboratory to screen for menopause-associated disease risk early to effectively deploy interventions.

Successful completion of our aims will result in the identification of, and effective treatment for, key modifiable risk factors—including arthralgia, that contribute to ill health and poor quality of life among ageing women in Singapore. In addition, we will develop unique technological expertise to establish norms and cut-offs for muscle mass and function, as well as for measuring super low levels of estrogen and androgen in the menopausal state. These new technologies will allow us to predict poor health and allow for the timely implementation of targeted interventions.

PROF YONG EU LEONG

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CLINICIAN SCIENTIST AWARD – INVESTIGATOR (CSA-INV) RECIPIENTS

The Effects of Ripasudil in Patients with Fuchs Endothelial Corneal Dystrophy Undergoing Femtosecond Laser Assisted Cataract Surgery

Cataract surgery may lead to complications such as corneal endothelial decompensation. An unavoidable decrease in corneal endothelial cell (CEC) density after successful cataract surgery is greater in high-risk conditions like Fuchs Endothelial Corneal Dystrophy (FECD), often requiring corneal transplantation. Topical Rho kinase Inhibitors (ROCK-I) – Ripasudil 0.4%, can protect CECs by promoting peripheral CEC migration post-surgery, quickly restoring corneal clarity. However, current imaging methods are limited (less than 1% central endothelium) and fail to represent the entire cornea endothelium.

My proposed study builds on my previous Transition Award, to assess ROCK-I's effects on corneal clarity and CEC function, using my described widefield endothelial imaging technique with artificial intelligence (AI)-enabled analyses. We will conduct a double-masked randomised clinical trial involving FECD patients undergoing cataract surgery over three months, treated with either Ripasudil 0.4% or a placebo at Singapore National Eye Centre to examine the main outcome of post-operative corneal clarity and CEC loss.

We have well-established clinical and research expertise to execute this study successfully, with future plans to conduct a larger cohort study for future prediction of CEC loss and cornea edema using AI. Ultimately, the work aims to develop a clinical protocol that could help reduce corneal blindness following cataract surgery in Singapore, and globally.

A/PROF MARCUS ANG HAN NIAN

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The Role of Primary Angle-Closure (PAC) Glaucoma (PACG) Susceptibility Gene, Ependymin Related 1 (EPDR1) in Clinical PACG Severity and Intraocular Pressure Susceptibility

PACG is a major form of glaucoma and visual loss in Singapore. However, current strategies for patient stratification do not identify PAC suspects (PACS) who may progress and develop advanced PACG. This unmet need has led us to identify EPDR1 as a potential biomarker of such high-risk PACG patients. Reports have suggested that the EPDR1 gene, a recently identified PACG susceptibility gene, is associated with the PACS phenotype and increased PACG severity. How EPDR1 is associated with PACG severity is unclear.

EPDR1 is expressed in the retinal ganglion cells (RGC), the site of glaucoma damage. EPDR1 transgenic mice exhibit PACS features and loss of RGC EPDR1 expression, making them ideal for studying the effects of Intraocular Pressure (IOP) elevation and EPDR1 loss.

By confirming that patients with reduced expression of EPDR1 in tissue and serum will have more severe glaucoma damage and using our novel experimental glaucoma model in EPDR1 transgenic mice to elucidate the molecular mechanism of PACG disease, our proposal aims to address the unmet need by elucidating the role of EPDR1 in PACG severity and its molecular mechanism potential targets for future therapy.

DR ANITA CHAN

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Targeting Novel Macular Pigment Analysis and Therapy to Improve Vision-Related and Patient-Centred Outcomes for Epiretinal Membrane (ERM) Surgery

ERM is a common age-related eye disease that can cause significant visual impairment with adverse impact on quality of life. Surgery remains the mainstay treatment for patients with ERM and vision loss. However, visual outcome for ERM surgery can be highly variable, with only about half of the patients achieving significant gain in vision after surgery. Therefore, improving the visual outcome for patients with ERM undergoing surgery is a major unmet medical need.

Macular pigment, consisting of lutein and zeaxanthin, has important neuroprotective functions for the macula, the part of the retina responsible for the sharpest central vision. During ERM surgery, some of the macular pigment could be inadvertently removed during surgical removal of the ERM at the macula. This may contribute to the variability in visual outcomes after surgery. Previous studies have shown that lutein supplement can increase macular pigment.

There is also emerging evidence that changes in macular pigment may correlate with visual outcome after ERM surgery. Therefore, we propose to conduct a clinical trial to determine whether the loss of macular pigment during ERM surgery can be replaced, with the use of oral lutein supplement, thus restoring the neuroprotective functions and improve visual outcome.

A/PROF CHEUNG NING

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Effect of Light on Atropine Response in Myopic Children

Myopia is a common problem in Singapore affecting 80% of our children by their 18th year. Fortunately, there are eyedrops, glasses, and contact lens treatments which can slow myopia by 50-70%. However, 20-30% of children continue to progress despite intervention. This may be due to poor compliance, genetic, or lifestyle factors (especially light exposure). Time spent outdoors has been shown to protect children against myopia.

In this study, we hope to determine if lifestyle behaviour (i.e. light exposure) can explain the difference in atropine response. We will also assess wearable devices which record light exposure, and see if children could modify behaviour, based on feedback from these devices, to achieve specific light targets.

To do this, we plan to identify children in our clinic with both good and poor responses to atropine and determine if there are differences in their light exposure. We will also be providing children starting on atropine with wearable devices to see if: (1) providing feedback will help them modify behaviour and lifestyles; and if (2) this makes a difference to the atropine treatment response. Results from this study could influence the way we counsel and treat children with myopia.

A/PROF AUDREY CHIA WEI LIN

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Cardiac Remodelling and Heart Failure Progression in Patients with Type 2 Diabetes Mellitus (T2DM) and Co-Existing Hypertension (REMODEL-2)

T2DM and hypertension have direct influence on the heart muscles and are prevalent risk factors for heart failure. With an increased prevalence in these risk factors, the burden of heart failure in Singapore is expected to increase further. Heart failure progression is characterised by adverse structural and functional changes in the heart, which progresses from an asymptomatic phase to an advanced stage where clinical symptoms occur. We reported that hypertensive patients with T2DM had a higher prevalence of impaired heart function and heart muscle scarring compared to hypertensive patients without T2DM.

Protein markers of increased inflammatory response and immune cell activation were associated with heart muscle scarring in patients with hypertension and T2DM. While the mechanisms mediating the adverse impact of T2DM in heart failure are not clear, metabolic changes in the heart may precede the abnormal structural and functional signs of heart failure.

Our over-arching hypothesis is that adverse cardiac remodelling in patients with cardiometabolic risk factors is complex. Beyond the hemodynamic consequences of elevated blood pressures, we suggest that heart failure progression may be mediated by activation of pathways that promote heart muscle scarring, inflammation, and/or abnormal glucose metabolism in the heart.

A/PROF CALVIN CHIN

Senior Consultant
National Heart Centre Singapore

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Duke-NUS Medical School

Risk Factors for Structural and Functional Losses Associated with Myopia-Associated Optic Neuropathy

The prevalence of myopia is increasing worldwide, and may be associated with vision loss due to high myopia-associated nerve damage in the eye. Optic nerve damage is challenging to assess in highly myopic eyes at present, as the methods used to determine optic nerve health do not work well in many myopic eyes. This is largely due to structural changes arising from the elongation of the eyeball that occurs in myopia, which are not accounted for in conventional testing approaches.

We also do not know at present if treatments that lower pressure within the eye are helpful for myopia-associated optic nerve damage. We intend to undertake research to determine if improved methods of assessing the optic nerve that account for difference in myopic eye anatomy will help to predict which eyes are at greatest risk of optic nerve damage. We also plan to assess if there is any association between eye pressure and optic nerve changes that are associated with high myopia.

Findings from this research will help to inform best clinical practices for the diagnosis and management of myopia-associated optic nerve damage.

DR RACHEL CHONG SHUJUAN

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Heart-Brain Connection for Vascular and Cognitive Health

Undetected memory and thinking problems in patients with heart failure is high, affecting around one in two people. A mechanistic study in heart-brain relationship explaining memory and thinking problems can provide better diagnosis and treatment. To achieve this, we are extending and expanding our heart-brain connection project. In the proposed project, we will examine the relationships between heart and brain, as well as look for related factors of memory problems.

A new drug, SGLT2i, is good for heart failure (HF) treatment and might help with memory problems. We will assess its impact on memory. In total, 400 patients with HF will be included, of whom 160 of them (80 with memory problem and 80 without) will be invited for investigations, e.g. blood tests and brain scan.

They will be followed over two years and examined for memory and thinking abilities as well as heart and brain functioning. The outcome of this project is to establish better support and treatment for HF patients with memory problems.

DR DONG YANHONG

Assistant Professor
Alice Lee Centre for Nursing Studies, Yong Loo Lin School of Medicine, National University of Singapore

SUREFIND-NDD: Singapore Undiagnosed Disease Research Endeavour for Identification of Novel Genetic Discoveries in Neurodevelopmental Disorders

Neurodevelopmental disorders (NDDs) affect about 5% of school-going children in Singapore. Caring for an individual with neurodevelopmental disorders can cost a significant amount, not only to the family but also the society. There is a strong genetic component to neurodevelopmental delay. Unfortunately, genetic causes of neurodevelopmental delay are very diverse and a cause cannot be identified in the majority of the individuals. In the absence of a specific cause, preventive strategies cannot be implemented.

As part of global research efforts, we and researchers elsewhere have uncovered molecular pathways that link different genes to causing neurodevelopmental delay, which allows one to prescribe specific medications to ameliorate the symptoms. However, there remains a significant gap in our understanding of NDDs and hence, treatment is available for only a minority of the patients.

Our research aims to increase our understanding of the genetic causes in our local patients by employing complementary technologies including advanced computational tools and functional analysis using state-of-the-art cellular models. The findings from this research would improve our understanding of NDDs, which would provide insight into targets to treat and help these patients.

A/PROF SAUMYA SHEKHAR JAMUAR

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Genetics of Treatment Resistance in Schizophrenia

Schizophrenia is associated with high levels of social burden as well as immeasurable pain and suffering to afflicted individuals and their caregivers. In addition, 20 to 30% of these individuals fail to respond to treatment, defined as "treatment-resistant schizophrenia" (TRS). Despite clozapine being the gold standard for treating TRS, the utility rate is often delayed and underused due to side effect and frequent monitoring. This leads to poorer clinical outcomes than TRS.

At present, it is not possible to reliably predict how individuals will respond to antipsychotic treatment. While there are studies focusing on common genetic variants in schizophrenia, available information on TRS is lacking. This present study aims to identify genetic variants in schizophrenia within our local population. This identification can in turn generate a risk score to predict patients' response to antipsychotic or clozapine based on their genetic makeup.

Together, this information will guide the possibility of personalised treatment and augment clinicians' decisions to initiate clozapine in a prompt manner for individuals with schizophrenia who are shown to be responsive to it.

A/PROF JIMMY LEE CHEE KEONG

Senior Consultant Psychiatrist
Institute of Mental Health

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Lee Kong Chian School of Medicine, Nanyang Technological University

HOPE (Helping to Optimise Potential & Experiences) after Paediatric Critical Illness Cohort Study

Improvements in medical care provided in paediatric intensive care unit (PICU) have reduced childhood deaths from critical illness. However, childhood critical illness survivors experience significant physical and cognitive impairment. These impairments are associated with subsequent worse health, increased burden, and higher costs for families and the healthcare system. It is essential that we identify ways to minimise the physical and cognitive impact of paediatric critical illness. Our understanding of how best to optimise outcomes in these young survivors is impaired by a lack of knowledge of which patients are at highest risk of poor physical and cognitive function, and which PICU interventions are associated with poor outcomes.

This proposal aims to address these important questions that impede progress towards improving the quality of life of PICU survivors. Through recruitment and systematic follow-up of PICU survivors, this study aims to: (1) describe physical and cognitive function of survivors through reliable and validated tools; (2) identify patients who are at highest risk of bad outcomes; and (3) find potential modifiable PICU practices that are associated with poor health outcomes. When completed, this study has the potential to improve our understanding on how to optimise each child's quality of life after critical illness.

A/PROF LEE JAN HAU

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Immune Signatures of Psoriatic Arthritis (PsA) Defining Treatment Response and Relapse

PsA is an autoimmune disease affecting working-age adults, causing joint damage and disability. 40% of patients have inadequate response despite advanced treatments. There is a huge need to develop predictive biomarkers for treatment response and relapses.

We aim to recruit PsA patients who: (1) start advanced treatment; and (2) stop advanced treatments and follow-up for treatment response/relapse. We will discover the immune signatures that predict treatment response and relapse. We will explore the underlying mechanisms and cross-talk between tissues (skin and joints), and infiltrating blood cells.

We will utilise single cell technologies and bioinformatics to discover and validate the subset of immune cells that predict: (1) treatment response; and (2) relapse. We will explore the gene expression within the tissue architecture in psoriasis skin and compare it with blood signals; and compare the immune cells in paired synovial fluid and blood to further reveal the disease mechanism of PsA.

This research has the potential to be a game changer in guiding treatment for PsA using biomarkers. It will enable patients to receive the most effective drug, minimise side effects, and save costs. Furthermore, an understanding of the mechanism of disease will lead to the development of new treatments.

A/PROF LEUNG YING YING

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Diabetic Corneal Neuropathy: A Potential Window into Diabetic Microvascular Complications

Diabetes affects multi-organs, including nerves (neuropathy), kidneys (nephropathy) and retina (retinopathy). The status of the corneal (the front of the eye) nerves has been used as an early indicator for these diabetic complications, as these complications are interlinked, and neuronal alterations precede vascular changes. With artificial intelligence (AI) techniques and multimodal data, as well as particularly novel large-area corneal nerve scanning, we aim to develop predictive algorithms and investigate the relationship between these diabetic microvascular complications.

We will recruit 600 patients with diabetes. AI-based prediction models for diabetic peripheral neuropathy and diabetic nephropathy will be built, using corneal nerve images, corneal clinical features, and risk factors. We will study the relationship between diabetic corneal neuropathy and diabetic retinopathy using multimodal corneal neural and retinal imaging, corneal and retinal data, and tear molecular profiles. Additionally, we will construct quantitative software for large-area corneal nerve images and evaluate its performance in the assessment of diabetic corneal neuropathy.

Our study will identify patients at risk of diabetic complications early, allowing for timely management and reducing medical burden. The study will provide the basis for exploring imaging or molecular biomarkers for disease severity, and will strengthen multi-disciplinary collaborations. Large-area corneal nerve scanning is innovative and addresses unmet clinical needs.

A/PROF LIU YU CHI

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Deputy Head
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Dissecting the Role of Immune-Endothelial Interactions and Portal Hypertension in Driving Patients with Metabolic Dysfunction-Associated Steatohepatitis (MASH) Advanced Fibrosis to Decompensated Cirrhosis

Current efforts at tackling late-stage disease in patients with MASH has focused on fibrosis. We hypothesise that abnormalities in the cells lining the vessels within the liver drive high pressures in the liver (portal hypertension), which then leads to progressive damage in the liver.

In this study, we aim to demonstrate the role of these cells in driving portal hypertension, as well as determine the factors in MASH that lead to abnormalities in these cells.

DR MARK DHINESH MUTHIAH

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Medical Director & Senior Consultant
Adult Liver Transplantation Programme, National University Centre for Organ Transplantation, National University Hospital

Evaluation of an Artificial Intelligence Model for the Combined Diagnosis and Treatment of High-Risk B3 Lesions Detected on Breast Ultrasound

High-risk B3 breast lesions increased lifetime breast cancer risk. When diagnosed on biopsy, surgery is often done to exclude cancer. Vacuum assisted excision (VAE) is a minimally invasive procedure for breast lesion removal without open surgery. This is done only after a biopsy because B3 lesions cannot be distinguished from cancers on imaging, and cancers should be excised with open surgery. We have developed an artificial intelligence model (AIUS) that can classify a lesion as benign, high-risk B3, or cancer. With this, the AIUS can identify high-risk B3 lesions as a distinct category.

We will first validate the accuracy of this AIUS and evaluate the use of VAE as an alternative to open surgery in B3 lesions with atypia. Next, we will recruit 100 women with a lesion predicted as high-risk B3 by the AIUS who will undergo VAE, instead of a biopsy; no subsequent surgery will be done. Accuracy of the AIUS prediction will be determined based on tissue diagnosis. Follow-up scans will confirm if the lesion was completely removed by VAE.

The AIUS' ability to provide three-category lesion classification is unique and allows us to explore using VAE to achieve tissue diagnosis and complete definitive treatment in a single encounter.

A/PROF TAN ERN YU

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Clinical Validation of Gene Expression Predictor for Bevacizumab Treatment Response

Bevacizumab is a monoclonal antibody targeting vascular endothelial growth factor (VEGF). It has been used in the treatment of several cancers in the advanced stage, including glioblastoma, ovarian, lung, colorectal, and nasopharyngeal cancer. Unfortunately, despite its wide use and inclusion in clinical practice guidelines for cancer, there is currently no accurate method to select patients for bevacizumab treatment.

Using a novel ribonucleic acid (RNA) sequencing platform optimised for patient biopsies, we have developed a gene panel that accurately predicts bevacizumab treatment response. We will evaluate the performance of the gene panel in clinical trials and large cohorts. With a clinical biomarker test in hand, this work will help doctors select the best treatment for their patients and make a lasting impact on clinical care.

DR TAY KAI XUN JOSHUA

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A Bioengineered Probiotic Approach for Immunoregulation and Restoration of Skin Barrier Function in Atopic Dermatitis (AD)

AD, or eczema, is a chronic itchy skin condition which is closely linked to skin inflammation, detrimental inflammatory response, and bacterial overgrowth. Current AD treatment approaches such as topical steroids, antiseptic washes, and biologics are non-specific, have undesirable side effects or are very costly.

We thus aim to develop an engineered probiotic which produces novel metabolites to regulate inflammatory responses, promote healthy skin bacteria growth, and skin recovery through restoration of the skin barrier. We will validate the efficacy of this system through testing its functional ability in skin cells, artificial three-dimensional skin models and mouse models.

This novel, precision-medicine based bio-engineering approach will be a first step towards developing a novel therapeutic product, which would be a valuable addition to existing AD treatment regimens, help retain healthy skin bacteria balance, and reduce skin inflammation. Its technology can be further developed for use in other infectious diseases to avoid antibiotic resistance. This approach can also be pivoted toward applications in other infectious diseases and microbe-linked skin disorders, paving the way for industry collaborations and the development of clinically relevant interventions to modify the skin microbiome for disease treatment or prevention.

A/PROF THAM HUIWEN ELIZABETH

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Elucidating the Drivers of Ethnic Disparities in Breast Cancer (BC) to Improve Outcomes

Although BC survival has improved with earlier detection and new treatments, even after correcting for treatment, patient, and tumour characteristics, outcomes remain poorer in Malays compared to Chinese in Singapore. We hypothesise that there are several factors or drivers causing these survival differences, including different biology.

We will aim to: (1) identify the drivers of worse survival in Malay patients by studying ethnic differences in patient and BC characteristics plus treatment received among women diagnosed with BC from 2000–2017 at our healthcare cluster, and determine the extent the survival differences are affected by these factors; (2) determine if the lower survival in Malays have persisted over time, by looking at ethnic differences in survival according to year of diagnosis at our institutions and in the national registry; and (3) look for ethnic differences in BC biology beyond standard characteristics through ribonucleic acid (RNA) sequencing, to identify gene expression signatures and immune cell differences by ethnicity and confirming significant findings with multiplex immunohistochemical profiling.

The new detailed knowledge generated can help to promote equity in BC outcomes, e.g. better education and health-seeking behaviour, healthier lifestyles with reduction in obesity, greater financial assistance, and new approach to treatments.

A/PROF YAP YOON SIM

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Diffuse Optical Tomography Near-Infrared Imaging (DOT-NIRS) for Acute Stroke Diagnosis and Monitoring with Feedback for Non-Invasive Augmentation of Ischemic Collaterals

We will use a novel method of near-infrared imaging called the DOT-NIRS to detect anterior circulation large vessel occlusion (LVO) strokes, then modulate a therapeutic compression device to improve the perfusion to the brain.

We hypothesise that the novel DOT-NIRS will detect anterior circulation LVO acute ischemic strokes. In addition, this NIRS technology will be used to automatically control limb compression cuffs to improve blood flow to the area of the brain that lacks blood.

Using a patented DOT-NIRS headset with high-density sensor array and signal processing techniques, we will build up a detailed map of cerebral blood flow in the large arteries. This will allow us to diagnose LVO in stroke patients. We will then use a patented machine-to-machine interface to control limb compression to improve cerebral blood perfusion to the brain.

This portable DOT-NIRS based device will allow us to diagnose LVO ischemic stroke in an ambulance or clinic. Accurate triaging to thrombectomy-capable hospitals will reduce healthcare costs, result in better functional outcomes, and reduce rehabilitation time. The therapeutic compression device will limit the brain damage, so more patients are eligible for thrombectomy.

DR LEONARD YEO

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Elucidating Disease-Relevant Ligand-Receptor Interactions in Early Multiple Sclerosis (MS) Cortical Pathology

MS is a neurological condition presenting in the 20s to 40s, whereby a person's immune system attacks their own brain cells. Over time, there is a gradual decline in walking, bladder and bowel control, and cognitive ability. It is thought that the main reason this decline occurs is due to the accumulation of injuries in the outer most layer of the brain, i.e. the cortex.

However, little is known about how injury in the cortex is initiated and sustained in early MS, as it is not possible to obtain brain specimens from these young individuals. Therefore, animal models represent a good way to understand these injurious mechanisms. In this project, we will use a state-of-the-art technology called spatial transcriptomics to see which genes are being turned on (or off) in the cortex of a rat model of MS.

To further verify that the model is valid, we will validate the top targets in post-mortem MS brains and in the spinal fluid of people with early MS. This will enable us to find suitable targets to stop injury in the cortex early, and to find spinal fluid markers that can help identify individuals with high levels of cortical injury for earlier treatment.

DR YEO TIANRONG

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Advancing the Understanding of Biological Mechanisms Influencing Atopic Dermatitis (AD) and Skin Barrier Function

AD is a common skin condition that affects many individuals. Despite its high prevalence, it is not a uniform skin disease and many knowledge gaps remain regarding how the disease develops and respond to treatment.

Genetic analysis of AD is a promising approach and has started to shed some light on the mechanisms of the disease, but many aspects remain to be elucidated. We propose a study to leverage on existing clinical and genomic data in a general population cohort and basic science experimental models, to investigate the underlying causes of AD. Analysis will be performed on the blood samples of about 40,000 study participants to identify genetic factors that play an important role in the development of AD as a skin disease.

These are then subsequently analysed and prioritised to identify plausible candidate genes for further evaluation using a skin culture platform. In addition, genetic information will be linked with clinical data from a national electronic health records database for better understanding of the risk of AD and clinical utility locally. Advancing our understanding of the biology of AD would provide important insights on potential treatment options for future development.

DR YEW YIK WENG

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HPHSR* CLINICIAN SCIENTIST AWARD – SENIOR INVESTIGATOR (HCSA-SI) RECIPIENTS

Using Patient-Reported Outcome Measures to Improve the Use of Elective Orthopaedic Surgeries: Development and Evaluation of a Treatment Decision Support Intervention for Patients with Knee Osteoarthritis (OA)

A/PROF LUO NAN

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This project aims to develop and evaluate a web-based application to assist knee OA patients in making better treatment choices, particularly regarding a knee operation known as total knee replacement (TKR) surgery. By providing predictions for the health outcomes of TKR surgery, this application is expected to help patients make more informed decisions, resulting in better outcomes and avoid unnecessary operations.

The project will be carried out in two phases, including a development phase (Phase 1) and an evaluation phase (Phase 2). During Phase 1, we will first analyse data collected since 2009 through three standardised health-status questionnaires from the National University Hospital Department of Orthopaedic Surgery (NUH-DOS). We will then work with patients and doctors to develop a web-based application and a workflow for its implementation in local hospitals. In Phase 2, we will assess the usefulness of this application by studying 210 knee OA patients who are seeking consultation and treatment at NUH-DOS.

Half of these patients will use the application when discussing treatment options with doctors, while the other half will not. All patients will be followed for one year to evaluate their decisions, satisfaction levels, and treatment outcomes based on the choices they make.

Validation and Pilot Implementation of a Novel Symptom Appraisal Tool for Early Diagnosis of Patients with Autoimmune Rheumatic Diseases (ARDs) in the General Population and Primary Care

PROF JULIAN THUMBOO

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Research and Innovation Director
Singapore General Hospital

Professor
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Early diagnosis and treatment of ARDs is a long-standing global problem. Delayed diagnosis and treatment can lead to serious complications, poor quality of life, increased cost, and at times death. This is a great burden to patients, their families, and society.

Many strategies have been proposed to shorten this delay. Among these, evaluating individuals with persistent musculoskeletal (MSK) symptoms such as joint pain using questionnaires has been proposed as the best way to reduce delayed diagnosis. We therefore developed a novel, multimedia symptom evaluation tool for ARDs, the Symptom Testing for Autoimmune RheumaTic diseases (START) tool, which showed promising results in detecting patients with ARDs in pilot testing.

In this study, we aim to address this unmet need for early diagnosis of ARDs through reducing delays in diagnosis in individuals with persistent MSK symptoms (i.e. individuals who are at risk of ARDs) in the general population and primary care using START. This project is of global importance because it addresses global unmet needs for: (1) early diagnosis of ARDs using a novel questionnaire which addresses limitations of existing questionnaires; and (2) approaches to optimise implementation of such questionnaires.

* Health Promotion, Preventive Health, Population Health and Health Services Research

HPHSR* CLINICIAN SCIENTIST AWARD – INVESTIGATOR (HCSA-INV) RECIPIENTS

Cost-effectively implementing an Artificial Intelligence (AI) Clinical Decision Support for individualised holistic care of chronic RESpiratory patients: The AiRES-CDS Project

DR CHEN WENJIA

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As Singapore's population ages, our society needs to spend more and more to deal with chronic diseases, in particular multiple ones in the same person. To flatten growing cost curves, our study team aims to create a novel AI-powered tool called the AiRES-CDS alert.

In the future, we aim to integrate this tool into Singapore's electronic health records (EHR) system. It will help doctors predict and treat patients with chronic respiratory conditions, like asthma and chronic obstructive pulmonary disease (COPD), who are at risk of hospitalisation for any reason in the next six months. First, we will use National Electronic Health Record data to create and test an AI model that can accurately predict hospitalisations. Next, we will understand the key factors and pathways leading to hospitalisations, and create a system that automatically alerts doctors with personalised advice on how to prevent hospitalisations.

We will evaluate the costs and benefits of this alert to make sure it is practical and affordable for the healthcare system. Finally, we will set up a test version of this tool as a web application and run workshops to gather feedback and improve it based on real-world use. This project is an important step towards digital health for personalised, patient-centred preventive care.

Direct Admission from Primary Care to Hospital-at-Home (HaH): An Implementation Evaluation

DR STEPHANIE KO QIANWEN

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HaH programmes provide hospital-level care to suitable patients in the comfort of their own homes, helping to address the increasing demand for hospital beds as our population ages. Existing HaH programmes focus on patients referred from emergency departments or hospital wards, while this proposal specifically explores directly admitting patients from primary care settings, such as polyclinics, general practice, home medical services, and nursing homes. Our main question is: How do we implement direct referrals from primary care to HaH?

We propose to explore this question using a variety of research methods in two phases. The first phase will identify and describe patients suitable for direct admission to HaH from different primary care settings, and compare outcomes of directly admitting patients from primary care to HaH and similar patients who attend the emergency department instead. We will also interview patients and their caregivers to understand their experiences. The second phase will include interviews with primary care referrers to understand challenges in referring patients to HaH. These insights will be used to co-develop implementation and policy strategies with primary care leaders, healthcare representatives, and policymakers. The results of this study will inform the further development of scale-up of HaH programmes nationally and internationally.

* Health Promotion, Preventive Health, Population Health and Health Services Research

Promoting Early Relational Health with PlayReadVIP to Prevent Socioeconomic Disparities in Child Development

Family income has a profound impact on children's capacity and achievement. In Singapore, income disparity in child development is evident as early as infancy and persists throughout childhood. These disparities have policy implications for education and human potential. Early relational health—defined as positive parenting practices, a structured environment, and nurturing relationships can buffer these disparities and poor outcomes.

This project first adapts an intervention called PlayReadVIP, which supports caregiver-child relational health for the Singaporean population. We will then examine its effectiveness and delivery with 450 families with a newborn. These families are recruited in the last trimester of their pregnancy, based on their need for medical subsidies and family income. Parents and extended family members, when possible, will be recruited.

The first intervention session occurs after the child is born in the maternity unit. Objective brain and behavioural measures will be used to compare outcomes in children and their families who are randomly assigned to either the intervention or no intervention group. This study aims to demonstrate evidence of that PlayReadVIP improvement in positive caregiving and responsive interactions after PlayReadVIP, and in turn better brain development as well as prevention of school readiness disparities during the first three years of life.

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Project Pensieve II—A Proof-of-Concept Study on an Artificial Intelligence (AI) Tool to Detect Delirium among Hospitalised Older Patients

Delirium is a condition akin to acute brain dysfunction, whereby a person's brain function (also known as "cognition") suddenly becomes impaired because of serious medical conditions. Undiagnosed delirium is a significant unmet medical need among hospitalised older patients, affecting around 56,000 older Singaporeans every year.

Despite being common, most delirium cases are undiagnosed (due to subtle cognitive disturbances and impracticality of conducting routine cognitive testing), resulting in adverse health outcomes. Previously, we have developed an AI tool that can capture cognitive disturbances among older persons. This study seeks to examine if this AI tool can be trained to identify delirium and be subsequently developed into a tool to diagnose delirium among hospitalised older patients. We will recruit 500 hospitalised older patients with delirium to complete the AI tool.

Data from these 500 recruited participants will be merged with a pre-existing dataset of another 500 controls without delirium (from our previous study). The combined dataset of 1,000 participants will be used to train AI models to distinguish between delirium and non-delirium cases. Currently, no similar AI solution exists in the market globally. If proven useful, the new AI tool can provide a more scalable and sustainable approach to diagnose delirium and improve health outcomes.

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DEFIN3E (DiabEtic Foot IN Engaging, Educating, Empowering) Community Care

The DEFIN3E Community Care project is designed to revolutionise the way we manage diabetic foot ulcers (DFU) in Singapore's Woodlands community by using advanced artificial intelligence (AI). This initiative aims to significantly improve the health outcomes of individuals suffering from DFU by enhancing the care they receive directly within their community, outside the hospital setting.

The core of this project is the innovative use of AI Health Coaches and AI Wound Healing Reports, which provides personalised advice and support to patients. This app helps patients understand and manage their condition better by reminding them of essential care practices and alerting them when they need to seek medical attention. Alongside the app, healthcare professionals from the community will actively engage with patients, offering guidance and support reinforced by the AI's insights.

This combination of high-tech solutions and personal human interaction is expected to empower patients, helping them manage their ulcers more effectively, prevent complications, and improve their quality of life. The integration of this technology into everyday health management holds the promise not only of better health outcomes for patients but also of reduced overall healthcare costs by minimising the need for hospital visits and treatments.

DR LO ZHIWEN JOSEPH

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Innovative M(Mobile)Health-Based Programme to Facilitate Exercise and Self-Management in Knee Osteoarthritis: A Non-Inferiority Randomised Controlled Trial

With an ageing population and with more people being overweight or obese, the number of people with painful knee osteoarthritis will increase with time. In Singapore, although outpatient physiotherapy is an important resource in knee osteoarthritis care, it is costly and inconvenient for patients and their caregivers. As a mobile application (app) can potentially deliver care to many patients at a relatively low cost, we aim to develop a mobile app-facilitated exercise and self-management programme with patients and healthcare professionals from various fields. We also aim to compare clinical outcomes and costs of patients who have undergone this programme with patients who have undergone hospital rehabilitation.

Two hundred patients with knee osteoarthritis will be randomly assigned to a 12-week physiotherapist-supervised, hospital-based programme or a 24-week app-guided exercise and self-management programme. Outcomes will be collected before treatment and at three and six months after treatment. These outcomes include measures of walking ability, knee pain, physical activity, quality of life, and costs.

This study is the first in Singapore to develop and examine an innovative solution for delivering affordable osteoarthritis care. If successful, it could reduce or delay the need for an expensive total knee replacement surgery.

DR PUA YONG HAO

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An Artificial Intelligence (AI)-Driven Predictive Tool to Identify High-Risk Individuals for Lung Cancer Screening in Singapore (LungAI-Screen)

Lung cancer remains the leading cause of cancer-related mortality in Singapore and continues to impose a significant burden on patients, families, and the healthcare system. Despite progress in treatment, most lung cancers are diagnosed at advanced stages, when survival rates remain poor. This highlights a critical need for earlier detection and more efficient screening strategies.

Our proposed research tackles these key challenges with three main goals. First, we will develop a new AI-driven risk prediction tool to identify individuals at high risk of developing lung cancer. Using routinely available information, such as age, medical history, and family history, the tool will enable more personalised and timely screening.

Second, the tool will be evaluated within a local pilot screening programme to assess its real-world performance. Finally, we will analyse how hospital visits and healthcare costs associated with lung cancer have changed over time, and model their future trajectory. The project will also evaluate the cost-effectiveness of integrating the AI tool into screening. Collectively, these efforts aim to improve early detection and reduce the long-term healthcare burden of lung cancer in Singapore.

DR SEOW WEI JIE

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Potential of Interface Care Models to Deliver More Appropriate Care to Patients with Acute Medical Illness in Singapore and Decrease Utilisation of Acute Care Bed-Days

Every country in the world is experiencing growth in both the size and the proportion of older persons. As a result, the profile and needs of people with medical illnesses are changing. How we deliver care to patients has to keep pace with these changes, or patients will experience poor care at high cost and not have their needs met. Two new models of care have emerged to meet these challenges: Acute Medical Unit and Comprehensivist-Extensivist Care.

Despite considerable investment and popularity of these models, questions remain: (1) Who benefits most from these care models? (2) How may these models be most effectively combined for best results? (3) How effective are these models? Singapore is well-placed to answer these questions with its national healthcare system and excellent research institutions. I plan to study the effectiveness of these models by comparing patients with similar profiles exposed to both care models against those receiving standard hospital care. The study will look for four differences: (1) how long patients stay in hospital; (2) how often they use the emergency department; (3) quality of health; and (4) cost. Additionally, I aim to characterise patterns of health needs for this group of patients.

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Development and Preliminary Evaluation of a Brief Stepped-Care Telehealth Early Intervention Protocol for Adolescent (STEP-A) Emergency Department Patients with Panic-Related Anxiety: An Early-Stage Multi-Site Single-Arm Hybrid Effectiveness/Implementation Trial in Singapore

Panic disorder is a severe anxiety-related condition that includes symptoms like chest pain and difficulty breathing. Up to one-third of adolescents who seek help for chest pain in the Emergency Department (ED) are experiencing panic-related anxiety, but they are not usually diagnosed or treated in the ED. This means they are more likely to continue having anxiety problems that can interfere with their lives.

Our team has developed a brief telehealth treatment for adults with panic-related anxiety, but it is unknown if it will be effective for adolescents. This research study will help us to: (1) adapt the adult treatment for use with adolescents via videoconferencing instead of in-person visits; (2) test how effective the treatment is for reducing panic-related anxiety and other important symptoms; and (3) find out how to improve the likelihood that the treatment can be implemented in the ED setting.

We will recruit adolescents, caregivers, and healthcare providers from EDs in SingHealth and conduct workshops, in-depth interviews, and surveys to evaluate the effectiveness of the treatment and identify factors that could help with implementation.

The results will be used to further improve the treatment and plan for a larger nation-wide study.

DR SHARON COHAN SUNG

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Supervising Clinical Psychologist
KK Women's and Children's Hospital

Supervising Clinical Psychologist
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Implementation-Effectiveness Hybrid Study of a Collaborative Model of Care between Orthopaedics and Allied Healthcare Professionals (CONNACT Plus) in Knee Osteoarthritis (OA) in Singapore

OA is a leading cause of pain and poor function, particularly among the elderly. The Collaborative Model of Care between Orthopaedic and Allied Healthcare Professionals (CONNACT) community intervention started in 2017 with a 12-week personalised group psychoeducation and exercise programme. A modified CONNACT Plus incorporating health coaches, was introduced in 2021 that was scaled up as a health cluster-wide programme.

The aim of this proposal is to evaluate this scaled-up version of CONNACT Plus where we hypothesise that CONNACT Plus is both a clinically and cost-effective intervention. Our effectiveness-implementation hybrid study consists of two components. The first component focuses on assessing the implementation of the sustainable delivery of the CONNACT Plus programme on a large scale. The second component focuses on studying the clinical and cost effectiveness of CONNACT Plus, identifying the subgroup of patients who would benefit most from CONNACT Plus.

Findings will inform sustainable upscaling of CONNACT Plus through precision population health, underpinned by the implementation of science principles to optimise rehabilitation and deliver value-based care.

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Bringing about Optimal weight loss Outcomes through dietary and weight management Support driven by generative artificial intelligence Technology (BOOST-AI): A Pragmatic Randomised Controlled Study in Type 2 Diabetes

Weight loss is important in diabetes. App-based weight management programmes are attractive because people can access self-care support whenever and wherever it suits them best. With the emergence of large language models (LLMs) that can comprehend and generate human-like text, more effective app-based programmes can be developed with less reliance on healthcare providers.

In our research programme, we will apply generative artificial intelligence (AI) to develop the Boost-AI weight management programme. The two main AI components are: (1) a meal recommender, which recommends meals to both individuals and groups, and suggests nearby food options using geo-location; and (2) a chatbot that answers questions related to weight management, and provides daily weight management tips. These AI components will be combined with a virtual pet app, to facilitate weight loss over a three-month period.

A randomised control study will be carried out to compare the effectiveness of the Boost AI programme compared to an existing diabetes self-care app over six months, and the outcomes will include weight loss, glycaemic and blood pressure levels, behaviours (diet, physical activity, self-care), self-efficacy, health-related quality of life, and resource utilisation. A qualitative study will assess the experience of the Boost-AI programme.

DR SABRINA WONG KAY WYE

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Dose-Response Effect of Community Dance Programme on the Physical, Cognitive, Psychosocial Health of Pre-Frail Older Adults: A Cluster Randomised Trial with Co-design Approach and Process Evaluation

Frailty is a complex and common phenomenon among older adults characterised by depletion of reserves in multiple organ systems leading to physiologic vulnerability, such as functional decline and increased risk of falls. Hence, it is important to prevent frailty and enable older adults to live healthily in the community. Dance is effective to improve muscular strength, endurance and balance. Furthermore, dance with music increases motivation and adherence to prescribed physical exercises.

The primary objective is to develop and evaluate a Community Dance Programme, which is aimed at promoting physical strength, balance, cognition, and psychosocial wellbeing of pre-frail older adults. A cluster randomised trial with co-design approach and process evaluation will be applied. We will engage the stakeholders (older adults, Active Ageing Centres staff, and dance instructors) in the co-design process of the tailored dance programme, taking into consideration the age, physical condition, and cultural preference of older adults.

The Community Dance Programme focuses on preventive health, takes proactive steps to stay physically active, and leads to healthier lifestyles. This customised dance programme, if proven effective, can be optimised for our local community, which will provide a platform to promote the Healthier SG initiative to a wider population of older adults.

DR WU XI, VIVIEN

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ENABLE-SG (Educate, Nurture, Advise, Before Life Ends for Singapore) as a Proactive Palliative Care Model: Evaluation and Implementation Preparation

The current model of interdisciplinary specialist palliative care focuses on supporting patients with advanced cancer who have complex problems in the last weeks of life. This model has two major problems. First, palliative care is delivered very late in the patient's disease trajectory. Second, as the initiation of palliative care is triggered by uncontrolled symptoms typically in a time of crisis, patients and families are often in distress and end up being passive recipients of services.

Models of palliative care ought to move beyond the current reactionary illness-stress paradigm to a proactive health-wellness approach that is integrated early in the patient's serious illness trajectory.

ENABLE (Educate, Nurture, Advise, Before Life Ends) is a proactive early palliative care model that aims to coach patients and caregivers on how to cope effectively with serious illness via developing self-management skills, including problem-solving, decision-making, advance care planning, symptom management, self-care, communication, and life review. This proposal aims to test the effectiveness of the adapted ENABLE-SG model in patients with recently diagnosed advanced cancer and collect data on subsequent real-world implementation of ENABLE.

A/PROF YANG MEIJUAN GRACE

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A Precision Medicine-Based Approach to Advancing Population Kidney Health in Singapore

Kidney damage and loss of kidney function is a common and serious health problem in Singapore and globally. Currently, there is limited understanding from studies as to why kidney disease is more common in Singapore, why some groups are more affected, and how risk factors such as diabetes, high blood pressure, lifestyle, environment, and other factors can be linked to kidney disease.

It is also not clear if our genes play an important role in determining risk of kidney disease. A better understanding of the different factors predicting kidney disease will allow for policies and strategies aimed at prevention, early detection, better risk assessment, and effective treatment of kidney disease.

These will then prevent kidney failure and serious problems due to kidney disease, reduce the need for dialysis treatment and improve general kidney health of the population. In this project, we aim to determine the frequency of kidney disease in different groups; study the links between kidney disease and genetics, chronic illnesses, lifestyle, and environmental factors in each group, and the relative contribution of these factors driving differences in kidney disease risks across different groups; and develop a personalised risk assessment for the prevention and treatment of kidney disease in Singapore.

A/PROF YEO SEE CHENG

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CLINICIAN INNOVATOR AWARD – SENIOR INVESTIGATOR (CIA-SI) RECIPIENTS

WeeCare — Providing Cost-Effective Home Monitoring of Urinary Flow for Men with Lower Urinary Tract Symptoms (LUTS)

DR NG TZE KIAT

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Department of Urology, Singapore General Hospital

The Urology Department at Singapore General Hospital sees 25,000 patients with lower urinary tract symptoms (LUTS) annually, representing around 50% of the clinic visits. This number will grow with an ageing population.

The clinical evaluation of patients with LUTS and, in particular, males with benign prostate enlargement (BPE) involves history taking, clinical examination, and investigations including uroflometry (measuring peak urine flow rate, among other parameters), both at the time of initial diagnosis and subsequent follow up visits. LUTS form the bulk of referrals from primary care physicians to tertiary urology centres.

These referrals are usually made with reference to patients' subjective complaints of voiding and storage symptoms, without any objective clinical parameters. This is mainly due to the lack of affordable and available equipment (i.e. clinic setting uroflometry machines). We aim to develop a portable device which can empower the primary care physician in the assessment and monitoring of patients with BPE, a chronic condition prevalent in the ageing population of Singapore. The primary physicians can use this device easily to follow up with these patients.

Longitudinal exploration of Extracardiac Adipose tissue and coronary Plaque (LEAP)

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Associate Professor
SingHealth Duke-NUS Cardiovascular Sciences Academic Clinical Programme, Duke-NUS Medical School

Coronary artery disease (CAD) is a major health challenge, underscoring the need for early detection and ongoing monitoring. Doctors use coronary computed tomography (CT) angiography to check for CAD, but its complex development involves various factors influenced by health conditions and medications. Predicting the progression of coronary plaque in the heart's arteries is difficult, and there is currently no method to identify people at risk of rapid plaque growth.

Building on our prior work, we have created advanced computer programs and patented technologies to precisely measure and evaluate fat around the heart known as extracardiac epicardial adipose tissue (EAT) and coronary plaque. This builds on our extensive database of CT scans and clinical data. Our current project, LEAP, aims to: (1) improve our artificial intelligence (AI) technology to better understand the growth of fat around the heart and coronary plaque; (2) test our technology with 180 cases, assessed by three independent experts, and gather user feedback; and (3) develop a product with quality management for future use. This project advances early CAD detection by transforming AI-based fat around the heart and plaque analysis into a validated, user-ready diagnostic tool, enhancing precision risk prediction and supporting clinical decision-making.

CLINICIAN INNOVATOR AWARD – INVESTIGATOR (CIA-INV) RECIPIENTS

Design to Fit: A Novel 3D-Printed Prosthetic Solution for Diabetics

DR TREVOR BRIAN BINEDELL

Principal Prosthetist/Orthotist
Prosthetics and Orthotics Department, Tan Tock Seng Hospital

Diabetes is the leading cause of limb amputations. Traditional prosthetic limbs can be uncomfortable and poorly fitted, affecting patients' mobility, and quality of life. Our project aims to develop a novel 3D-printed transtibial prosthetic socket specifically for diabetic amputees to enhance comfort and functionality.

With an ageing population and rising diabetes rates, Singapore faces increasing demand for better prosthetics. Current methods are labour-intensive and often result in uncomfortable prosthetics. To address these issues, we will use innovative 3D printing technology.

The project aims to: (1) develop and validate an effective and comfortable 3D-printed prosthetic socket using Hewlett-Packard (HP)'s 3D printing technology; (2) engage in a clinical trial by comparing the new 3D-printed socket with traditional sockets, measuring improvements in user satisfaction and quality of life; (3) optimise and scale by refining the design and production process with HP, exploring mass production and commercialisation; and (4) standardise production through implementing a digital production method in Singapore to ensure high-quality, affordable prosthetic care.

The collaboration between Tan Tock Seng Hospital and HP, along with existing data and Singapore's digital health infrastructure, supports the project's success. This research will advance prosthetic care by making it more personalised and effective, improving treatment and quality of life for diabetic amputees.

Be Right! Back: An Artificial Intelligence (AI) Enabled Mobile Application for Patients with Low Back Pain (LBP)

DR CHEONG KWOK CHEE, PHILIP

Senior Principal Physiotherapist (Clinical)
Department of Physiotherapy, Singapore General Hospital

Director of Research
SingHealth Duke-NUS Sports and Exercise Medicine Centre

Adjunct Assistant Professor
Singapore Institute of Technology

LBP is a common problem with complex causes, of which some are modifiable. Physical factors like strength, movement, and pain play a big role, but measuring all these factors accurately is tricky. This is where AI comes in.

This project aims to develop an AI solution (in the form of a mobile application) that can measure four key components of the physical factor of LBP, such as, how quickly you can stand up five times, your spine's flexibility, how you walk, and your pain levels while moving. The measurements taken by the mobile application will be compared against those of trained physiotherapists to ensure its accuracy. If successful, this AI solution will be a game-changer. Physiotherapists will be able to remotely track the progress of their LBP patients.

The data gained from remote tracking will allow physiotherapists to have a better understanding of the individual profile of each LBP patient and adjust their treatment accordingly, hence allowing for better care and more effective LBP management. In short, this project aims to harness the power of AI to make managing LBP easier for both patients and physiotherapists.

Digital Imaging Using Optical and Thermal Sensors to Scale the General Inspection for Kaki Ailments and Promote Healthy Feet in People with Diabetes (DigiKAH Experience)

One in 10 Singapore residents has diabetes; many of whom develop foot ulcers that may lead to leg amputations. Screening to detect foot disease from diabetes prevents complications. Currently, there are insufficient nurses to perform foot screening that takes 30 minutes each time. Many residents skip the screening as they have many medical appointments. We have developed the DigiKAH machine that incorporates a high-quality camera and heat scanner to take pictures of the foot and detect disease by assessing the temperature or skin condition.

We aim to enhance the image processing techniques of DigiKAH and build its artificial intelligence to recognise foot conditions in diabetes from live images. We will deploy DigiKAH in hospitals and polyclinics, and image the feet of 300 people with diabetes and healthy volunteers. We will train DigiKAH to accurately recognise diabetic foot ulcers, poor circulation, and bone or nerve injury.

We can deploy DigiKAH widely in clinics and community health posts nearer to homes as a convenient mass and rapid screening tool for diabetic foot disease. DigiKAH will reduce the staffing required to screen the projected 870,000 residents with diabetes by 2030, and facilitate our efforts in preventing diabetic foot complications in Singapore.

A/PROF CHUA HORNG RUEY

Head & Senior Consultant
Division of Nephrology, Department of Medicine, National University Hospital

Adjunct Associate Professor
Department of Medicine, Yong Loo Lin School of Medicine, National University of Singapore

The Development of a Novel Ear Surgery Toolkit

Eardrum perforations are common, affecting 330 million people worldwide. These lead to recurrent ear infections and hearing loss, particularly in developing countries. Only surgical repair of the eardrum can provide a permanent cure. Currently, there are two ways to perform surgery, but both suffer from significant limitations. The microscopic technique involves a long incision around the ear, is invasive, requires general anaesthesia, and is associated with significant complications. Endoscopic ear surgery is challenging to perform, since surgeons are forced to operate with only one hand, with the other occupied holding the endoscope.

To enable minimally invasive, two-handed eardrum repair surgery that can be performed as an office procedure with local anaesthesia, we have developed a novel toolkit consisting of three devices—an endoscope holder (EH), a graft delivery device, and a tympanic membrane suction punch (TMP).

In this project, our specific aims are to: (1) refine the EH and TMP through serial testing, and demonstrate their effectiveness in a cadaver trial; and (2) conduct a first-in-man trial of the complete surgical toolkit, to generate preliminary data for further refinements of all three devices. Through these activities, the Principal Investigator will be further developed as a Clinician Innovator.

DR CHUA JIAN KAI ANDY

Consultant
Sengkang General Hospital

High Fidelity Personalised Liver Digital Twin for Surgical Planning and Intraoperative Navigation

Liver surgery is one of the most complex surgeries in the abdominal cavity. Various studies have shown that it takes, on average, 40 to 50 major liver surgeries performed before a surgeon gains enough competency to minimise potential complications. Standard anatomical resections for liver surgery are the most performed types.

These types of liver surgery follow known surgical landmarks, mainly the blood vessels within the liver and the ischaemic line. The majority of anatomical resections are relatively straightforward, with experienced surgeons performing them with minimal blood loss and complications.

However, there are situations when even experienced surgeons may encounter difficulties, especially when there are variations in anatomy, or when the tumour is very close to the planned resection line. Non-standard resections are even more challenging as there are no fixed landmarks, and the liver resection line often crosses vascular boundaries. In addition, the non-anatomical nature of some surgeries results in the resection line coming extremely close to the tumour that needs to be removed. We propose a system that enables real-time superimposition of a pre-operative scan on the patient's liver during surgery, coupled with a computational deformability model that will show in real-time the location of critical structures.

DR GAO YUJIA

Assistant Group Chief Technology Officer
National University Health System

Consultant
Division of Hepatobiliary & Pancreatic Surgery, Department of Surgery, National University Hospital

Consultant
Adult Liver Transplantation Programme, National University Centre for Organ Transplantation, National University Hospital

Adjunct Assistant Professor
Yong Loo Lin School of Medicine, National University of Singapore

Reducing False-Positive Diagnoses and Biopsies from Breast Screening: A Novel Non-invasive and Clinically Integrable Ultrasound-Guided Optoacoustic Imaging System

With the introduction of breast cancer screening programmes, breast cancer mortality rates have been reduced by up to 40%. However, screening has its own consequences and generates high numbers of uncertain breast findings. With fear of potentially missing a cancer, these uncertain breast lesions would inevitably require an invasive breast biopsy for a definitive answer. The false positive rates of such abnormal breast findings/biopsies have been reported to be as high as above 75%. Therefore, there is a pressing need for a highly specific and accurate imaging modality to resolve the large amounts of uncertain breast findings/lesions generated from these routine breast screening modalities.

Our aim is to incorporate a novel optical imaging modality called Optoacoustic Tomography (OT), fusing with clinical ultrasound, to provide clinicians with additional biochemical information (e.g. fat, collagen, blood, and water) in order to better risk stratify breast findings. This modality could confirm the benignity of an indeterminate breast lesion and hence, obliterate the need for a breast biopsy, therefore reducing the false positive rates from breast screening programmes.

The reduction in false positive rates, in turn, would reduce healthcare costs, procedure related complications from invasive procedures, and increase the number of patients who will attend future breast screening programmes.

DR GOH YONG GENG

Senior Consultant
Department of Diagnostic Imaging, National University Hospital

Deep Learning (DL) Pipeline for Augmented Reporting of Magnetic Resonance Imaging (MRI) Whole Spine

Back pain is a very common complaint and affects up to 80% of adults in Singapore with considerable impact on livelihood. MRI of the spine is often used to determine the cause of back pain, grade narrowing along the spine, detect spinal cord compression, and assess for fractures. Spine MRI is a commonly requested scan and in Singapore there are an estimated 120,000 scans performed per year.

Reporting MRI spine is time-consuming because the narrowing needs to be measured along the cervical, thoracic, and lumbar spine. In addition, fractures, spinal cord compression, and vertebral slippage needs to be detailed. This study will use deep learning to provide assistance with reporting MRI spines. This should improve the reporting accuracy and improve radiologist productivity, enabling faster diagnosis with reduced costs.

We aim to develop a multitask DL tool to improve radiologist assessment of whole spine MRI by developing: (1) DL models for grading of narrowing along the cervical and thoracic spine; (2) a DL model for grading spinal cord compression along the whole spine; (3) a DL model for the assessment of vertebral fractures; and (4) a DL model for the assessment of vertebral slippage.

DR JAMES THOMAS PATRICK DECOURCY HALLINAN

Senior Consultant
Department of Diagnostic Imaging, National University Hospital

Assistant Professor
Yong Loo Lin School of Medicine, National University of Singapore

Development of Novel Heating Blanket to Prevent Unintentional Perioperative Hypothermia

During surgery, patients often get cold due to the effects of anaesthesia, which can lead to various complications, including infections and longer hospital stays. To prevent this, hospitals use warming systems, with a global market of over $1 billion.

The most common system involves blowing warm air into a blanket placed over the patient. However, this method is expensive, limits patient movement, increases energy use, and is not suitable for all medical settings. It may also interfere with clean air flow in the operating room, raising infection risks. To improve this, our team is developing a new type of blanket that generates heat when placed on the skin, using a safe chemical reaction.

This innovative blanket aims to keep patients warm by both generating heat and conserving body heat, potentially reducing hospital costs and stays, lowering waste, and eliminating the need for expensive equipment. With this grant, we plan to test this material for safety and effectiveness, hoping it will offer a better solution for patient care.

DR SHARIQ ALI KHAN

Senior Consultant
Anaesthesiology, Singapore General Hospital

Senior Consultant
Anaesthesiology, Sengkang General Hospital

Clinical Assistant Professor
SingHealth Duke-NUS Anaesthesiology & Perioperative Sciences Academic Clinical Programme

Optimising and Assessing Electrical Stimulation of the Optic Nerve in Comparison with Visual Stimulation for Diagnostic and Monitoring of Ocular Disease—the AESON Study

The main aim of the study is to establish a baseline assessment of how well you can see and compare it with follow-up visits (to monitor disease progression or assess response to treatment) in patients with optic nerve or retinal disease. It will also be helpful in assessing optic nerve function when there is media opacity, e.g. cataract or cornea opacity.

This technology also can be used for diagnostic and monitoring purposes in myopia—where we can use it to differentiate myopia-related optic nerve or retinal diseases. We have designed a technique which can accurately use stimulation with light, pattern, and a low-voltage harmless electric current to assess how well you can see. The study will be divided into two phases. The first phase will recruit 100 patients with optic nerve and/or retinal diseases and 100 volunteers with no eye diseases. They will perform the visual evoked potential (VEP) then the electrical evoked potential (EP) tests and the results will be analysed. The second phase will recruit 100 myopia patients who will undergo the VEP and EP test, with the addition of multifocal pattern electroretinogram (PERG).

DR LIM PIN MIAO FIONA

Glaucoma Consultant
Singapore National Eye Centre

Glaucoma Consultant
Eye Department, Changi General Hospital

Clinical Assistant Professor
SingHealth Duke-NUS Ophthalmology & Visual Sciences Academic Clinical Programme, Duke-NUS Medical School

Continuous Non-Invasive Haemodynamic Monitoring

Estimation of right atrial pressure is a critical step in managing patients with heart failure or pulmonary hypertension. The gold standard of measurement is by invasive introduction of a pressure transducer into the heart chambers and measuring pressure through a fluid-filled channel. This is invasive with a risk of potentially life-threatening complications. Naturally, patient uptake is limited. Non-invasive estimates of right atrial pressure have been limited in accuracy.

When a patient is placed in a supine position, the internal jugular vein is at the same level as the right atrium, allowing direct transduction to measure right atrial pressure. We have developed a sensor consisting of a piezoelectric pressure sensor embedded in a Poly Di-Methyl Siloxane (PDMS) patch to be applied over the landmarked area of the internal jugular vein. Early demonstrations have shown excellent correlation against non-invasive blood pressure measurements when transducing the radial artery. In further testing with an internal jugular vein phantom with simulated patient waveforms, the sensor has also shown good results and correlation.

Our aim is to develop a non-invasive method of estimation of right atrial pressure with high temporal resolution to save patient costs, reduce morbidity, and improve follow up and titration of therapy.

DR LIM YINGHAO

Consultant
Department of Cardiology, National University Heart Centre Singapore

Clinical Assistant Professor
Yong Loo Lin School of Medicine, National University of Singapore

A Novel Device to Regulate Drainage of Cerebrospinal Fluid (CSF) from External Ventricular Drain

A build-up of brain fluid may occur rapidly following a stroke or head injury. This may result in death unless it is treated promptly with a drainage procedure. A small drain is inserted into the brain and left inside the brain for a few days to drain the excessive brain fluid.

The amount of brain fluid drained has to be meticulously controlled; draining too much or too little of the brain fluid can similarly lead to brain damage. The regulation of brain fluid drainage is currently controlled by a manometer device that requires frequent manual adjustment and is prone to human error.

We have designed a novel device capable of detecting brain pressure and can automatically release or hold brain fluid based on a set pressure value determined by the doctor. The device will improve patient safety and reduce the work of healthcare professionals. We have obtained satisfactory laboratory results. In the next stage, we will assemble the components into a single unit and run more tests to ascertain its functionality, reliability, and durability.

DR LING JI MIN

Head & Senior Consultant
Department of Neurosurgery, National Neuroscience Institute

Assistant Professor
SingHealth Duke-NUS Neuroscience Academic Clinical Programme, Duke-NUS Medical School

Rapid Diagnosis of Peritoneal Dialysis-Related Peritonitis by Point-of-Care Vis/NIR Optical Spectroscopy and Machine Learning Algorithms

Peritoneal dialysis (PD) treats end-stage kidney disease but can cause peritonitis, an abdominal infection. Swift diagnosis is vital, yet identifying the infecting bacteria often takes one to two days. Researchers are pursuing faster, more accurate methods. An explored option is urine or fluid strip tests showing promise in peritonitis detection but limited precision. Another approach involves assessing fluid molecules, like proinflammatory cytokines, hinting at infection. A test kit with these markers exists, but faces cost and accuracy challenges.

Optical spectroscopy is also investigated. By analysing samples with light, it detects infections caused by viruses and bacteria in body fluids. Integrating optical spectroscopy with machine learning offers hope for better diagnosis. This study aims to assess a novel diagnostic device using visible light, near-infrared spectroscopy, and artificial intelligence (AI) to detect PD-related peritonitis. The device's diagnostic ability will be compared to laboratory parameters and bacterial culture. The study involves PD patients with peritonitis symptoms, analysing and comparing fluid samples via the new device and laboratory.

The overarching goal is to develop an affordable, rapid, point-of-care diagnostic tool for PD-related peritonitis that can accurately identify specific infecting microorganisms. This research could significantly advance peritonitis diagnosis and treatment in PD patients, enhancing patient care.

DR LIU YAN LUN ALLEN

Head and Senior Consultant Nephrologist
Division of Nephrology, Department of General Medicine, Khoo Teck Puat Hospital

Assistant Professor (Clinical Practice)
Lee Kong Chian School of Medicine, Nanyang Technological University

Developing a Renal Detection System for Early and Accurate Detection of Silent Kidney Injury in Obesity Using Shear Wave Elastography (ReELASTO study)

Early kidney disease is implicated in obesity, but poorly recognised in clinical medicine because current laboratory tests cannot correctly identify this phase known as hyperfiltration. One in 10 Singaporeans today are obese, and risk progressing to kidney failure and requiring dialysis. We aim to assess kidney stiffness as a marker of early kidney disease using advanced ultrasound shear wave elastography, on which we have invented computer or artificial intelligence (AI) assisted guidance to aid the accuracy and simplicity of scan. This technique is known as ReELASTO.

In this study, we will utilise prior assembled datasets to study the long-term outcomes for ReELASTO in correlation to validated endpoints in kidney health, including blood and urine biomarkers. Using a provisional patent-filed software technique, we will also progressively train a computer algorithm to develop ReELASTO's AI-assisted kidney scanning system.

In time to come, ReELASTO will aid in early detection and contribute to delaying the progression of chronic kidney disease. This project's funding brings ReELASTO one step closer in development and commercial potential, and to eventually become available for widespread use in the community and primary care settings to further our fight against chronic kidney disease in Singapore and globally.

DR NGOH LEE YING CLARA

Consultant
Division of Nephrology, Department of Medicine, National University Hospital

Digitisation of Rehabilitation's Evaluation and Activity Monitoring using Thermography (D.R.E.A.M.T.): An Exploratory Clinical Study

The aim of this project is to develop a state-of-the-art monitoring system using thermography cameras to track and analyse patients' physical activities continuously during their stay in rehabilitation wards. Currently, patients' activity levels are mostly recorded by nurses through observation, which can be time-consuming and not always accurate. Without precise information, it is difficult to keep patients motivated to stay active, and nursing staff may find it hard to allocate their time efficiently.

To address this, we plan to develop a system that uses advanced thermal cameras and artificial intelligence to automatically detect and record patients' movements throughout the day and night. The information collected will be shown on a user-friendly digital dashboard that provide real-time feedback and help set personalised goals for each patient. This will encourage them to stay active and engaged in their recovery.

By combining this technology with clinical data, the system can also help nurses and therapists better understand patients' progress and allocate care resources more effectively. In the long run, this approach aims to improve patient recovery, enhance staff efficiency, and raise the overall quality of care in rehabilitation wards.

DR ONG POO LEE

Consultant and Rehabilitation Medicine Specialist
Tan Tock Seng Hospital

Artificial Intelligence (AI)-Incorporated Handphone Application for Detection of Skin Cancers

There is a rising incidence of skin cancers, with a significant economic burden and a need for timely diagnosis to reduce mortality and morbidity.

With the Centre for Medical Technologies & Innovations (CMTi)-National Health Innovation Centre (NHIC)/19009 and the ongoing NHIC-I2I-2303013 grants, we have achieved the following, an adaptable, attachable, affordable dermoscope, an AI algorithm for the ABCD rule used in diagnosis of melanomas, a deep learning component for melanoma identification, an ongoing study for validation, and a future study at an Australian site.

We currently have two handphone applications for an integrated seamless system: (1) SkAI Lite targeted at the public. It uses the camera on the handphone to take a picture of the lesion and provides instant risk assessment. High-risk patients can be seen early by specialists; and (2) SkAI Pro targeted at clinicians and dermatologists. It requires an attachable dermoscope and takes a photo of the lesion using the handphone camera and provides instant risk assessment for melanomas.

For this current grant application, we would want to increase AI use to cover the non-melanoma skin cancers—basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) as well as the acral melanomas which are not covered in the earlier grants. Importantly, BCCs and SCCs are more common in Asians and the local population compared to melanomas.

DR TAN SI YUN LUCINDA

Senior Consultant
National Skin Centre

Remote Monitoring of Swallowing Function Using a Mechanoreceptor Sensor System

People with swallowing impairment have difficulty swallowing food and drinks safely and efficiently down the throat into the stomach. This may result in inadequate nutrition and/or lung infection. People with stroke, dementia, Parkinson's disease, head and neck cancer, and the frail elderly are at risk of having a swallowing impairment. Periodic reassessment of swallowing function is necessary to make timely adjustments to recommended food textures and liquid thickness.

Swallowing assessments involve observation of eating and drinking in the clinic, and/or direct visualisation under an X-ray or endoscopy.

Currently, there is no method to remotely monitor patients' swallowing function in their daily environment across meals and hydration throughout the day. A wearable, non-invasive swallowing sensor system is being developed to provide objective data on eating and drinking ability in between routine clinic visits. This system has potential applications in both hospital and home settings. It aims to enhance the care of individuals with swallowing impairment by enabling early detection of worsening swallowing function, monitoring for stability of the swallowing problem, and in guiding clinicians to make timely changes to feeding recommendations to reduce the risk of choking, lung infection, and reduced appetite.

A/PROF WONG SENG MUN

Associate Professor
Health and Social Sciences, Singapore Institute of Technology

Senior Principal Speech Therapist
Singapore General Hospital

CLINICIAN SCIENTISTS IN THE SPOTLIGHT

Singapore Translational Research (STaR) Investigator Award

PROF GEMMY CHEUNG

- Head and Senior Consultant, Medical Retina Department, Singapore National Eye Centre
- Head, Retina Research Group, Singapore Eye Research Institute
- Professor, Duke-NUS Medical School

SEEING THE HIDDEN CAUSES OF RETINAL DISEASE

Many existing clinical trials on eye care have been based largely on Western populations. Prof Gemmy Cheung's work focuses on Asian retinal diseases and developing better ways to diagnose and treat them.

In age-related macular degeneration (AMD), for instance, a feature called drusen is common in Western patients but appears less frequently in Asian eyes. The main factors, in her words, are "nature, nurture—our environment, our dietary habits, which are very different." As Head of the Retina Research Group at the Singapore Eye Research Institute, she wants to champion greater representation in clinical trials. "We now have trials specifically looking at the Asian population to robustly test treatments before we just accept and say, 'Okay, it's FDA-approved.'"

Prof Cheung's fascination with retinal health began early in her career, during a period of rapid innovation. She recalls the introduction of intravitreal injections for AMD, a breakthrough for millions. "When I started, it was the first medicine that we used, called an anti-vascular endothelial growth factor that we inject into the eye. It was very, very new," she recalls. Two decades on, she has witnessed these therapies evolve, each iteration more precise and longer-lasting.

Revealing the Pachychoroid Puzzle

Her current project, which earned her the STaR Investigator Award, investigates the "pachychoroid disease spectrum". This refers to retinal conditions caused by abnormal blood flow in the choroid, a layer that supplies oxygen and nutrients to the retina. "Pachychoroid is one of the newer concepts that suspect there may be some blood flow resistance to the choroid, and that can lead to diseases," she explains.

Breakthrough imaging technology has been pivotal. "Ophthalmology is a very visual field. We can see the structures and abnormalities," she says. "Together with the imaging, we can look at high magnification changes of the retina." These advances allow her team to detect previously invisible changes and track disease progression over time.

This work addresses a key healthcare gap. Many eye conditions require frequent monitoring, yet not all visits are optimally targeted. By identifying root causes and risk factors, Prof Cheung aims to predict which patients are most likely to develop severe complications, enabling more precise care. "We can then move from reactive care to proactive prevention," she adds.

Looking ahead, her goal is to improve quality of life through early detection and better disease management. She also finds it deeply meaningful to mentor younger clinician scientists, guiding them as they embark on their own journeys. Reflecting on her career, she says: "I've spent 20 years as a clinician scientist. I may have a few more to give. But progress must continue, and we need the next generation to carry on this spirit of advancing the status quo."

> **"Progress must continue, and we need the next generation to carry on this spirit of advancing the status quo."**

Singapore Translational Research (STaR) Investigator Award

PROF MARCO PERES

- Deputy Chief Executive Officer (Research & Education), National Dental Centre Singapore
- Professor, Health Services and Systems Research Programme, Duke-NUS Medical School

BRIDGING THE GAP IN ORAL HEALTHCARE

Raised and trained in Brazil, Prof Marco Peres spent nearly two decades there as an academic before taking on senior leadership and research roles in Australia and later in Singapore. He is the first dentist in Singapore to receive the prestigious NMRC STaR Investigator Award. The award recognises his efforts in leading the Singapore Oral Population Health Initiative (SOPI), an evidence-based research programme that seeks to inform policymakers and health professionals. Through its findings, SOPI aims to improve the oral health and overall wellbeing of Singaporeans.

"Poor oral health isn't simply the result of individual choices," he explains. "It's deeply tied to social inequalities, poverty, limited access to care, and inadequate public health policies." This conviction has driven Prof Peres to explore the broader social and commercial determinants of oral health. His research highlights how communities with fewer resources often suffer from preventable oral conditions that lead to serious health issues later in life—from cardiovascular disease to diabetes and cognitive decline.

In Singapore, where diabetes is a major public health concern, he has found strong links between poor oral health and overall health. "Oral health problems are a source of inflammation and chronic inflammation can have harmful effects on the brain," he notes.

Population Studies for Better Oral Health

This insight has shaped SOPI, a programme that brings together scientists, clinicians, economists, statisticians, and social scientists to improve oral and general health. SOPI applies behavioural, clinical and population-based studies, along with education and policy research, to provide robust evidence for policymakers and healthcare professionals.

One strand of his work involves studying Singaporeans aged over 70 through oral health examinations, detailed health data, and brain MRI scans. By analysing these data, Prof Peres and his team have found strong associations between oral health conditions and brain health. These findings add weight to the case for making oral care an integral part of healthy ageing strategies.

But building the evidence base has not been without hurdles. "One of the biggest challenges I encountered was accessing and integrating large-scale health data from various sources," he says. Coordinating international efforts also proved demanding. "Working across institutions means navigating different administrative systems and research standards. It's a continuous balancing act."

Even with evidence in hand, another challenge lies in translation. Research must lead to action, which means engaging stakeholders across healthcare, government, and community sectors. Despite obstacles, Prof Peres remains focused on outcomes. "I hope my research ultimately benefits both patients and the healthcare system," he says.

With a career grounded in compassion and scientific rigour, Prof Peres envisions a future where dental care is more accessible, affordable, and better integrated into overall health strategies. "It's about treating the whole person, not just isolated conditions," he emphasises. His work stands as a testament to the power of research in building fairer, healthier societies.

> **It's about treating the whole person, not just isolated conditions.**

Clinician Scientist Award – Senior Investigator (CSA-SI)

PROF CAROLYN LAM

- Senior Consultant, Department of Cardiology, National Heart Centre Singapore
- Professor, SingHealth Duke-NUS Cardiovascular Sciences Academic Clinical Programme, Duke-NUS Medical School

REVOLUTIONISING HEART FAILURE DETECTION

Despite advances in the treatment of heart failure, early detection and accurate diagnosis remain persistent challenges. This disconnect between care and timely diagnosis is what inspired Prof Carolyn Lam to create a solution that brings specialist-level diagnostics into the hands of primary care providers.

In Singapore, where an ageing population is contributing to a rise in chronic diseases such as heart failure, primary care has become the critical frontline for early intervention. Yet general practitioners often lack access to specialised diagnostic tools, which can lead to delayed or missed diagnoses. Commonly overlooked symptoms, like breathlessness or prolonged fatigue, frequently go unrecognised as early signs of heart failure.

Prof Lam's answer to this challenge lies in harnessing the power of digital innovation. She believes artificial intelligence (AI) can transform the way heart failure is detected and managed. By developing AI-enhanced screening tools capable of analysing clinical inputs or standard imaging data, she aims to close the diagnostic gap that often exists in community healthcare settings. These tools allow general practitioners to access cardiologist-level insights without the need for advanced equipment or immediate referrals. This not only empowers primary care providers to identify early warning signs of heart failure but also facilitates earlier, more accurate interventions that could significantly improve patient outcomes and reduce hospitalisations.

An Innovation That Clinicians Welcome

Contrary to common assumptions about resistance to digital health tools, Prof Lam found that clinicians were eager for solutions that could aid their decision-making and ability to care for their patients. "Innovation isn't about replacing the human touch in medicine; it's about empowering it."

Through digital tools, Prof Lam envisions a fundamental shift in the healthcare industry from reactive, late-stage treatment to proactive, preventive care. She emphasises the importance of equipping primary care with the means to detect diseases like heart failure before they escalate. She draws a parallel to the evolution of the electrocardiogram, a technology that was once restricted to specialist clinics and hospitals, but has since become widely accessible through devices like smartwatches and integrated into routine care in general practice. This transformation has enabled earlier detection of cardiac issues, and Prof Lam believes similar breakthroughs are possible for heart failure through AI-powered diagnostics.

Despite the constant demands of clinical work and research, Prof Lam remains steadfast in her mission. "Research isn't just about publishing papers; it's about making a difference for patients." Through her work, Prof Carolyn Lam is not only reshaping how we detect and treat heart failure, but also redefining the role of innovation in patient care—one early diagnosis at a time.

> **Innovation isn't about replacing the human touch in medicine; it's about empowering it.**

Clinician Scientist Award – Senior Investigator (CSA-SI)

PROF YONG EU LEONG

- Head & Emeritus Consultant, Division of Benign Gynaecology, Department of Obstetrics & Gynaecology, National University Hospital
- Professor, Department of Obstetrics & Gynaecology, Yong Loo Lin School of Medicine, National University of Singapore

TACKLING MENOPAUSAL ARTHRALGIA AT SCALE

"Menopause is a universal experience for women as they age. Most of them sail through menopause smoothly, but about 20% to 30% have severe symptoms that require help," says Prof Yong Eu Leong.

An obstetrician and gynaecologist by training, Prof Yong has long been drawn to the continuity of care for women across their lifespan. "Starting from the embryo in in-vitro fertilisation incubator, to menopause, to ageing," he explains, "obstetrics and gynaecology is one of the few specialties where you can provide continuous care spanning generations."

In 2014, Prof Yong launched the Integrated Women's Health Programme (IWHP), a first-of-its-kind longitudinal study that focused on the health concerns of mid-life women. Thanks to advancements in healthcare, Singaporean women now enjoy one of the longest life expectancies in the world. However, for about a third of them, the menopause transition is challenging.

IWHP has scientifically mapped women-specific health issues such as menopausal symptoms, muscle aches and joint pain (arthralgia), pelvic discomfort, poor sleep, anxiety, depression, and lack of exercise leading to weak muscle strength and osteoporosis. Perimenopausal weight gain increases the risk for chronic conditions like hypertension, diabetes, and cognitive decline. "For some women, these conditions could lead to a vicious spiral of poor health and quality of life. The challenge is to identify women at risk, in order to help arrest this downward spiral."

Arthralgia: A Silent Burden

After surveying over 1,000 mid-life women, menopausal arthralgia was the one condition that emerged with unexpected prominence. "Menopausal arthralgia causes chronic pain. It is a debilitating condition and can hinder a lot of high-functioning women from performing their tasks," Prof Yong explains. "Furthermore, the pain can come on suddenly over a period of a few months and worsen over the years," he adds.

Unlike hot flushes, which are more commonly observed in the West, arthralgia appears to be more prevalent in East Asia. Yet, many women are being dismissed, misdiagnosed, or investigated without good outcomes. "Women are told to go see a bone doctor or a rheumatologist. They do all the tests which turn out negative but the pain continues."

Thus, his team has conducted an NMRC-supported randomised control trial to study the effects of muscle strengthening exercises and estrogen replacement therapy. Prof Yong believes that arthralgia may be linked to the sudden drop in estrogen during menopause. "Preliminary results look very hopeful," he says. "We are on the verge of solving this problem."

For Prof Yong, supporting mid-life women is about ensuring that they age with strength, dignity, and purpose. He is determined to ensure his research is translated into real-world care, so that these solutions can benefit as many Singaporean women as possible. "The biggest challenge is to inform both our medical colleagues and patients of these new developments," he explains. "Solutions also need to be applied at scale—we will need to engage our partners in the health system and other care providers."

Ultimately, Prof Yong's goal is simple: to ensure that mid-life women receive the understanding, care, and respect they deserve.

> **"Our women are high-functioning and demand effective solutions for menopausal issues."**

Clinician Scientist Award – Investigator (CSA-INV)

DR YEW YIK WENG

- Senior Consultant Dermatologist, National Skin Centre
- Assistant Professor, Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore

UNDERSTANDING THE GENETICS BEHIND ECZEMA

Atopic dermatitis, or eczema is one of the most prevalent skin conditions in Singapore, affecting about 20% of children and 10% of adults. Many patients face social stigma, as their visible rashes are often mistakenly perceived as contagious. In a climate as hot and humid as Singapore's, the condition can have a profound impact on quality of life. The skin barrier, the body's first line of defence, plays a critical role in shielding individuals from environmental stressors. When compromised, it can lead to flare-ups, infections and chronic discomfort.

For Dr Yew Yik Weng, unlocking better treatment outcomes for eczema begins with a deeper understanding of the genetic mechanisms that govern skin barrier function. Much of the existing knowledge in dermatology has been shaped by research conducted in Western populations, which may not fully reflect the unique genetic and environmental factors present in Asian communities. "Our understanding of disease currently comes from the West, but we know that our genetic makeup is different, even our environmental conditions are also different," he explains.

From Genes to Patient Care

Dr Yew's research focuses on how genetic variations specific to Asian populations influence skin barrier integrity. With access to large and diverse patient cohorts through Project SG100K, he and his team are analysing genomic and other "omics" data from tens of thousands of participants. His research could also shed light on other allergy-related diseases that tend to occur together, such as eczema and asthma. "We are hoping this research will give us insights into how skin barrier function is connected to other atopic diseases," he says. "Ultimately, our goal is to find novel treatment options that are not only scientifically sound but also tailored to the needs of our patients."

Working with such vast datasets brings challenges. Each participant's genomic data can amount to gigabytes, requiring secure and powerful computing resources. "It's not that the computers are slow—it's that the scale of analysis demands time, security and expertise," he explains. Learning to navigate this complexity has been part of his journey as a clinician scientist, supported by data analysts, overseas collaborators and strong mentorship.

Preliminary findings from the first 10,000 participants have already pointed to candidate genetic factors linked to eczema and asthma. These findings offer clues to the "atopic march", which refers to how one allergic condition can lead to another over time. Comparing results with international cohorts will also shed light on how genetic and environmental differences shape disease across populations.

For Dr Yew, the CSA-INV is more than just funding. It is, in his words, a "manpower development grant", giving him the opportunity to acquire new skills, work with international collaborators and equip himself for an even more impactful career as a clinician scientist. Above all, he remains focused on the ultimate goal: improving the lives of patients with eczema and other allergy-related conditions.

> **"We are hoping this research will give us insights into how skin barrier function is connected to other atopic diseases. Ultimately, our goal is to find novel treatment options that are not only scientifically sound but also tailored to the needs of our patients."**

HPHSR* Clinician Scientist Award – Senior Investigator (HCSA-SI)

PROF JULIAN THUMBOO

- Senior Consultant Rheumatologist, Director Health Services Research Unit, Research and Innovation Director, Singapore General Hospital
- Professor, Duke-NUS Medical School
- Adjunct Professor, Yong Loo Lin School of Medicine, National University of Singapore

A SMARTER WAY TO SPOT AUTOIMMUNE RHEUMATIC DISEASES

Inspired by a patient whose kidneys were severely affected by an undiagnosed autoimmune rheumatic disease (ARD), Prof Julian Thumboo embarked on a mission to improve how these conditions are detected. ARDs such as lupus, rheumatoid arthritis, and other systemic autoimmune conditions can cause widespread organ damage if left untreated. Yet their diagnosis often comes too late, after irreversible harm has already occurred.

The earlier these diseases are caught, the better the chances of a good outcome. Studies consistently show that timely diagnosis leads to earlier treatment and significantly improved quality of life.

However, diagnosing ARDs is not straightforward. Their symptoms are often hard to recognise and many patients suffer in silence for years, with persistent joint pain or other subtle symptoms that may be dismissed or misattributed. For example, rheumatoid arthritis is typically diagnosed five to six months after the onset of joint pain. Yet the best outcomes require treatment to begin within just three months.

ARDs are more common than many realise and often strike individuals in the prime of their lives. These chronic conditions can cause significant joint damage, impair vital organs such as the kidneys, lungs, and heart, and in severe cases, may even lead to death. Early diagnosis and timely treatment are not only critical to prevent irreversible damage, but also to improve health outcomes, reduce complications, and enhance the overall wellbeing of many Singaporeans affected by these often-overlooked diseases.

A New Tool for Early Diagnosis

To close this gap, Prof Thumboo developed a new screening tool: a Novel Symptom Appraisal Tool for Early Diagnosis of Patients with Autoimmune Rheumatic Diseases in the General Population and Primary Care. The questionnaire helps individuals with unexplained joint pain or related symptoms assess whether they may be experiencing the early signs of an ARD.

In evaluating his tool against existing models, Prof Thumboo found promising preliminary results. Unlike older questionnaires, which often failed to identify high-risk individuals early, his new version showed significantly improved accuracy. His current NMRC funded study aims to validate this tool and develop approaches for its widespread adoption. The goal is to diagnose ARDs at an early stage to improve outcomes and avoid irreversible damage.

One of the key challenges he encountered was refining the questionnaire to reduce false positives. "Patients sometimes over-report symptoms, consciously or unconsciously because they want to be seen by a doctor," he explains. To address this, his team is currently testing a range of strategies to enhance the tool's precision without compromising sensitivity.

The potential impact of this work is far-reaching. For patients, earlier diagnosis could mean fewer complications, a reduced need for intensive treatment, and an overall better quality of life. For the healthcare system, it may result in significant cost savings—both by treating conditions earlier and by identifying individuals who do or do not require specialist evaluation.

> **Autoimmune rheumatic diseases are not uncommon and often affect Singaporeans in the prime of their lives. Earlier diagnosis and treatment can therefore help to improve the health of many Singaporeans.**

* Health Promotion, Preventive Health, Population Health and Health Services Research

HPHSR* Clinician Scientist Award – Investigator (HCSA-INV)

DR EVELYN LAW CHUNG NING

- Assistant Professor, Department of Paediatrics, Yong Loo Lin School of Medicine, National University of Singapore
- Senior Consultant, Division of Developmental and Behavioural Paediatrics, Department of Paediatrics, Khoo Teck Puat-National University Children's Medical Institute, National University Hospital
- Principal Investigator, Translational Neuroscience Program, Institute for Human Development and Potential, Agency for Science, Technology and Research

BUILDING STRONG FOUNDATIONS IN EARLY CHILDHOOD

For Dr Evelyn Law, every interaction between caregiver and child holds the potential to shape a life. Her work helps a whole population of children, not just the one in front of her. Her studies show that early relational health can buffer the effects of adversity and build healthy brain architecture.

Her first exposure to research was transformative. She recalls being struck by the Bucharest Early Intervention Project, which revealed how institutionalised children deprived of nurturing environments suffered stunted growth and lasting cognitive challenges. "That got me really intrigued to see if the opposite is true. If we provided positive interactive experiences every day, how would these kids look like?" she asks.

In Singapore, as many as 63% of children from lower-income families show delays in school readiness, compared to 15% from higher-income households. These disparities often appear as early as six months and widen over time. Such gaps in early exposure to language and interaction have lifelong consequences. "If they're not catching up in the beginning, they are very likely to continue to fall behind. I really worry about their self-esteem and self-concept," she says.

To address this, Dr Law is leading the PlayReadVIP programme, a US intervention adapted specifically for Singapore. It encourages parents and caregivers to strengthen early relational health through play, reading and responsive interactions to prevent socioeconomic disparities. A crucial part of this study will involve examining brain development through neuroimaging. Delivered in maternity wards and polyclinics, the sessions use short videos of parents interacting with their children to highlight their strengths. "Even small things make a difference. When parents see their child respond, they gain confidence and keep building on those interactions," she notes.

Science Meets Everyday Parenting

Behind its simplicity lies robust science. Play, shared reading, and "serve-and-return" interactions help to form neural connections and support development. A study found that by age three, children lacking in early relational health may hear 30 million fewer words than their peers. "Children's work is play. Just five minutes of play or reading builds not just skills, but also emotional connection with caregivers," she explains.

Pilot studies have shown promising results. Families reported feeling more confident and found the suggestions practical. One mother, initially convinced her son was uninterested in toys, was astonished when he responded enthusiastically. "Through that interaction, she realised, wow, my kid actually kind of likes me," Dr Law recalls.

"Without NMRC, none of my research ideas will come to fruition," she says. But sustaining this work takes more than funding. "There are many times people may dismiss my findings. But if the science shows it's important, I will keep going." For Dr Law, this combination of support, resilience and conviction is what will continue driving her mission to give every child the chance to flourish.

> **Even small things make a difference. When parents see their child respond, they gain confidence and keep building on those interactions."**

* Health Promotion, Preventive Health, Population Health and Health Services Research

HPHSR* Clinician Scientist Award – Investigator (HCSA-INV)

DR SABRINA WONG KAY WYE

- Family Physician, Senior Consultant, Deputy Director, Principal Clinician Researcher, Clinical Research Unit, NHG Polyclinics
- Assistant Professor, Lee Kong Chian School of Medicine, Nanyang Technological University

EMPOWERING PATIENTS WITH CHRONIC CONDITIONS THROUGH AI SUPPORT

As a family physician at the polyclinics, Dr Sabrina Wong Kay Wye observed that many of her patients have chronic illnesses—long-lasting health conditions such as diabetes. Managing these conditions requires more than just medication; it involves lifestyle changes, emotional support, and consistent follow-up. Recognising this, Dr Wong turned to technology to bridge the gap between clinical care and self-management. "I am interested in using technology to positively disrupt and transform the way we deliver care to our patients with chronic conditions," she says. "I hope that my solution goes beyond improving a person's medical condition but can also reduce the patient's emotional burden."

Dr Wong had previously developed a diabetes care app but patient testing revealed a gap. "We found that in order for the app to do better, we had to bring in a more 'human' element," she says. That insight led her to create Wabi, a digital health coach powered by a large language model. "We are trying to support people in their weight loss journey, especially those with common chronic conditions," Dr Wong explains. "Usual wellness products do not consider people's existing medical conditions and their recommendations may not be appropriate."

This is especially relevant as obesity rates rise in Singapore, particularly among people with diabetes. "There are few effective clinical weight loss programmes in Singapore," Dr Wong says. Wabi aims to provide effective advice through two modalities.

First, Wabi is able to scan nearby locations to recommend meals that are appropriate for the patient's medical needs and allows patients to upload a photo of a dish to receive real-time nutritional feedback. "For example, when carbohydrates are too high or when there's insufficient fibre, the app can suggest: 'Would you want to consider eating something else?'" she adds.

Secondly, patients can sync their digital trackers and weighing scales to track their data, discuss plans and set personalised goals—all via WhatsApp to drive accessibility.

BOOST-ing patient empowerment

The original Bringing about Optimal weight loss Outcomes through dietary and weight management Support (BOOST) app was launched in 2024 and sits in the NHG Health app. "Like most app-based products, they are mainly about monitoring," Dr Wong highlights. "What we found was that while users have found it helpful, most patients still prefer to be able to chat with someone," she says.

BOOST has since evolved into Wabi. Dr Wong envisions full integration between the two systems to offer personalised, accessible support to patients with type 2 diabetes.

"I would like to bring what is considered complex medical knowledge to the hands of the patient. When people are supported in caring for their own health, I believe that's what empowerment is."

> **I am interested in using technology to positively disrupt and transform the way we deliver care to our patients with chronic conditions.**

* Health Promotion, Preventive Health, Population Health and Health Services Research

HPHSR* Clinician Scientist Award – Investigator (HCSA-INV)

A/PROF YANG MEIJUAN GRACE

- Senior Consultant, Division of Supportive and Palliative Care, National Cancer Centre Singapore
- Associate Professor, Lien Centre for Palliative Care, Duke-NUS Medical School
- Associate Professor, Programme for Health Services and Systems Research, Duke-NUS Medical School
- Deputy Head and Director, Research, SingHealth Duke-NUS Supportive and Palliative Care Centre

REDEFINING PALLIATIVE CARE FOR BETTER PATIENT SUPPORT

Less than half of those who die in Singapore receive palliative care, and among those who do, the median time between the first palliative care review and death is a mere 20 days. This suggests that patients often access palliative care only when they reach a dire stage in their illness, despite its potential to improve outcomes for patients with advanced serious illnesses earlier in their journey.

For A/Prof Yang Meijuan Grace, the statistics reflect a pressing need to rethink when palliative care is delivered. "The initiation of palliative care is triggered by uncontrolled symptoms typically in a time of crisis," A/Prof Yang explains. "Patients and families are often in distress and end up being passive recipients of services."

To empower patients to take charge of their healthcare, the current models must be re-structured. "Models of palliative care ought to move beyond the current reactionary illness-stress paradigm to a proactive health-wellness approach that is integrated early in the patient's serious illness journey," she adds.

So how early should intervention take place? A/Prof Yang believes there is no one-size-fits-all model. "Because every patient is different," she emphasises. "We need to move away from a time-based way of thinking. How do you really know when you're going to die? Early or timely palliative care is when you have a palliative care need."

How is a need identified? "It can range from pain and symptoms to practical caregiver support. If and when someone with advanced serious illness has a need that can be addressed by palliative care, then that person should receive early palliative care in an individualised way that addresses their need, rather than having the one-size-fits-all way of delivering palliative care," she says.

Innovating for Earlier and Better Support

This led to the development of ENABLE-SG (Educate, Nurture, Advise, Before Life Ends for Singapore), an early palliative care telehealth model adapted from the United States-based ENABLE programme. Focusing on proactive intervention, psychoeducational sessions are conducted to coach patients and caregivers on how to cope with serious illness—not just for symptom relief but including decision making, communication skills, and advance care planning.

ENABLE-SG also reflects local cultural nuances. Unlike Western cultures that prioritise individual autonomy, medical decisions in Singapore are often family-based. "The sessions were modified to involve the family in terms of articulating preferences and goals," A/Prof Yang says. The model also offers guidance on using complementary therapies and dispels common misconceptions around nutrition to help families and patients make more informed decisions.

Despite the stigma that still surrounds palliative care, A/Prof Yang's passion remains unwavering. "It's about trying to improve the quality of life of patients with serious advanced illnesses, whether or not they have a short time left to live, as well as supporting the families."

> **ENABLE-SG is about trying to improve the quality of life of patients with advanced serious illnesses, whether or not they have a short time left to live, as well as supporting the families.**

* Health Promotion, Preventive Health, Population Health and Health Services Research

Clinician Innovator Award – Investigator (CIA-INV)

DR TREVOR BRIAN BINEDELL
- Principal Prosthetist/Orthotist, Prosthetics and Orthotics Department, Tan Tock Seng Hospital

RETHINKING PROSTHETIC CARE THROUGH INNOVATION AND EMPATHY

"In Singapore, diabetes is the leading cause of limb loss, with more people needing prosthetic legs. The traditional socket—the part that connects the leg to the body—can be hot, heavy, and uncomfortable, which makes walking painful and limits independence," explains Dr Trevor Binedell.

With one of the world's highest diabetes rates and a rapidly ageing population, Singapore faces a pressing need for better prosthetic solutions. Dr Binedell, whose work focuses on comfort-driven design, leverages digital tools such as scanning, computer-aided design (CAD), and 3D printing to enhance prosthetic fit and function. He has patents filed in the area of prosthetic liners that directs sweat away from the limb and a second liner made from a graded stiffness 3D-knitted textile.

As part of his PhD research, he mapped Lines of Non-Extension (LoNE), parts of the limb that do not stretch or compress, to guide more precise, personalised socket designs. He is also developing breathable liners and sleeves that minimise heat, sweat, and skin irritation while improving control and comfort for sensitive users.

Dr Binedell's approach stems from a strong rejection of the traditional "one-size-fits-all" mindset. Over time, he observed that while patients may present with similar clinical conditions, each case requires a tailored solution. Instead of "one-size-fits-all," he envisions an "individual-design-fit" model—tailored to the unique anatomy and needs of every patient.

"Young, active users and older diabetic patients often received the same socket principles, despite very different needs," he explains. Inspired by his findings on LoNE, he saw an opportunity to redistribute forces more intelligently. "Given Singapore's high diabetes burden, I questioned whether a diabetic-specific, digitally manufactured socket could better protect fragile tissue, adapt to limb volume change, and improve comfort. The promise of 3D printing to realise intricate, breathable, adjustable structures made this a logical next step," he adds.

X Marks the Spot

Dr Binedell aims to set a new benchmark for prosthetic care in Singapore. This led him to develop the X-Socket, leveraging 3D technology, designed for people with diabetes who had to undergo below-knee amputations.

Traditional socket fabrication tends to be labour-intensive and relies heavily on individual craftsmanship. This can lead to slow rehabilitation and other challenges. "I really wanted to make it a whole paradigm shift to something completely new and challenge the traditional prosthetic socket," he reflects.

Designed to be lighter, more breathable and cost-effective, the X-Socket aims to improve comfort and shorten recovery time. "The X-Socket demonstrates how innovation can bridge urgent clinical needs with national goals for digital transformation, preventive care, and equitable access to high-quality medical solutions," he says.

Still under development, the X-Socket is expected to begin patient trials in October.

Dr Binedell's achievements also include other pioneering efforts, such as fitting the country's first bionic limbs and being the only prosthetist from Singapore to provide technical expertise at two Paralympic Games. At the heart of it all is a simple goal, "I had an interest in helping people, especially helping them walk again with comfort."

> **"Innovation can bridge urgent clinical needs with national goals for digital transformation, preventive care, and equitable access to high-quality medical solutions."**

Clinician Innovator Award – Investigator (CIA-INV)

A/PROF WONG SENG MUN
- Senior Principal Speech Therapist (Research), Speech Therapy, Singapore General Hospital
- Associate Professor, Health and Social Sciences, Singapore Institute of Technology

SMARTER CARE FOR SWALLOWING DISORDERS

For A/Prof Wong Seng Mun, research is not an abstract exercise but a way to transform daily life for patients. A senior principal speech therapist and clinician innovator, she has spent more than two decades helping people overcome voice and swallowing disorders.

"Swallowing is such a reflexive activity. You don't think about it when you eat or drink," she says. "But when that ability is lost, it changes everything, from social life to emotional wellbeing." The loss can isolate patients, alter family dynamics and erode confidence. For A/Prof Wong, restoring that function also restores a sense of dignity.

Her professional journey began in 2003, when speech therapy in Singapore was still a young field. She specialised in voice and swallowing rehabilitation at Singapore General Hospital and also became a part-time teaching faculty member at the National University of Singapore (NUS) when it launched its first speech therapy programme in 2007. "Even though I was quite junior then, I wanted to challenge myself and broaden my horizons," she recalls.

Her first exposure to research came through assisting in data collection in a clinical trial comparing two surgical materials used for voice restoration in patients with vocal fold paralysis. The experience was pivotal. "We could clearly say that one was superior to the other. It changed our clinical practice and improved patients' quality of life," she says. That study showed her how evidence-based research could directly shape patient care and outcomes.

A Personalised and Data-Driven Approach

Currently, speech therapists rely on brief clinical snapshots to assess patients, a method that can miss critical fluctuations during mealtimes. A/Prof Wong's sensor technology aims to change that by providing continuous and objective data. "We can focus intensive clinical attention where it is most needed," she explains, highlighting an urgent need for a more personalised and data-driven approach that enables healthcare providers to prioritise patients at greatest risk.

The path of innovation, however, is rarely smooth. An early prototype of the swallowing sensor showed a mere 5% change in resistance, a significant setback. Dr Wong saw this not as a failure, but as a clear target. "It gave us a target to work towards," she says, crediting her research collaborators at NUS for their breakthrough in refining the sensor's composition and fabrication to achieve the necessary sensitivity.

Through funding by National Health Innovation Centre Singapore, A/Prof Wong's team developed the VisBuddy device to address another critical gap: the inaccurate and time-consuming preparation of thickened liquids. For elderly patients and their caregivers, this tool can reduce the physical and cognitive load, ensuring that drinks are accurately prepared to reduce choking risk, thereby supporting Singapore's ageing-in-place initiatives.

A/Prof Wong's motivation is grounded in her clinical practice. She cites patients and caregivers as her greatest inspiration for candidly sharing their daily struggles. "They are really the most important people on the team," she affirms. This connection ensures that her research addresses real-world problems, bridging the gap between academic discovery and clinical application.

As the first speech therapist to receive CIA-INV from NMRC, A/Prof Wong has a message for her profession. "We may be a small profession," she says, "but the disorders of communication and swallowing that we specialise in are essential to everyday life." Her drive to push boundaries proves that size is no barrier to revolutionising patient care.

> **"I draw my greatest inspiration from patients and caregivers who challenge me with their candid insights. They show me precisely where we need to innovate to create real impact."**

TALENT PIPELINE PROGRAMMES

Transition Award (TA)

TA is designed to help budding clinician scientists who have just completed formal research training. This award provides up to four years of salary and grant support to help recipients build up their research capabilities, facilitating their transition to stable, independent research roles. It will enhance their ability to successfully obtain independent research support in the future.

The long-term goal of the award is to increase the cohort of new and talented NMRC-supported independent clinician scientists in the three clinician scientist tracks: Translational and Clinical Research, HPHSR*, or Health Technology.

NMRC Research Training Fellowship (RTF)

NMRC RTF provides doctors and health science/healthcare professionals with research training to have qualifications and skills to become clinician scientists.

The fellowship provides funding and salary support for formal research training and research attachments at local and overseas institutions. Awardees may also submit a research proposal for seed funding upon completion of the training.

National Outstanding Clinician Scientist Resident Award

This is a yearly award given to a clinician scientist resident who has excelled at residency training, and also made significant research contribution(s) with actual or potential translational application to improve clinical care and showed exemplary behaviour during residency. The winner receives a $500 book prize.

* Health Promotion, Preventive Health, Population Health and Health Services Research

TRANSITION AWARD (TA) RECIPIENTS

24 recipients were awarded TA.

Name	Host Institution	Project Title
Chan Kok Hong Dedrick	National University Hospital	STAG2 Mutant-Induced KRAS Upregulation in Normal Colon Tissue — Characterising a Novel Mechanism of Colorectal Oncogenesis
Nicholas Chew Wen Sheng	National University Hospital	Guarding Against Coronary Artery Disease and its Hidden Risk Factors in the Singaporean Population without Standard Modifiable Risk Factors (SG-GUARD Study): A Prospective, Cross-Sectional Study
Widanalage Sanjay Prasad de Mel	National University Hospital	Evaluating the Role of Tumour-Associated Macrophages in the Response to Anti-CD38 Monoclonal Antibody Therapy in Multiple Myeloma
Deng Xiao	National Neuroscience Institute	Developing and Validating an AI-Based Assessment Tool to Predict the Motor Progression of Parkinson's Disease
Ho Su Hui	National University of Singapore	Elucidating the Neural Basis of Emotional Dysregulation and Other Factors via a Transdiagnostic Approach: A Longitudinal Follow-Up of Mood Disorder Patients in the Cohort Health Study in Mood and Emotional Regulation in Singapore (CHIMES)
Huang Qing Yao Daniel	National University Hospital	From Non-Alcoholic Steatohepatitis to Hepatocellular Carcinoma: Investigating the Molecular Mechanisms for Biomarker Development and Therapeutic Insights
Huang Zhongwei	National University Hospital	Exploring the Role of the mTORC1-SMAD Pathway in Ovarian Ageing to Extend Ovarian Lifespan and Health-Span of Women
Amit Jain	National Cancer Centre Singapore	Isolating Functional T-Cells from Patients that Recognise KRAS Mutations and Can Exert Cytotoxicity
Ku Chee Wai	KK Women's and Children's Hospital	Evaluation of the Healthy Early Life Moments in Singapore (HELMS) Programme during Preconception
Lee Hsien Ren Shawn	National University Hospital	Functional and Genomic Profiling for Precision Medicine in Childhood T-Cell Acute Lymphoblastic Leukaemia
Lim Chin Hong	Singapore General Hospital	Gastric Bypass via Natural Orifice Trans-Luminal Endoscopic Surgical (NOTES) Approach: Towards Clinical Translation
Low Kiat Mun Serena	Khoo Teck Puat Hospital	The Role of Diabesity and Ageing-Related Mitochondrial Dysfunction Endophenotypes in the Paradigm of Physical Frailty
Loy See Ling	KK Women's and Children's Hospital	Associations of Metabolic Indicators and Circadian Behaviour Changes with Reproductive Outcomes in Overweight and Obese Women Who Are Trying to Conceive
Neo Hui Shan Shirlyn	National Cancer Centre Singapore	Timely Interventions to Enable and Reach patients with Heart Failure, and their Caregivers, with Palliative Care (TIER-HF-PC)
Ong Hon Shing	Singapore Eye Research Institute	Advancing Precision Medicine in Ocular Surface Diseases: Developing and Implementing a Point-of-Care Diagnostic Device
Aishworiya Ramkumar	National University Hospital	Evaluating a Screening Instrument for the Early Identification of Autism Spectrum Disorder among Young Children in Singapore

Name	Host Institution	Project Title
Saw Pei Li Stephanie	National Cancer Centre Singapore	INdividualised proFiling of Recurrence Risk Using Multiomics for EGFR-Mutated Non-Small Cell Lung Cancer (INFORM-EGFR)
Michaela Seng Su-fern	KK Women's and Children's Hospital	Working Towards Next-Generation Allogeneic CAR-T Therapies for Relapsed/Refractory Neuroblastoma and Other Childhood Cancers
Sia Ching Hui	National University Hospital	Thromboinflammation and Cerebral Dysfunction following Acute Myocardial Infarction (TICAMI) Study
Aaron Chia-Ken Tan	National Cancer Centre Singapore	UNVEIL study – UNcovering Therapeutic Vulnerabilities in EGFR and HER2 Exon 20 Insertion Mutated Lung Cancer
Tay Sen Hee Frank	National University Hospital	IMMUNe-mediated Diseases: Epigenetic PRediction, Biomarker Identification and Novel Therapeutics (IMMUNEPRINT)
Etienne Wang	National Skin Centre	The Efficacy and Mechanism of Controlled Microtrauma on Human Hair Regrowth and Regeneration
Judith Ju Ming Wong	KK Women's and Children's Hospital	Dissecting the Mechanisms Underlying Paediatric Acute Respiratory Distress Syndrome
Zhong Youjia	National University of Singapore	Defining Innate Immune Drivers of T-Cell Responses to mRNA Vaccination in Children

NMRC RESEARCH TRAINING FELLOWSHIP (RTF) RECIPIENTS

50 recipients were awarded NMRC RTF.

Name	Host Institution	Type of Training
Anantharaman Saradha	Changi General Hospital	**Part-time local Master's Degree** Burden of COVID-19 infection in CKD patients
Angelina Ang Su Yin	KK Women's and Children's Hospital	**Part-time local Master's Degree** Training in Master of Science in Behavioural and Implementation Sciences in Health (MScBIS) Course to Gain Knowledge and Expertise in Evidence-Based Behavioural and Implementation Science Approaches and Implementation Strategies for Inter-Disciplinary Value-Based Healthcare Delivery
Chan Wei Keong, Daniel	KK Women's and Children's Hospital	**Part-time local Master's Degree** Evaluating the Efficacy of a Digital Feeding and Lifestyle Behaviour Intervention for Infants: A Randomised Controlled Trial
Chee Ying Jie	Tan Tock Seng Hospital	**Part-time local PhD** Evaluating the Clinical Applicability of Flow-Mediated Dilation of the Brachial Artery as a Marker of Endothelial Function
Jocelyn Chew	National University of Singapore	**Full-time Singapore Biodesign Innovation Fellowship**
Chia Jia Qian	Tan Tock Seng Hospital	**Part-time local Master's Degree** Muscle Quality Assessment in Sarcopenia: Examining the Role of Shear Wave Elastography in Sarcopenia Assessment and Diagnosis
Clement Chia Luck Khng	Khoo Teck Puat Hospital	**Full-time Singapore Biodesign Innovation Fellowship**
Choi Ci En Ellie	National University Hospital	**Part-time local PhD** Development and Testing of a Digital Psychological Toolkit to Improve Symptom Burden in Dermatology Patients
Chue Koy Min	Sengkang General Hospital	**Full-time local PhD** Understanding the Trans-Kingdom Metagenomic Interactions of the Human Microbiome on Obesity and Metabolic Syndrome
Fan Bingwen Eugene	Tan Tock Seng Hospital	**Full-time Singapore Biodesign Innovation Fellowship**
Charissa Goh Shu Ying	KK Women's and Children's Hospital	**Part-time local Master's Degree** A Review of Endometrial Pathology in Women's Health and Fertility
Ho Quan Yao	Singapore General Hospital	**Full-time overseas PhD** Optimising Antigen Targeting in Next Generation Regulatory T-Cell Therapy
Sharlene Ho	Tan Tock Seng Hospital	**Part-time local PhD** Neutrophil Phenotyping in Community Acquired Pneumonia and its Association with Disease Severity and Post-Infectious Sequelae

Name	Host Institution	Type of Training
Hoe Hui Min Rebecca	National Neuroscience Institute	**Part-time local Master's Degree** Longitudinal Analysis of Non-Motor Symptoms in Parkinson's Disease
Huan Khian Wan Sarah Joy	National University Hospital	**Part-time local Master's Degree** Investigation of Muscle Histopathology in Post-Stroke Spasticity and the Impact of Hyperselective Neurectomy
Ke Yuhe	Singapore General Hospital	**Part-time local PhD** Enhancing Perioperative Cardiovascular Risk Predictions with Static and Dynamic Physiological Data and Interpretable Deep Learning — A Study with Smart Wearable Devices
Sky Koh Wei Chee	National University Polyclinics	**Part-time local PhD** Improving Antimicrobial Stewardship and Infection Control in Primary Care
Lee Hsien Xiong Raphael	Woodlands Health	**Part-time local Master's Degree** Effectiveness of a New Framework ACP-FG in Screening to Identify Patients with Palliative and Supportive Care Needs and in Increasing the Delivery of Generalist Palliative Care, Using a Surrogate Measurement of Incidence of Conduct of Goals of Care Discussions
Joycelyn Lee Jie Xin	National Cancer Centre Singapore	**Part-time local PhD** HArnessing the MicrObiome to improve therapeutic outcomes in caNcer patients receiving immunotherapY (HARMONY)
Lee Yuexian, Elis	KK Women's and Children's Hospital	**Part-time local Master's Degree** The adOlescent Acne STudy (TOAST): Assessing Quality of Life and Improving Management
Li Weiling Sarah	National University Hospital	**Part-time local PhD** Application of Artificial Intelligence to Improve Patient Care and Resource Allocation in Obstetric Medicine
Li Yunkai Andrew	Woodlands Health	**Part-time overseas PhD** Identification and Management of Progressive Pulmonary Fibrosis
Mervyn Lim Jun Rui	National University Hospital	**Part-time local PhD** Advancing Precision Neuromodulation through Individualised Brain Maps Using Functional Connectivity and In-Vivo Electrophysiology
Lim Kim Wei	Singapore General Hospital	**Part-time local Master's Degree** Utility of DNA Methylation Markers in Biliary Brush Cytology and Bile Sample in Malignant Biliary Stricture
Lim Ru Sin	Tan Tock Seng Hospital	**Part-time local PhD** GENEKIDS-PRO: Genomic Enhancement and Patient Engagement in NEphrology through Multidisciplinary KIDney Genetics Clinic Implementation and Integration in Singapore — using PROcess Evaluation Framework
Lim Sheng Jie Christen	National Neuroscience Institute	**Part-time local Master's Degree** Identifying Laboratory Biomarkers and Microbiological Correlates that Prognosticate and Monitor the Clinical Course of Guillain-Barré Syndrome

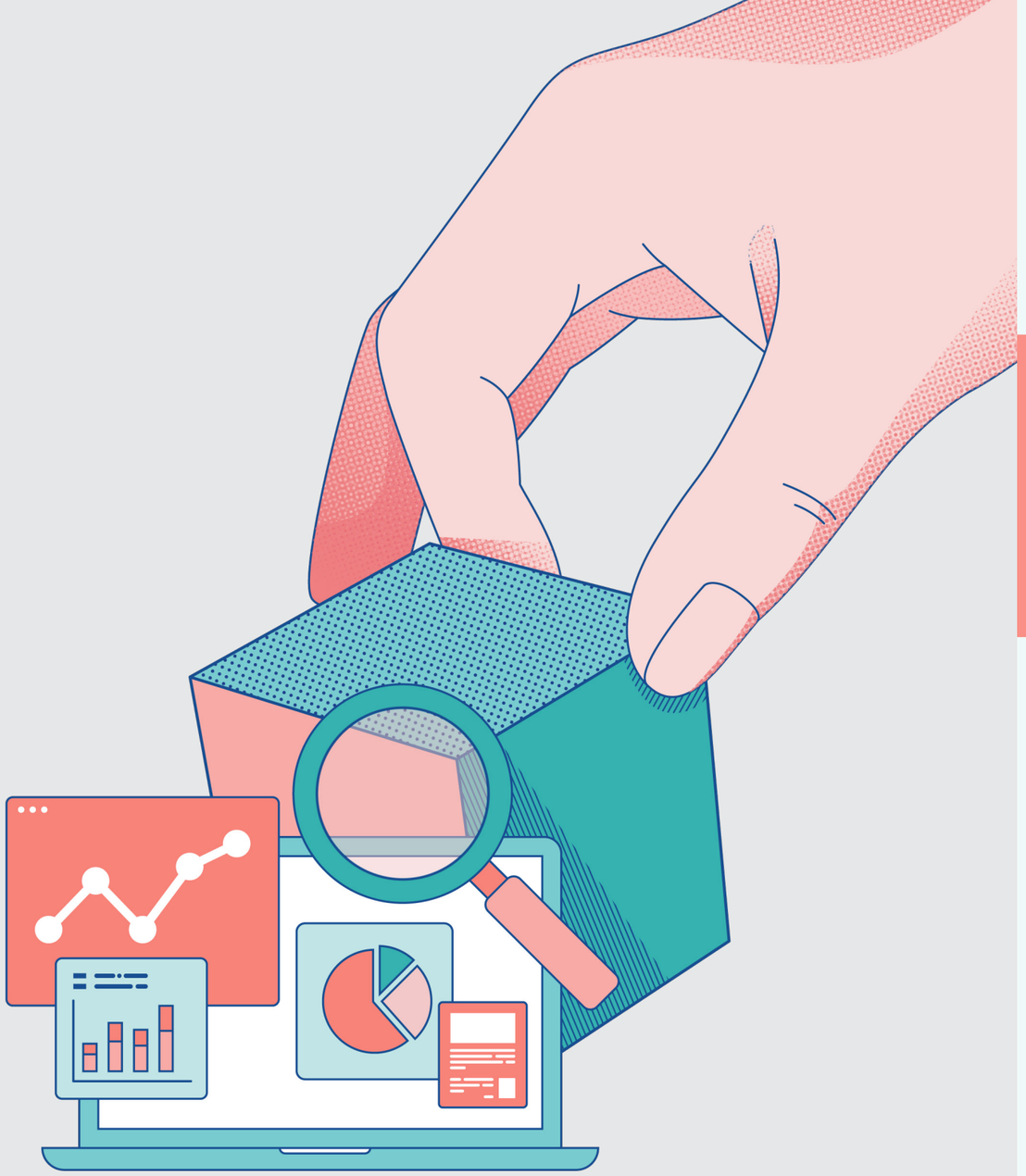
Name	Host Institution	Type of Training
Lim Shi Zhong Nigel	Ng Teng Fong General Hospital	**Full-time Singapore Biodesign Innovation Fellowship**
Lin Weicong Kenneth	Changi General Hospital	**Part-time local Master's Degree** ENdocuff and Computer Aided Detection of Polyps in Colonoscopy (ENCAD)
Loh Wann Jia	Changi General Hospital	**Part-time local PhD** A Comprehensive Assessment of Lipoprotein(a) [Lp(a)] in Cardiovascular Risk Prediction, Management, and Detection — to facilitate the formulation of a model of care for Lp(a)
Lo Yu Tung	National Neuroscience Institute	**Full-time overseas research attachment** Decoding Cortical and Spinal Signals through Ultrafast Functional Ultrasound Neural Interface
Loo Kai Guo, Benny	KK Women's and Children's Hospital	**Part-time local PhD** Clinical Characterisation of Physical Activity, Cardiorespiratory Fitness, and/or Muscle and Bone Strength on Performance of Physical and Mental Health, and/or Prevention and Control of Medical Diseases
Low Jia Ming	National University Hospital	**Part-time local PhD** Immunoprofiling and Microbiome Analysis of Gestational Immunity for Transfer Cohort Against Common Neonatal Respiratory Pathogens
Azizah Binte Mohamed Afif	Singapore General Hospital	**Part-time local PhD** Developing Methods to Reduce Functional Loss in Transplant Kidney: Using Non-Invasive Shear Wave Elastography as a Predictive Tool
Moosa Aminath Shiwaza	SingHealth Polyclinics	**Part-time local PhD** Development and Pilot Evaluation of a Clinical-Decision Support Tool to Manage Patients with Hypertension in Primary Care based on Self-Monitored Blood Pressure
Roderica Ng	Singapore General Hospital	**Part-time local PhD** Optimising Preoperative Screening and Intervention Strategies for Glycemic Control in Surgical Patients: A Comprehensive Analysis for Enhanced Population Health
Ngiam Jinghao Nicholas	National University Hospital	**Part-time local Master's Degree** Doxycycline Host-Directed Therapy to Improve Neurological Recovery and Clinical Outcomes in Central Nervous System Tuberculosis
Clara Ngoh	National University Hospital	**Full-time Singapore Biodesign Innovation Fellowship**
Maria Noviani	Singapore General Hospital	**Part-time local PhD** Towards Precision Medicine in Systemic Sclerosis: Identification of Immune Signatures Associated with Disease Activity and Predictive of Treatment Response in the Systemic Sclerosis Cohort Singapore
Ooi Su Kai Gideon	National Cancer Centre Singapore	**Full-time Singapore Biodesign Innovation Fellowship**

Name	Host Institution	Type of Training
Ming Ann Sim	National University Hospital	**Part-time local PhD** THE GENESIS STUDY—discoverinG novEl blood-based biomarkers aNd protEomic SIgnatureS of neurocognition and aging
Sooi Wei Xiong Kenneth	National University Hospital	**Part-time local Master's Degree** An Open-Label Phase II Study of EGFR TKI in Patients with Advanced NSCLC Harbouring EGFR Mutations Categorised According to Structural Based classification
Sarah Tai Beishan	Singapore General Hospital	**Part-time local PhD** Granzyme B-Targeting PET as a Predictive Imaging Biomarker of Cancer Immunotherapy Treatment Response
Tan Hui Xuan Sharon	National University of Singapore	**Part-time joint PhD** Health Technology Assessment of Population Oral Health Strategies
Tan Tien-En	Singapore National Eye Centre	**Full-time overseas PhD** Developing a Genetic Treatment Strategy for GUCY2D-Related Autosomal Dominant Cone-Rod Dystrophy
Tan Yi Hern	Singapore General Hospital	**Part-time local Master's Degree** Proteomic and Transcriptomic Analysis of Bronchoalveolar Lavage Fluid and Whole Blood in Immunocompromised Patients with Undiagnosed Pulmonary Infiltrates
Tan Yong Qiang Benjamin	National University Hospital	**Full-time overseas research attachment** PhENoTyping And Genotyping of yOuNg stroke in Singapore (PENTAGON-SG)
Tay Rong Hao John	National Dental Centre Singapore	**Full-time local PhD** Utilising Electronic Health Records Data to Determine Periodontitis Treatment Trajectories in People Suffering from Severe Periodontitis and its Association with Systemic Multimorbidity Clustering
Ian Wee Jun Yan	Singapore General Hospital	**Full-time local PhD** The Relationship between Gut Microbiome and Tumour Microenvironment through Different Phases of Colorectal Cancer Progression
Woon Tian Kai	KK Women's and Children's Hospital	**Part-time local Master's Degree** Assessment of the Diagnostic Accuracy of Artificial Intelligence Solution in the Detection of Pneumonia using Pediatric Chest X-Rays in the Emergency Department
Amanda Zain	National University Hospital	**Part-time local PhD** A Greener, Healthier Future for Our Children: Pioneering Sustainable Paediatric Practice through Implementation Science

NATIONAL OUTSTANDING CLINICIAN SCIENTIST (CS) RESIDENT AWARD RECIPIENTS

4 recipients were awarded National Outstanding CS Resident Award.

Name	Cluster	Clinical Specialty
Dr Liang Zhen Chang	National University Health System	Orthopaedic Surgery
Dr Mervyn Lim Jun Rui	SingHealth Health Services	IP Neurosurgery
Dr Meghan Lim Xuxin	SingHealth Health Services	Paediatric Surgery
Dr Maria Noviani	SingHealth Health Services	Rheumatology



RESEARCH GRANT PROGRAMMES (PROJECT-BASED)

PROMOTING TRANSLATIONAL CLINICAL RESEARCH EXCELLENCE

Promoting excellence in Translational and Clinical Research is one of the core pillars of NMRC's mandate. In line with this, NMRC offers several grants to support small- to large-scale Singapore-based research initiatives across the biomedical sciences spectrum. To ensure the best possible use of research funding, all grants are peer-reviewed and awarded competitively.

The Research Grant Programmes (project-based) in FY2023 and FY2024 are:

- Centre Grant (CG)
- Clinical Trial Grant (CTG)
- Clinician Scientist-Individual Research Grant (CS-IRG)
- Clinician Scientist-Individual Research Grant-New Investigator Grant (CS-IRG-NIG)
- Population Health Research Grant (PHRG)
- Population Health Research Grant-New Investigator Grant (PHRG-NIG)
- Healthy and Meaningful Longevity (HML)

Open Fund Grants

- Large Collaborative Grant (LCG)
- Individual Research Grant (IRG)
- Young Individual Research Grant (YIRG)

Centre Grant (CG)

CG aims to support the public healthcare institutions/clusters in building their core research capabilities through common research platforms, shared resources (e.g. equipment), and core manpower. The goal is to enhance collaborative and transdisciplinary research productivity, contributing to the advancement of healthcare research in alignment with Singapore's Research, Innovation and Enterprise (RIE) objectives. CG seeks to capitalise on existing institutional research capabilities, and facilitate the development of shared resources which can support the public healthcare institutions'/clusters' and/or partnering entities' research. CG encourages collaboration and coordination of research efforts within the institution/cluster and across healthcare institutions, focusing on the same area of research to disseminate research findings for the benefit of the community. CG grant call is made once every five years.

RIE2025 CG

Under the RIE2025 CG framework, there are three funding categories as follows:

Funding Category	Funding Quantum & Duration	Aim
Category 1 – Established Centres	Up to $20 million over four years	• To support individual public healthcare institutions (PHIs) in strengthening existing research capabilities to meet the CG's objectives • To support individual healthcare clusters in developing/ strengthening capabilities in population health research
Category 2 – Collaborative Centres	Up to $7 million over four years	• To support joint collaborations between two or more PHIs in strengthening existing research capabilities to meet the CG's objectives
Category 3 – Developing Centres	Up to $3 million over four years	• To support individual PHIs in developing new/existing research capabilities to meet the CG's objectives, under the mentorship or guidance of a named co-partner that can be an entity or an individual

The RIE2025 CG grant call was made in April 2021. Applicants were required to demonstrate the translational outcomes of their research strategies and alignment with RIE2025 Human Health and Potential goals in terms of transforming and protecting the health of the nation, through one or more of the following: (i) good healthcare outcomes at sustainable costs; (ii) population health, preventive health, and epidemic preparedness and response; (iii) data-centric healthcare and digital health; and/or (iv) achieving quadruple aims (i.e. improving health outcomes, keeping per capita cost manageable, improving care experiences and keeping providers satisfied).

Specifically for Category 2 (Collaborative Centres), priority consideration was given to applications that focused on at least one of the seven Ministry of Health (MOH)-prioritised disease domains: (i) cancers; (ii) cardiovascular diseases; (iii) infectious diseases; (iv) eye; (v) metabolic and endocrine; (vi) neuroscience; and (vii) mental health.

The success rate is as follows:

Grant Call	Proposals Reviewed	Proposals Awarded	Success Rate (%)
Apr 2021	40	22	55

A mid-term review was conducted in February 2024 to assess the progress and performance of the CGs. The review demonstrated encouraging results with the majority of CGs showing good progress. All 22 CGs were recommended continued funding.

Clinical Trial Grant (CTG)

CTG-Industry Collaborative Trials (ICT) Scheme

CTG-ICT scheme supports clinical trials involving both the clinician and company contributing intellectual inputs and funds to conduct the trial as well as the development of novel or pre-existing drugs/medical devices/interventions for new indications.

The prerequisite for application is the Principal Investigator (PI)'s ability to obtain industry contribution of at least 70% (cash or in-kind) of the Total Project Costs (TPC). The PI can apply for funding quantum of up to 30% of the TPC (inclusive of 30% indirect costs). Funding quantum for each project is capped at $4.94 million (inclusive of 30% indirect costs) for up to five years.

CTG-ICT grant call is open throughout the year. The success rates for FY2023–2024 are as follows:

FY	Proposals Reviewed	Proposals Awarded	Success Rate (%)
2023	No proposals received		
2024	2	2	100
Total	**2**	**2**	**100**

CTG-Investigator-Initiated Trials (IIT) Scheme

CTG-IIT scheme supports both early and late phases clinical trials that are initiated and driven by clinicians who are interested to conduct clinical trials on novel or pre-existing drugs/medical devices/interventions for new indications. While there are no requirements for minimum company contributions, applications with industry contributions will be given higher priority.

Funding quantum for each project is capped at $1.625 million (inclusive of 30% indirect costs) for up to five years.

CTG-IIT grant calls are made twice per year, in January and July. The success rates for FY2023–2024 are as follows:

Grant Call	Proposals Reviewed	Proposals Awarded	Success Rate (%)
Jan 2023	8	3	37.5
Jul 2023	3	1	33.3
Jan 2024	6	3	50.0
Jul 2024	12	2	16.7
Total	**29**	**9**	**31.0**

Clinician Scientist-Individual Research Grant (CS-IRG)

CS-IRG is provided to clinician scientists to carry out medical research on a specifically defined topic for a period of three to five years in a local public institution.

Funding quantum for each project is capped at $1.95 million (inclusive of 30% indirect costs) for up to three years. Projects involving prospective patient/subject recruitment may apply for a funding duration of up to five years.

CS-IRG grant calls are made twice per year, in January and July. The success rates for FY2023–2024 are as follows:

Grant Call	Proposals Reviewed	Proposals Awarded	Success Rate (%)
Jan 2023	32	10	31.3
Jul 2023	40	13	32.5
Jan 2024	49	11	22.4
Jul 2024	49	12	24.5
Total	**170**	**46**	**27.1**

CS-IRG New Investigator Grant (CS-IRG-NIG)

CS-IRG-NIG is a subcategory of CS-IRG to cater for new clinical investigators. CS-IRG-NIG is a step for the new investigator towards winning a first independent national level grant. Applicants with substantial research experience will not be accepted under this category.

Funding quantum for each project is capped at $260,000 (inclusive of 30% indirect costs) for up to two years. Projects involving prospective patient/subject recruitment may apply for a funding duration of up to three years, subject to the same funding quantum.

CS-IRG-NIG grant calls are made twice per year, in January and July. The success rates for FY2023–2024 are as follows:

Grant Call	Proposals Reviewed	Proposals Awarded	Success Rate (%)
Jan 2023	17	11	64.7
Jul 2023	8	5	62.5
Jan 2024	23	12	52.2
Jul 2024	22	9	40.9
Total	**70**	**37**	**52.9**

Population Health Research Grant (PHRG)

As part of Ministry of Health (MOH)'s aim to develop an integrated ecosystem that anchors preventive health efforts in primary care and care in the community with good system linkages to support citizens at different life stages, novel strategies, and approaches will be needed to drive sustained behavioural modifications for individuals to adopt healthier behaviour and habits. To achieve this, PHRG will fund research proposals which seek to improve health outcomes through a population health approach under the research areas of Health Promotion and Preventive Health, and Health Services Research.

RIE2025 PHRG comprises two categories:

1. The Open Category welcomes applications on all topics within the research areas articulated above to allow space for researchers to identify emerging areas of need and discover novel ideas that may contribute significantly to health outcomes in the medium- to long-term; and
2. The Thematic Category supports only proposals with scope falling within specific research themes to specifically address MOH's areas of pressing research needs.

PHRG – Open Category

Funding quantum for each project is capped at $1.95 million (inclusive of 30% indirect costs) for up to three years. Projects involving prospective patient/subject recruitment may apply for up to five years.

PHRG (Open Category) grant calls are made twice a year. The success rates for FY2023–2024 are as follows:

Grant Call	Proposals Reviewed	Proposals Awarded	Success Rate (%)
Jan 2023	13	3	23.1
Jul 2023	20	4	20
Jan 2024	31	3	9.7
Jul 2024	33	6	18.2
Total	**97**	**16**	**16.5**

PHRG New Investigator Grant (PHRG-NIG)

PHRG-NIG is a subcategory of the PHRG Open Category as a step for new investigators towards winning their first independent national level grant. Applicants with substantial research experience will not be accepted under this category.

Funding quantum for each project is capped at $130,000 (inclusive of 30% indirect costs) for up to two years. Projects involving prospective patient/subject recruitment may apply for up to three years.

PHRG-NIG grant calls are made twice a year, in January and July. The success rates for FY2023–2024 are as follows:

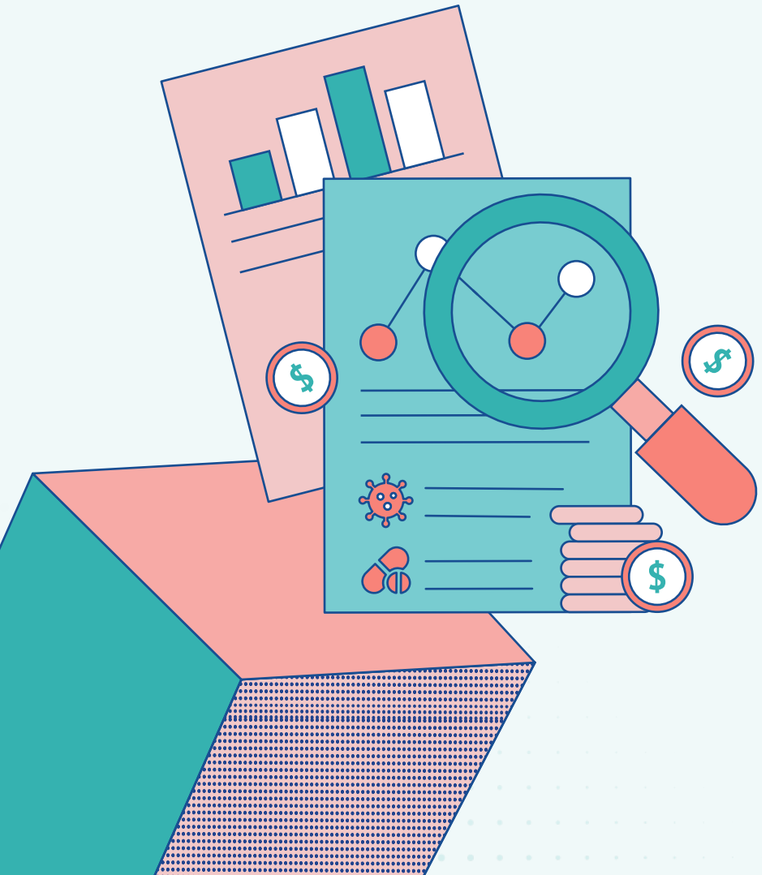
Grant Call	Proposals Reviewed	Proposals Awarded	Success Rate (%)
Jan 2023	13	5	38.5
Jul 2023	10	3	30
Jan 2024	19	3	15.8
Jul 2024	24	5	20.8
Total	**66**	**16**	**24.2**

PHRG – Thematic Category

There are no stipulated caps in funding quantum or duration, which are deliberated during the co-creation and review process.

PHRG (Thematic Category) grant call is open throughout the year. The success rates for FY2023–2024 are as follows:

FY	Proposals Reviewed	Proposals Awarded	Success Rate (%)
2023	14	5	35.7
2024	15	2	13.3
Total	**29**	**7**	**24.1**



Healthy and Meaningful Longevity (HML)

HML, also known as National Innovation Challenge (NIC) on Active and Confident Ageing Phase 2, aims to build a strong ageing research and development ecosystem that catalyses cross-institutional multi-disciplinary applied research to increase the productive capacity and health span while optimising the rising costs of care in an ageing population like Singapore.

The HML Funding Initiative comprises the following competitive grant calls:

1. Healthy Longevity Catalyst Awards (HLCA)
2. Translation Grant

Healthy Longevity Catalyst Awards (HLCA)

HLCA will reward bold, new, potentially transformative ideas to improve the physical, mental, or social wellbeing for people as they age, and in a measurable and equitable way. In particular, we seek ideas that will extend the human health span through innovations in disease prevention, biology, mobility and function, social connectedness, productive longevity and more. Ideas could focus on early-, mid-, or late-life, as long as it ultimately promotes health as people age.

Funding quantum for each project is capped at $200,000 (inclusive of 30% indirect costs) for up to two years.

HLCA grant calls are made once a year. The success rates for FY2023–2024 are as follows:

Grant Call	Proposals Reviewed	Proposals Awarded	Success Rate (%)
Feb 2023	31	5	16.1
Mar 2024	29	4	13.8
Total	**60**	**9**	**15**

Translation Grant

Translation Grant aims to support the scale-up of promising research projects in the community that will benefit seniors. The focus of this translation phase is on large-scale test bedding to:

1. Understand application of implementation science approaches (e.g. barriers affecting uptake of the innovation by service providers/seniors, staff training & resourcing required);
2. Establish cost-effectiveness, and
3. Validate whether the good proof-of-concept or proof-of-value results achieved in earlier stages of research continue to hold when project is scaled. The envisioned outcome is such that at the end of the research grant, researchers will be able to generate sufficient evidence to demonstrate that the solution is effective, cost-efficient, viable, and financially sustainable at scale, and can use their findings to garner support from potential funders to adopt and implement the solution more widely (e.g. rolling out as a mainstream service in eldercare settings).

There is only one planned Translation Grant call, which was launched in FY2023. Funding quantum for each project is capped at $5 million (inclusive of 30% indirect costs) for up to five years. The success rate for FY2024 is as follows:

Letters of Intent Reviewed	Full Proposals Reviewed	Proposals Awarded	Success Rate (%)
11	6	3	27.3

OPEN FUND GRANTS

Large Collaborative Grant (LCG)

LCG aims to bring together the best teams from public institutions to advance human health and wellness as well as create economic value for Singapore and Singaporeans, through the pursuit of excellence in research and its applications. The purpose of the LCG scheme is to support patient-centric translational research[3], underpinned by basic[4] and/or applied research[5]. The scheme will not support pure basic science, pure clinical or pure applied research.

Its key elements are as follows:

- Interdisciplinary collaboration across institutions is preferred and encouraged to integrate, coordinate, and leverage on the full spectrum of research capabilities in Singapore, from basic science to clinical research.
- LCG programmes should aim to make significant contributions to the advancement of knowledge and help establish Singapore as a global leader in therapeutic areas.
- LCG programmes should facilitate the discovery and application of basic science ideas relevant to the advancement of health, as well as the translation of clinical findings into policy and practice. They should also provide opportunities for international partnerships and/or industry collaborations.
- Pathway(s) to impact should be clearly articulated.

LCG is open to proposals of the highest quality in all areas, typically involving multidisciplinary teams. To better realise the goals of the Human Health and Potential (HHP) domain in Singapore, the following seven areas have been identified as national priorities for research: cancers and neoplasms, cardiovascular, eye, infection, mental health, metabolic and endocrine, and neurological.

For each grant call, specific therapeutic areas will be selected as the emphasised therapeutic areas which the HHP community is encouraged to address. At the same time, proposals in other areas will also be considered. Similar to RIE2020 LCG, there are two funding tiers for application, providing funding (inclusive of 30% indirect cost) of up to $10 million and $25 million.

The review process is two-stage. It comprises Letter of Intent (LOI) and Full Proposal for shortlisted LOI applications.

LCG grant call is made once a year, in May. For the May 2023 grant call, mental health and neurological were set as the emphasised therapeutic areas. The success rate and details of the awarded programmes are as follows:

Grant Call	Funding Tier	Letters of Intent Reviewed	Full Proposals Reviewed	Proposals Awarded	Success Rate (%)
May 2023	Tier-1	15	6	2	18.5
	Tier-2	12	5	3	
Total	**-**	**27**	**11**	**5**	**18.5**

[3] Translational Research: Prevention, Detection and Diagnosis, Treatment Development and Treatment Evaluation.
[4] Basic Research: Underpinning and Aetiology.
[5] Applied Research: Disease Management and Health Services.

Awarded Programmes

Programme Title (Funding Tier)	Therapeutic Area(s)	Leadership Team (Institution)
ADEPT: Atopic DErmatitis research Program for patienTs **(Tier-1)**	Others – Dermatology	**Corresponding Principal Investigator (PI):** Prof Steven Thng (National Skin Centre) **Theme PIs:** Steven Thng (National Skin Centre) Yew Yik Weng (National Skin Centre) Elizabeth Tham (National University Hospita) Kenneth Lay (A*STAR Skin Research Labs) Franklin Zhong (Nanyang Technological University) Anand Andiappan (Singapore Immunology Network) James Chan (A*STAR Skin Research Labs) Sebastian Maurer-Stroh (Bioinformatics Institute)
The Academic Respiratory Initiative for Pulmonary Health (TARIPH) **(Tier-1)**	Others – Respiratory and Critical Care	**Corresponding PI:** A/Prof Sanjay Chotirmall (Nanyang Technological University) **Theme PIs:** Tiew Pei Yee (Singapore General Hospital) Sanjay Chotirmall (Nanyang Technological University) Koh Siyue Mariko (Singapore General Hospital) Tang Wern Ee (National Healthcare Group Polyclinics) Matthew Cove (National University Hospital) Jason Phua (Alexandra Hospital) Thai Tran (National University of Singapore) Wang De Yun (National University of Singapore) John Abisheganaden (Tan Tock Seng Hospital) Angela Chow (Tan Tock Seng Hospital) Lim Jue Tao (Nanyang Technological University) Yim Hung Lam Steve (Nanyang Technological University) Chew Fook Tim (National University of Singapore) Loo Xiu Ling Evelyn (Institute for Human Development and Potential)
Colo-SCRIPT: Colorectal cancer subtype-specific research informs phenotypes, diagnostics & treatments **(Tier-2)**	Cancers and neoplasms	**Corresponding PI:** A/Prof Iain Tan (National Cancer Centre Singapore) **Theme PIs:** Ashok Venkitaraman (National University of Singapore) Shyam Prabhakar (Genome Institute of Singapore) Vinay Tergaonkar (Institute of Molecular and Cell Biology) Sunny Wong Hei (Nanyang Technological University) Tam Wai Leong (Genome Institute of Singapore) Patrick Tan (Duke-NUS Medical School) Iain Tan (National Cancer Centre Singapore) Li Qi-Jing (Institute of Molecular and Cell Biology) Joseph Sung Jao Yiu (Nanyang Technological University) Tony Lim Kiat Hon (Singapore General Hospital)

Programme Title (Funding Tier)	Therapeutic Area(s)	Leadership Team (Institution)
Singapore lYMPHoma translatiONal studY (SYMPHONY) 2.0 **(Tier-2)**	Cancers and neoplasms	**Corresponding PI:** Prof Lim Soon Thye (National Cancer Centre Singapore) **Theme PIs:** Ng Siok Bian (National University of Singapore) Anita Chan (Singapore National Eye Centre) Ong Choon Kiat (National Cancer Centre Singapore) Jason Chan Yong Sheng (National Cancer Centre Singapore) Chen Jinmiao (Bioinformatics Institute) Tan Soo Yong (National University of Singapore) Anand Jeyasekharan (National University of Singapore) Francesca Lorraine Lim (Singapore General Hospital) Michaela Seng Su-Fern (KK Women's and Children's Hospital) Joe Yeong Poh Sheng (Institute of Molecular and Cell Biology) Nicholas Grigoropoulos (Singapore General Hospital) Navin Kumar Verma (Nanyang Technological University) Hong Wanjin (Institute of Molecular and Cell Biology) Chng Wee Joo (National University of Singapore) Lim Soon Thye (National Cancer Centre Singapore) Olaf Rotzschke (Singapore Immunology Network) Amit Jain (National Cancer Centre Singapore) William Hwang (National Cancer Centre Singapore) Woo Xing Yi (Bioinformatics Institute) Lee Hwee Kuan (Bioinformatics Institute) Chiang Jianbang (National Cancer Centre Singapore) Sebastian Maurer-Stroh (Bioinformatics Institute)
Translational Asian Age-related Macular Degeneration Program Phase 2 (TAAP-2) **(Tier-2)**	Eye	**Corresponding PI:** Prof Gemmy Cheung (Singapore Eye Research Institute) **Theme PIs:** Gemmy Cheung (Singapore Eye Research Institute) Tham Yih Chung (Singapore Eye Research Institute) Low Lian Leng (SingHealth) Fan Qiao (Duke-NUS Medical School) Leopold Schmetterer (Singapore Eye Research Institute) Jacqueline Chua (Singapore Eye Research Institute) Wang Xiaomeng (Singapore Eye Research Institute) Su Xinyi (National University Hospital)

Individual Research Grant (IRG)

IRG supports research proposals in basic, translational, and clinical research relevant to Human Health and Potential, including research that looks at the causes, consequences, diagnosis, and treatment of human diseases.

Funding quantum for each project is capped at $1.625 million (inclusive of 30% indirect costs) for up to five years.

IRG grant calls are made twice a year, in January and July. The success rates in FY2023–2024 are as follows:

Grant Call	Proposals Reviewed	Proposals Awarded	Success Rate (%)
Jan 2023	85	20	23.5
Jul 2023	104	16	15.4
Jan 2024	105	18	17.1
Jul 2024	111	18	16.2
Total	**405**	**72**	**17.8**

Young Individual Research Grant (YIRG)

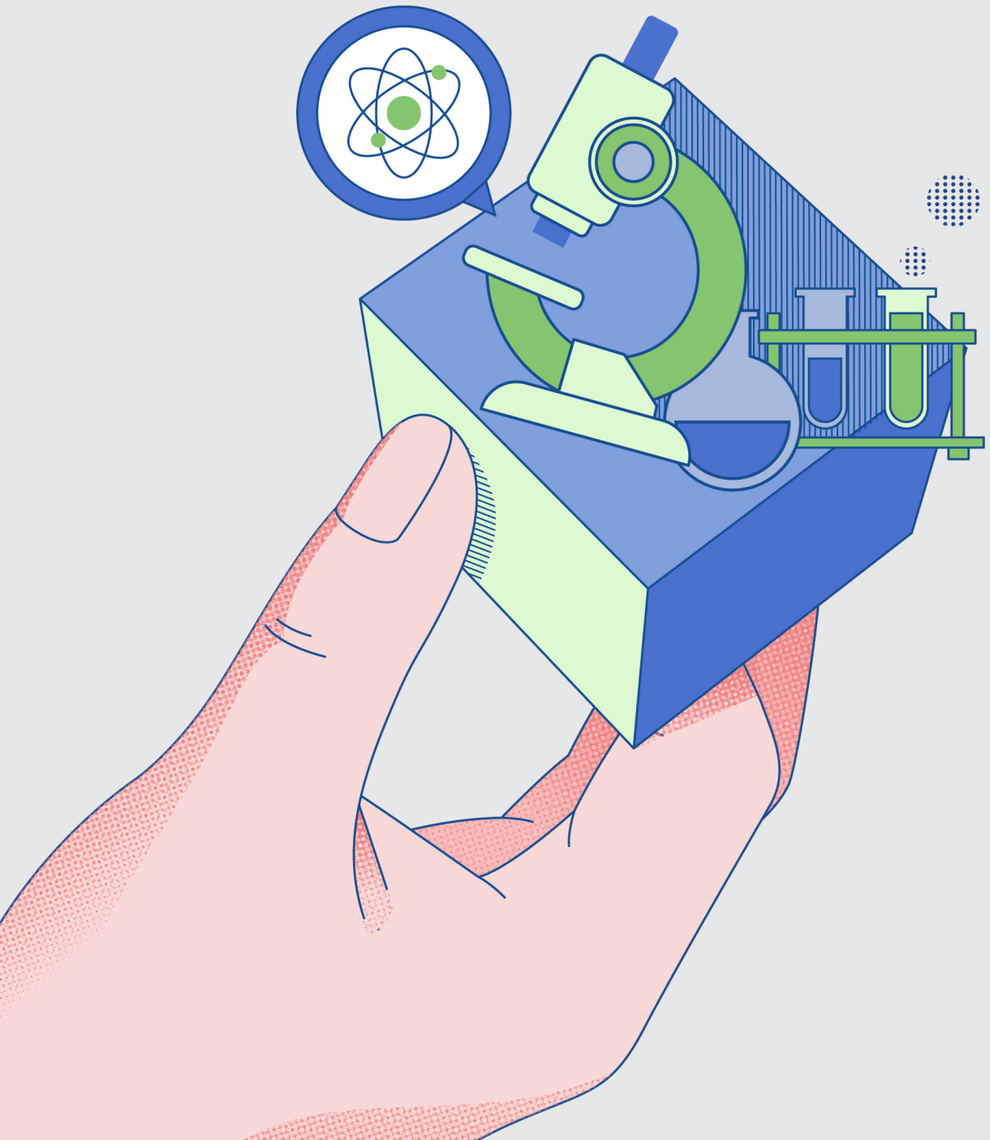
YIRG is a subcategory of IRG and a step for new investigators to their first independent national-level grant. Applicants with substantial research experience will not be accepted under this subcategory. YIRG is provided to support proposals for basic, translational, and clinical research that are relevant to Human Health and Potential, including research that looks at the causes, consequences, diagnosis, and treatment of human diseases.

Funding quantum for each project is capped at $325,000 (inclusive of 30% indirect costs) for up to three years.

YIRG grant calls are made twice a year, in January and July. The success rates for FY2023–2024 are as follows:

Grant Call	Proposals Reviewed	Proposals Awarded	Success Rate (%)
Jan 2023	51	23	45.1
Jul 2023	68	21	30.9
Jan 2024	57	21	36.8
Jul 2024	68	23	33.8
Total	**244**	**88**	**36.1**

RESEARCH ENABLERS AND INFRASTRUCTURE INITIATIVES



ENHANCING KNOWLEDGE TRANSLATION FOR IMPACT

NMRC supports the development, maintenance, and enhancement of research enablers and infrastructure initiatives that align with Singapore's focus on strengthening and expanding its capabilities in translational and clinical research, with the aim of driving both health and economic outcomes. NMRC Office serves as the desk head, and/or works with the Ministry of Health (MOH) divisions to provide grant administrative support and help these initiatives achieve their national-level objectives, in alignment with MOH and Research, Innovation and Enterprise strategies.

The research enablers and infrastructure initiatives in FY2023 and FY2024 are:

- Consortium for Clinical Research and Innovation, Singapore (CRIS)
- National Health Innovation Centre Singapore (NHIC)**
- Programme for Research in Epidemic Preparedness And REsponse (PREPARE)

Enablers and Infrastructure Support for Clinical Trials-related activities (EISCT)

- Bioethics Advisory Committee (BAC)
- Clinical Research Coordinator (CRC)
- Science, Health and Policy-relevant Ethics in Singapore (SHAPES) programme by Centre for Biomedical Ethics (CBmE)
- Investigational Medicine Unit (IMU)
- Institutional Review Board (IRB)
- Singapore Clinical Research Institute (SCRI)**

National Clinical Translational Programmes (NCTPs)

- Advanced Cell Therapy and Research Institute, Singapore (ACTRIS)**
- CArdiovascular DiseasE National Collaborative Enterprise (CADENCE)**
- Precision Health Research, Singapore (PRECISE)**
- Singapore Translational Cancer Consortium (STCC)**

Strategic Datasets and Data-Sharing Infrastructure (SDDSI)

- National Cohorts Office (NCO)
- Trusted Research and Real world-data Utilisation and Sharing Tech (TRUST)

** CRIS programme

Consortium for Clinical Research and Innovation, Singapore (CRIS)

CRIS was established in 2020 with the goal of strengthening synergies and developing strategies for national-level clinical research and translation programmes under the stewardship of Ministry of Health. It is a subsidiary of MOH Holdings.

CRIS brings together six key national-level research and development initiatives and facilitates synergistic collaborations among them. These initiatives include:

1. Singapore Clinical Research Institute (SCRI)
2. National Health Innovation Centre Singapore (NHIC)
3. Advanced Cell Therapy and Research Institute, Singapore (ACTRIS)
4. Precision Health Research, Singapore (PRECISE)
5. Singapore Translational Cancer Consortium (STCC)
6. CArdiovascular DiseasE National Collaborative Enterprise (CADENCE)

CRIS aims to make a positive difference to Singapore's patients and researchers by ensuring that these clinical research platforms and programmes are at the cutting edge of capability development and innovation. This is achieved through facilitated collaborations and enduring partnerships with research and biomedical entities, as well as communities across the public sector and industry across Singapore.

National Health Innovation Centre Singapore (NHIC)

NHIC is a nationally appointed programme office that works with public healthcare institutions across Singapore to identify and commercialise promising clinical innovations. NHIC funds the translation and development of medical innovations from Singapore's clinical sector, and provides strategic guidance and connection to industry partners, accelerating impact in healthcare. NHIC's programmes catalyse the translation of clinical innovations towards commercially viable products that benefit both patients and the healthcare sector.

Established in 2014, the office has supported several projects and companies in the development and implementation of innovative medical technologies and services, helping to improve the standard of healthcare in Singapore and beyond.

NHIC is a programme of the Consortium for Clinical Research and Innovation, Singapore.

Programme for Research in Epidemic Preparedness And REsponse (PREPARE)

PREPARE is a national research programme set up by Ministry of Health to support and strengthen Singapore's key essential pandemic research capabilities, translational platforms and expertise to develop tools, methods and products that can be tapped on to detect, respond to, and contain future infectious disease threats.

Infectious disease outbreaks are a continuous threat to Singapore. As an international travel hub with a high population density, Singapore is particularly vulnerable to imported and local transmission of novel infectious diseases and the re-emergence of established ones. Developing cutting-edge research capabilities to prepare for and respond well to future epidemics is thus a crucial national priority.

PREPARE seeks to:

- Enhance research capabilities for early detection and sense-making to prepare Singapore against future infectious disease threats;
- Develop and strengthen key enablers in data infrastructure, analytics, and behavioural science research to respond to public health crises;
- Strengthen research capabilities to enhance our national resilience in diagnostics, therapeutics, and vaccines; and
- Develop a strong infectious diseases research collaboration network across countries in our region to respond to epidemics and facilitate multi-centre clinical trials.

PREPARE is a national programme under the Communicable Diseases Agency.

ENABLERS AND INFRASTRUCTURE SUPPORT FOR CLINICAL TRIAL-RELATED ACTIVITIES

Bioethics Advisory Committee (BAC)

BAC is an independent national advisory committee that examines ethical, legal, and social issues arising from human biomedical science and research, with the aim of protecting the rights and welfare of individuals while allowing the biomedical sciences to develop and realise their full potential for the benefit of humankind. BAC actively gathers information and views from both the international and local communities and, after careful deliberation, provides recommendations to the Singapore government and local research community on ethical standards for human biomedical research. International engagement and public education also fall within BAC's remit.

The Biomedical Ethics Coordinating Office, under Ministry of Health's Regulatory Policy and Legislation Division provides policy, administrative and secretariat support to BAC. Further efforts are being undertaken by BAC to support the biomedical research landscape in Singapore, and in profiling Singapore as a leading regional and international biomedical research hub with high ethical standards and public trust preserved in local research activities.

Clinical Research Coordinator (CRC)

Since Research, Innovation and Enterprise (RIE) 2020, funding was allocated to the CRC initiative to support a core group of CRCs and set up the national training and certification programme for CRCs.

Continued funding in RIE2025 retains this critical pool of talent and strengthens the clinical trial landscape and support in Singapore. Support for CRCs is vital as they assist to identify suitable patients for recruitment to clinical trials, hence, ensuring rapid patient recruitment and prompt completion of clinical trials. The national training and certification programme provides a structured training programme for CRCs to ensure that high quality trials are conducted.

Centre for Biomedical Ethics (CBmE)

CBmE at the Yong Loo Lin School of Medicine, National University of Singapore (NUS) is committed to strengthening national capacity and cultivating an ethically responsible scientific community under its Science, Health and Policy-relevant Ethics in Singapore (SHAPES)'s initiatives. It drives interdisciplinary research that addresses urgent challenges in public health, health systems, and the governance of emerging biomedical technologies—particularly within the Singaporean and broader Asian contexts. CBmE actively collaborates with academic partners across and beyond NUS, as well as key stakeholders in healthcare, biomedical science, and policy, positioning itself as a catalyst for responsible innovation and ethical leadership. CBmE endeavours to keep the research community informed through evidence-based ethical research that upholds professional and responsible standards, reinforcing Singapore's position at the forefront of global biomedical research. The Centre contributes to shaping ethical norms and policy frameworks. Its research outputs are designed to be both relevant and accessible, supporting informed decision-making across the healthcare ecosystem and promoting ethical integrity in clinical and translational research.

To further cultivate national expertise, CBmE collaborates with the Bioethics Advisory Committee Secretariat and leading clinician researchers—including NMRC grant-holders—to convene working groups that produce and disseminate position papers on key developments in translational science and medicine. These papers engage the scientific community in consensus-building and debate, reinforcing CBmE's role as a thought leader in biomedical ethics research and policy.

Investigational Medicine Unit (IMU)

IMUs provide supporting infrastructure for clinician-investigators, such as a dedicated space and beds for inpatient and outpatient research, computer hardware, and software systems for data management and analysis, as well as manpower "infrastructure" such as clinical pharmacologists, clinical research coordinators, specialised research nurses/clinical research nurses, and biostatisticians.

IMUs focus on early phase trials (Phases 1 and 2), preferably first-in-man while also supporting late phase trials. They encourage collaborative efforts across trial units, institutions and clusters in Singapore as well as outside Singapore to develop innovative thought leadership and to strengthen global competitiveness.

Institutional Review Board (IRB)

NHG Health Domain Specific Review Board (DSRB) and SingHealth Centralised Institutional Review Board (CIRB) are public healthcare IRBs that serve to ensure rigour in ethics review for the protection of human research subjects in biomedical, translational and clinical research. NHG Health and SingHealth launched the Ethics and Compliance Online System in May 2024 as a one-stop solution for public healthcare clusters and local partners to streamline ethics review and support the research lifecycle from study initiation to completion. A Memorandum of Agreement for the mutual recognition of ethics review between IRBs from NHG Health, SingHealth, Nanyang Technological University, Singapore, National University of Singapore, and Agency for Science, Technology and Research was effected in April 2025 to streamline ethics review procedures for collaborative studies.

Singapore Clinical Research Institute (SCRI)

SCRI was established in 2008 as the national academic clinical research organisation to enhance the standards of clinical research in Singapore by developing core capabilities, infrastructure, and scientific leadership for clinical research. In 2021, SCRI was appointed to implement the national clinical trial strategy and enhance Singapore's clinical trial ecosystem. This is accomplished through the deployment of innovative technologies and processes, and strategic coordination of ecosystem capabilities, and infrastructure. These efforts aim to achieve synergies that will enhance the clinical research ecosystem, contributing to a healthier community and better patient outcomes.

SCRI's key platforms include:

1. National Coordinating Office
2. Academic Research Organisation
3. SCRI Academy
4. Clinical Research Network
5. Clinical Research Analytics Group

SCRI is a programme of the Consortium for Clinical Research and Innovation, Singapore.

Clinical Trials.SG (CTSG)

CTSG is an effort by SCRI to serve as Singapore's centralised portal for clinical trial-related matters. CTSG caters to patients, caregivers, clinical investigators, and companies by making clinical trial information more accessible and comprehensible to all. By demystifying the clinical trial landscape, CTSG aims to encourage greater interest in clinical trials, fostering innovation, and improving health outcomes.

NATIONAL CLINICAL TRANSLATIONAL PROGRAMMES

Advanced Cell Therapy and Research Institute, Singapore (ACTRIS)

ACTRIS was established in April 2020 to meet the increasing clinical demand for cellular therapeutics to treat various life-threatening diseases.

Its vision is to be the national and regional centre of excellence for facilitating discovery, process development, and manufacturing of cellular-based therapeutics across the broad spectrum of immunotherapy and regenerative medicine, encompassing both investigational and clinical-use products for Singapore.

Through its specialised infrastructure and skilled workforce, ACTRIS aims to promote and support the entire value chain of the cell therapy ecosystem by enabling translational research and development, manufacturing, clinical service provision, and commercialisation by serving the healthcare, academic and industrial sectors.

In addition, ACTRIS will also provide value-added services such as workforce training, regulatory support, and the standardisation of ancillary materials and product testing pertaining to the delivery of cellular therapy to patients.

ACTRIS is a programme of the Consortium for Clinical Research and Innovation, Singapore.

CArdiovascular DiseasE National Collaborative Enterprise (CADENCE)

Established in February 2023, CADENCE is a national clinical translational programme aimed at synergising cardiovascular research and technology capabilities across Singapore.

Its goal is to integrate existing research capabilities by bringing together the strongest basic, clinical, and translational talent and expertise across Singapore and its institutions. This aims to establish a focused and impactful national cardiovascular disease research and translational programme with world-class peaks of excellence. To achieve this, CADENCE has established four national joint platforms focused on data science, clinical trials, and artificial intelligence or digital health, together with a business intelligence and development unit to attract industry collaborations and external investments.

CADENCE is a programme of the Consortium for Clinical Research and Innovation, Singapore.

Precision Health Research, Singapore (PRECISE)

PRECISE is the central entity established to coordinate Singapore's nationwide efforts in implementing Phase II of Singapore's three-phase National Precision Medicine (NPM) programme. Phase I (2017–2020) focused on developing an Asian reference genome database, known as SG10K_Health, which comprises whole genome sequences from 10,000 Singaporeans representing multi-ancestry Asian populations. This dataset is a national resource of Asian genetic normality supporting clinical and biomedical research. It also provided initial estimates of the genetic disease burden among Singaporeans, with a focus on clinically relevant genes.

Phase II (2020–2025) builds upon the genomics infrastructure established in Phase I to create the longitudinal PRECISE-SG100K cohort, which integrates genomic, phenotypic, and clinical data. Key achievements include completion of five clinical implementation pilots to develop predictive preventive pathways that can be implemented in Singapore's healthcare system, completion of the PRECISE-SG100K cohort, enhanced public-private enterprise partnerships involving 11 companies operating in Singapore, and support for seven local start-ups in Singapore's health research and innovation ecosystem.

Phase III (2025–2031) will focus on healthcare transformation and precision population health through deeper partnerships with Singapore's healthcare clusters. Phase III will target three core areas: identifying genetic factors in Asian-relevant diseases to support the development of novel treatments; gathering research data to support scaling precision medicine from pilot projects to national-level implementation; and leveraging innovative data linkages to enhance Asian-centric datasets for artificial intelligence applications and international collaboration.

PRECISE is a programme of the Consortium for Clinical Research and Innovation, Singapore.

Singapore Translational Cancer Consortium (STCC)

STCC was established in 2020 as a nationally coordinated consortium to synergise cancer research capabilities in Singapore.

STCC brings together basic, clinical, and translational talent in Singapore to create globally significant peaks of excellence in selected Asian cancers. STCC's five joint platforms—Cancer Clinical Trials and Investigational Medicine Units, Cancer Databases and Tissue Banks, Translational Research Integration and Support, Business Intelligence and Development, and Impact and Population Health—provide an enabling research and innovation environment driven to foster translational research and meaningful outcomes for society.

Through these forged collaborative relationships between local cancer research groups and by capitalising on the strengths of industry and academia, STCC is uniquely poised to develop initiatives that are aligned with Singapore's goals in value-based healthcare innovation and economic value creation.

STCC is a programme of the Consortium for Clinical Research and Innovation, Singapore.

STRATEGIC DATASETS AND DATA-SHARING INFRASTRUCTURE

National Cohorts Office (NCO)

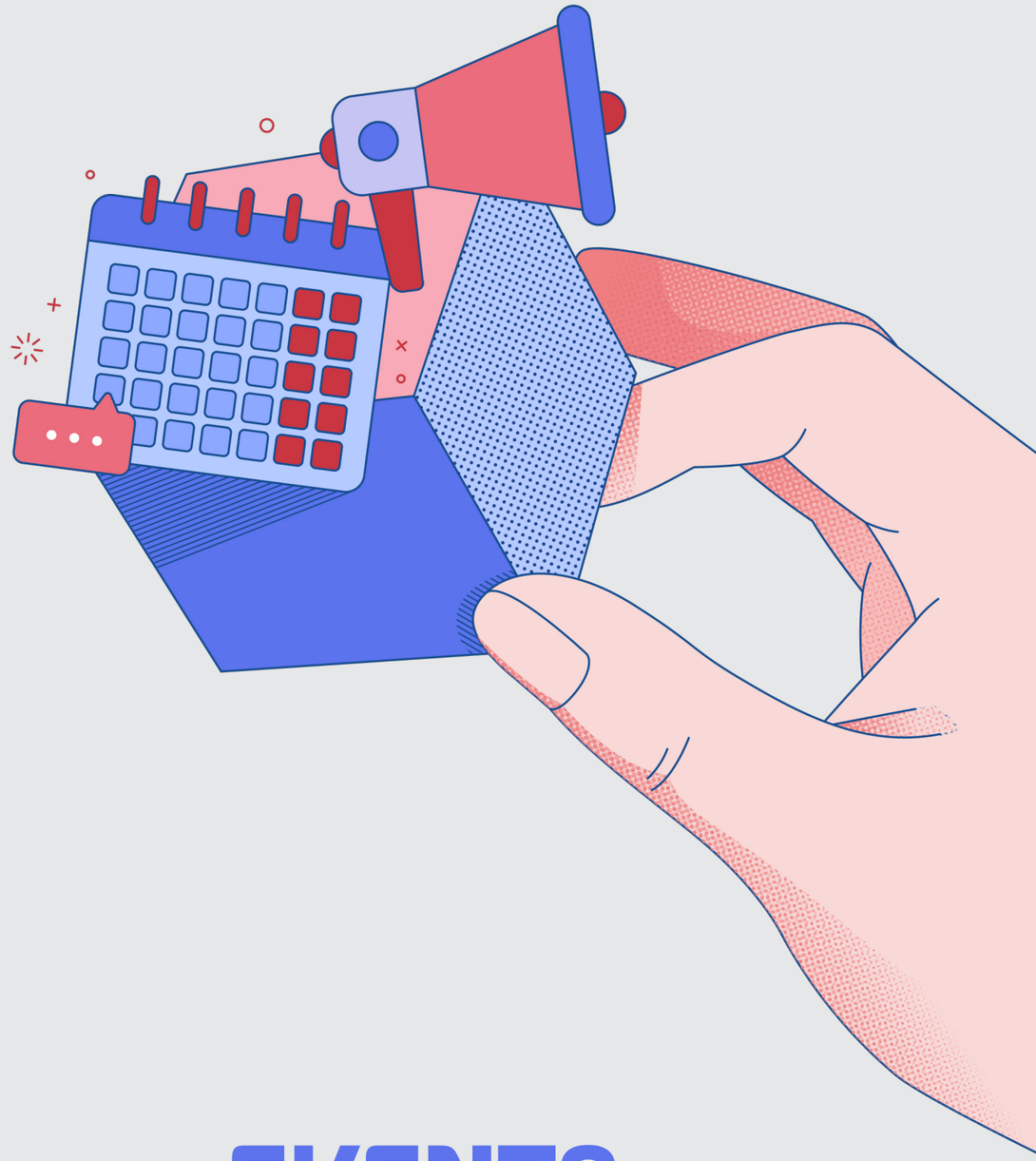
NCO advocates and facilitates competency building among cohorts to enhance the long-term biomedical research ecosystem in Singapore. Its roles and responsibilities are:

Roles	Responsibilities
Ecosystem Facilitator	Connect across cohorts and other stakeholders to build a collaborative ecosystem
Cohort Advocator	Highlight needs of cohorts at the national level
Competency Building	Establish and encourage best practices
Methodological Innovation	Promote development, evaluation, and dissemination of relevant methods
Funding Administrator	Launch grant calls and administer strategic cohorts funding

Trusted Research and Real world-data Utilisation and Sharing Tech (TRUST)

TRUST was set up as a national platform that enables anonymised health-related research and real-world data to be brought together, accessed, and used in an expeditious and secure manner. The platform supports health data analysis and innovation between public institutions, and between the public and private sectors to improve health outcomes.

TRUST is co-developed by the Ministry of Health, Ministry of Digital Development and Information, Government Technology Agency and Synapxe. It aims to enable discoveries that improve lives by making it possible to derive knowledge and insights from complex and diverse health data, and bring together large-scale datasets to address health-related questions that cannot be tackled by individual institutions.



EVENTS

NATIONAL MEDICAL EXCELLENCE AWARDS 2023 AND 2024

The National Medical Excellence Awards (NMEA) recognise the efforts of outstanding clinicians and healthcare professionals who made outstanding contributions in advancing healthcare, improving the standards of patient safety, driving research and education, and developing better health in the community, which ultimately improve people's lives.

The National Community Care Excellence Team Award was introduced in 2024 to recognise teams that have contributed significantly to improving community health and raising awareness of preventive health in the community care setting.

In 2023 and 2024, NMEA recognised 12 individuals and three teams for their outstanding contributions. The Minister for Health, Mr Ong Ye Kung, was the patron who graced the awards ceremony and presented the awards for both years.

The following are the six categories of awards:

- National Outstanding Clinician Award
- National Outstanding Clinician Scientist Award
- National Outstanding Clinician Mentor Award
- National Outstanding Clinician Educator Award
- National Clinical Excellence Team Award
- National Community Care Excellence Team Award (introduced in 2024)

NATIONAL OUTSTANDING CLINICIAN AWARD 2023

PROF WILLIAM HWANG YING KHEE

Chief Executive Officer
National Cancer Centre Singapore

Senior Consultant
Department of Haematology
Singapore General Hospital

Chair, Oncology Academic Clinical Programme
SingHealth Duke-NUS Academic Medical Centre

Prof William Hwang is a locally and internationally recognised expert in haematology, especially in the field of haematopoietic stem cell transplantation (HSCT). Prof Hwang has played key roles in establishing several clinical services, including the Singapore Cord Blood Bank—Singapore's first public cord blood bank—where he was the Founding Medical Director. He also initiated, set up and now leads the SingHealth Duke-NUS Cell Therapy Centre to train, coordinate, and execute various clinical cell therapy activities across SingHealth. To address the growing science of regenerative medicine, he also set up the Regenerative Medicine Institute of Singapore (REMEDIS) as a joint institute of SingHealth Duke-NUS Academic Medical Centre.

Prof Hwang serves in several national roles to help shape healthcare for the benefit of Singaporeans. He is Deputy Chairman of the Ministry of Health (MOH)'s Clinical Services Strategy Committee for Cell Therapy, where he provides leadership for creating a pipeline for cancer therapeutics based on patients' needs. He is also part of the Board Oversight Committee of two entities in MOH Holdings – the Singapore Translational Cancer Consortium, and the Advanced Cell Therapy and Research Institute. As Chairman of the Lien Centre for Palliative Care and Co-Chair of the National Advisory Committee on Cancer Care, he is working to strategise and enhance collaborations, ensuring patients receive holistic support every step of the cancer journey. Prof Hwang has also been involved in the development of various national-level guidelines, regulations, and recommendations as Chair of the Biobanking Advisory, MOH; Co-Chair of the Cell, Tissue and Gene Therapy Regulations workgroup, and Co-Chair of the HSCT Regulations workgroup.

Prof Hwang is internationally recognised as a key opinion leader in HSCT. He was previously elected as President of the World Marrow Donor Association from 2013 to 2015, becoming the first Asian to serve in this role. He was also an Executive Board member of the Asia Pacific Blood and Marrow Transplant Group, and currently serves as both the Global Committee member of the European Blood and Marrow Transplant Group and Regional Vice-President (Asia) of the International Society of Cell and Gene Therapy.

Prof Hwang has published over 140 scientific papers, and conducted clinical trials and laboratory research in haematology. A key opinion leader in haematologic oncology and HSCT, Prof Hwang is regularly sought as an international speaker to share his expertise. He has two patents based on new molecules and cytokines which could be used to treat human diseases—one for growing blood stem cells and another for treating autoimmune diseases.

An advocate for training the next generation of healthcare professionals, Prof Hwang has mentored numerous young doctors, post-doctoral fellows and PhD students. Prof Hwang has received several teaching awards, including Outstanding Faculty for Engagement, Distinguished Faculty, and Outstanding Faculty for his teaching in various modules at Duke-NUS Medical School.

Even with the diverse roles that he holds, service to patients as a clinician remains Prof Hwang's passion. Over the course of his career, he has won several service awards, including the Singapore General Hospital (SGH) Service Quality "Service with a Heart" award, SGH Heart of Gold Award and SGH CEO Service Award for outstanding patient care. He has also been awarded the Singapore Health Quality Service Award (Star and Gold awards) and SingHealth Transplant Most Outstanding Doctor Award.

> **For his dedication to serving his patients, sterling contributions in driving the advancement of haemato-oncology and stem cell transplantation, and steadfast leadership in steering National Cancer Centre Singapore to new heights in clinical service and research excellence.**

NATIONAL OUTSTANDING CLINICIAN AWARD 2023

Prof Tan Huay Cheem is an internationally renowned cardiologist who is well-regarded for his clinical acumen, procedural competence and teaching qualities. His medical career of 35 years in the public sector, includes 18 years in positions of leadership, and is marked by two legacies: service and mentorship.

Prof Tan's lifelong commitment and devotion to patient care brought about revolutionary changes to the cardiology service in Singapore. He was the Founding Director of the National University Heart Centre, Singapore (NUHCS), an established national centre known for its comprehensive clinical services, structured educational programmes, and research innovation. Under his leadership, NUHCS adopted an inter-departmental, barrier-free, and patient-centric approach to provide seamless multidisciplinary clinical care. His push to develop new areas of cardiology care, such as cardiac intensive care, sports cardiology, cardio-oncology, geriatric cardiology, and community cardiology, was visionary. He has taken the cardiology service at NUHCS and in Singapore to its current comprehensive and world-class status.

Prof Tan's most significant contribution has been in the management of patients with heart attacks. He played a vital role in advancing the treatment of patients with ST-segment elevation myocardial infarction (STEMI) at NUHCS by setting up the primary (or emergency) percutaneous coronary intervention service in 1997. This then became a 24/7 service in 2001. He initiated a clinical quality improvement project to reduce door-to-balloon time in 2007, which led to NUHCS being awarded the MOH's National Clinical Excellence Team Award in 2011 and resulted in its adoption as a quality indicator for all other hospitals in Singapore.

In 2017, he conceived the idea of the Western STEMI network where all patients with heart attacks in the western cluster of Singapore will be directed straight to NUHCS via an ambulance, saving time to allow for maximal salvage of damaged heart muscle. In 2018, he also set up the Cardiogenic Shock Centre at NUHCS with its attendant multidisciplinary team capable of treating heart patients in the highest risk group for mortality and morbidity. NUHCS now holds national records for the shortest door-to-balloon time, the highest volume of patients treated annually, and the lowest mortality rate.

Under Prof Tan's leadership, cardiology services at NUHCS continued without disruption to provide COVID-19 patients with emergency angioplasty. This is noteworthy as the provision of hospital services for heart attack patients in many other countries were affected by the COVID-19 pandemic.

As an interventional cardiologist who has performed more than 11,000 procedures, Prof Tan is a key opinion leader in this field and often receives referrals for the most complex cases from his colleagues, both locally and internationally.

Prof Tan has received many accolades in his illustrious career. These include the Chien Foundation Lifetime Achievement Award in 2023, Singapore Cardiac Society Lifetime Achievement Award in 2022, and the Asian Interventional Cardiovascular Therapeutics (India) Golden Lights of Asia Award in 2012, which was awarded to him for elevating Asia to the world map of interventional cardiology. He was also the longest serving President of the Asia-Pacific Society of Interventional Cardiology.

Prof Tan is an excellent mentor who has taught generations of medical students, cardiology trainees and interventional cardiology fellows. He is an active researcher who has published more than 200 papers in international peer-reviewed journals, authored 18 book chapters and is the Founding Editor of the *AsiaIntervention* journal, which is PubMed-listed.

PROF TAN HUAY CHEEM

Senior Consultant Cardiologist and Senior Adviser
National University Heart Centre, Singapore

Professor of Medicine
Yong Loo Lin School of Medicine
National University of Singapore

Chairman
Singapore Heart Foundation

For his excellence in clinical service and outstanding leadership and stewardship in revolutionising the cardiology service in Singapore and elevating it to world-class standards.

NATIONAL OUTSTANDING CLINICIAN SCIENTIST AWARD 2023

A/Prof Mahesh Choolani is a clinician scientist with a long track record in clinical and basic science research. His main research focus is in translational medicine, aimed at developing advanced technology that addresses the unmet need for faster and more accurate diagnostic testing to support precision healthcare for Asian women.

A/Prof Choolani has been actively pursuing technology for the non-invasive isolation of cell-based foetal DNA from maternal blood for prenatal diagnosis of chromosomal abnormality. He introduced and validated non-invasive prenatal testing/screening using cell-free foetal DNA in the plasma fraction of maternal blood. This liquid biopsy assay is an excellent screening tool for three common foetal trisomies (21, 18, 13) and is currently offered to pregnant women in Singapore and the region.

A/Prof Choolani's work has been well-recognised in the field locally, internationally, and by industry partners. Over the years, he has attained more than $20 million in grant funding as Principal Investigator, and more than $15 million in grant funding as Co-Principal Investigator. This funding has translated into more than 220 peer-reviewed publications including in top tier journals such as *The Lancet*, *Nature*, and *Cell*, with over 12,000 citations and a Hirsch index of 59. He has seven patents and six of them are licensed by the industry.

The importance of collaboration between science, medicine, and industry cannot be overstated. Cognisant of this, A/Prof Choolani founded INEX Innovate in 2006, as a women's health diagnostic company offering molecular tests and developing new point-of-care diagnostics in the women's health space. In recognition of INEX Innovate, the Association of Small and Medium Enterprises awarded him the Entrepreneur of the Year 2022 Award for Established Entrepreneur (Overall Winner). This highlights the relationship between Singapore's medical academia and industry, as well as the vital role of the clinician scientist in converting a clinical need to a viable science-based product for both industry and society.

A/Prof Choolani has been actively imparting his knowledge and skills. Over the years, he has introduced many programmes that have fostered closer interactions between clinicians, scientists, and other research professionals. Many of these programmes have led to collaborations, grant-funded projects and publications. He has worked tirelessly to establish a community of clinician scientists beginning with the establishment of the National University of Singapore (NUS) Clinician Scientist Unit in 2006 and continuing with his active involvement in the National University Health System (NUHS) Clinician Scientist Academy. A/Prof Choolani is now serving his second term as President of the College of Clinician Scientists, Academy of Medicine, Singapore.

The most significant recognition of A/Prof Choolani's work is his leadership in various regional and international organisations that focus on foetal diagnosis and therapy. He has held the appointment of Chairman or President in several professional societies, including the Asia-Pacific Conference for Fetal Therapy (2015 to 2016), the International Fetal Medicine and Surgery Society (2018) and the International Fetal Transplantation and Immunology Society (2018). He is currently the President of the International Society for Prenatal Diagnosis (ISPD), and the recently appointed President-at-Large for the International Fetal Medicine and Surgery Society (IFMSS). His goal in these societies is to cultivate a cadre of clinician scientists working in his own field and the broader field of medicine, and to build an ecosystem to drive scientific medicine in Asia.

A/PROF MAHESH CHOOLANI

Associate Professor and Head
Department of Obstetrics and Gynaecology
Yong Loo Lin School of Medicine
National University of Singapore

Head and Senior Consultant
Department of Obstetrics and Gynaecology
National University Hospital

For his immense dedication, passion and unwavering commitment to developing the clinician scientist community in Singapore, and outstanding leadership in revolutionising the obstetrics and gynaecology field.

NATIONAL OUTSTANDING CLINICIAN MENTOR AWARD 2023

Over the past few decades, Adjunct A/Prof Brenda Ang has been synonymous with infectious disease (ID) and infection control in Tan Tock Seng Hospital (TTSH). This award is a recognition of her efforts, having spent the past 30 years developing ID as a specialty in Singapore and advocating a culture of good infection control practices at institutional and individual levels. Through the relentless efforts of A/Prof Ang and her contemporaries, ID and infection prevention and control have become an integral and crucial part of our healthcare services.

From the threat of emerging IDs such as Nipah, Severe Acute Respiratory Syndrome, Chikungunya, H1N1, Middle East Respiratory Syndrome, Ebola, to the most recent COVID-19, A/Prof Ang has weathered different waves of ID outbreaks where her expertise and experience have contributed to their control and mitigation. Her leadership in the planning and implementation of policies relating to pandemic preparedness has also enabled TTSH, National Centre for Infectious Diseases and National Healthcare Group (NHG) to be prepared for unforeseen circumstances, contributing to a safer environment for staff, patients, and visitors alike.

Following her appointment as the Chairman of the TTSH Infection Control Committee in 1996, she has worked on reducing nosocomial infections and multi-drug resistant organisms. In addition to serving as Clinical Director of the Department of Infection Prevention and Control, she sits on multiple committees, including the Steering Committee of Hospital Acquired Infection Elimination Collaborative and the Antimicrobial Stewardship Committee. She also chairs the NHG Infection Control Committee and is a member of MOH's National Infection Prevention and Control Committee (NIPC). She has been instrumental in strengthening the surveillance of infections in the hospital, analysing and understanding reasons for transmission, and developing response measures such as infection control electronic surveillance systems, staff sickness surveillance systems, and real-time location systems.

She also introduced active surveillance for methicillin-resistant *Staphylococcus aureus* (MRSA) in all inpatients at TTSH from 2010. In addition, she initiated the use of rapid polymerase chain reaction testing for patients listed for elective surgery or admitted via the Emergency Department, making TTSH the first hospital to do so. These strategies resulted in improved workflows for staff managing MRSA patients and a reduction in MRSA infection rates. A/Prof Ang has been actively involved in coming up with recommendations to address key questions in preventing nosocomial infections, alongside responding to antimicrobial resistance and emerging infectious diseases.

Her passion has led her to teach ID and create opportunities for learning through the exchange of ideas among members of the local ID community. A/Prof Ang has been a role model and a constant inspiration to younger generations of ID physicians. During her term as a member of the ID Specialist Training Committee from 1998 to 2006, and as Chairman from 2002 to 2006, she worked on developing the curriculum for ID training as well as the conducting of exit examinations, impacting the younger generation of ID physicians trained in Singapore.

Since 2004, A/Prof Ang has been teaching at National University of Singapore as a Senior Clinical Lecturer. She is also currently Adjunct Associate Professor at the Lee Kong Chian School of Medicine and helps mentor trainees as a Visiting Consultant to the Department of Infectious Diseases at Singapore General Hospital.

A/Prof Ang has been recognised with numerous awards for her contributions over the years. She has continuously been a role model, exemplifying strong ethos, values, professional integrity, and conduct. Her distinguished contributions to the medical profession, Singapore's public healthcare sector, and international community, in clinical service, education, and research, have also earned her the title of Emeritus Consultant, Department of Infectious Diseases at TTSH in 2021.

ADJUNCT A/PROF BRENDA ANG SZE PENG

Clinical Director
Department of Infection Prevention and Control
Tan Tock Seng Hospital

Emeritus Consultant
Department of Infectious Diseases
Tan Tock Seng Hospital

Clinical Senior Lecturer
Yong Loo Lin School of Medicine
National University of Singapore

Adjunct Associate Professor
Lee Kong Chian School of Medicine
Nanyang Technological University

> **For her tireless dedication, passion and unwavering commitment towards championing the areas of Infectious Diseases (ID) and Infection Control and nurturing successive generations of ID clinicians.**

NATIONAL OUTSTANDING CLINICIAN MENTOR AWARD 2023

The filmmaker Steven Spielberg once said, "The delicate balance of mentoring someone is not creating them in your own image but giving them the opportunity to create themselves."

That is exactly what Prof Julian Thumboo has been doing and beyond. Besides medical and PhD students, he has supervised and mentored doctors training in Rheumatology and Internal Medicine as well as budding clinician scientists and clinician researchers, among many others.

In particular, Prof Thumboo, who was Head of the Department of Rheumatology & Immunology at Singapore General Hospital (SGH) from 2007 to 2014, has mentored a generation of rheumatologists. Some mentees have become mentors themselves, just as Prof Thumboo was inspired by his own mentors to become one. One such mentee, A/Prof Andrea Low, currently helms the Department of Rheumatology & Immunology at SGH. Others have taken on senior positions in public healthcare institutions or private practice or are making significant contributions in their respective fields of research.

To ensure there are proper structures and environment to facilitate mentoring, Prof Thumboo initiated several programmes at the national and institution levels, such as the SingHealth Nurturing Clinician Researcher Scheme that benefits more than those he mentored personally over the years.

The successes of his mentees are a reflection of Prof Thumboo's passion for guiding individuals to fulfil their greatest potential. He believes that there is no success without a successor, and mentoring juniors helps mentors leave behind a legacy.

One of his mentees, SGH's A/Prof Low Lian Leng, succeeded Prof Thumboo in 2023 as Director of SingHealth's Centre for Population Health Research and Implementation. He is also a recipient of the National Medical Research Council HPHSR* Clinician Scientist Award. A/Prof Low describes Prof Thumboo as a dedicated, nurturing, and gentle mentor who devotes time to developing his mentees. By observing how Prof Thumboo conducted himself as a researcher, how he managed a large research centre, and how he demonstrates collaborative leadership, A/Prof Low has learnt immensely and is now not only an independent researcher, but a clinician leader too.

Prof Thumboo's passion for mentoring has been recognised by the accolades he has received. Some of his recent awards include the National Day Award – Public Administration Medal (Bronze), the SingHealth Excellence Award for Distinguished Mentor, and the Duke-NUS Medical School Master Academic Clinician.

Prof Thumboo is also a keen researcher, having published more than 330 papers in peer-reviewed journals, and receiving several million dollars in individual grant funding. As Research Director, he also helped to secure $20 million in grant funding for SGH, and $21 million for the SingHealth Regional Health System. His research interests are in population health, patient reported outcome measures, systemic lupus erythematosus, and osteoarthritis.

PROF JULIAN THUMBOO

Senior Consultant
Department of Rheumatology and Immunology
Singapore General Hospital

Research Director and Director
Health Services Research Unit
Singapore General Hospital

Advisor
SingHealth Centre for Population Health Research and Implementation

Professor
Office of Clinical and Faculty Affairs and Health Services and Systems Research
Duke-NUS Medical School

Adjunct Professor
Yong Loo Lin School of Medicine
National University of Singapore

> **For his outstanding contributions in guiding and mentoring clinicians and researchers, imparting knowledge, and instilling compassion, commitment, integrity, and a passion to learn.**

* Health Promotion, Preventive Health, Population Health and Health Services Research

NATIONAL OUTSTANDING CLINICIAN EDUCATOR AWARD 2023

A/Prof Nigel Tan is an epilepsy neurologist, whose diverse contributions to medical education have impacted individuals and organisations at the institutional, cluster, national and international levels.

A/Prof Tan is a natural teacher who is known for his infectious enthusiasm and for creating effective learning environments in clinical or classroom settings. His interest in medical education started as a neurology registrar and he continues to teach medical students from all three medical schools in Singapore and residents from SingHealth and National Healthcare Group in the wards and clinics. He has promoted active learning through effective teaching methods, fair assessment, and by providing actionable feedback.

A/Prof Tan was appointed Education Director of the National Neuroscience Institute (NNI) from 2011 to 2018. Recognising the need for formal training of education leaders, he led by example and graduated with a Master of Health Professions Education in 2013. A/Prof Tan has consistently applied his educational training to creating education programmes, strengthening education systems to improve quality, and developing educators across all health professions. He also continues to mentor junior educators.

As Group Director of Education (Undergraduate) for SingHealth since 2018, A/Prof Tan led an interprofessional committee to conceptualise the Educator Development Framework. This interprofessional framework provides guidance for all healthcare educators across the SingHealth Duke-NUS Academic Medical Centre (AMC) to grow and develop as educators, specifying roles, competencies and development opportunities. He also co-developed a Certificate in Technology-Enhanced Learning in 2021 with Prof Fernando Bello from Duke-NUS Medical School for SingHealth Duke-NUS AMC. Such learning became important during the COVID-19 pandemic as a means of quickly upskilling faculty in technology-enhanced learning.

At the national level, A/Prof Tan served on the Neurology Residency Advisory Committee (RAC) from 2013 to 2018. As RAC Examination Chair, he initiated and led an evidence-based overhaul of the national Neurology Exit Examination, successfully implementing a new examination format in 2015.

With the introduction of Entrustable Professional Activities (EPA) by the MOH in 2018, A/Prof Tan led a national workgroup that successfully designed, piloted, and implemented neurology EPAs for neurology senior residencies in Singapore. These initiatives required significant education and change management expertise, a testament to A/Prof Tan's knowledge and leadership skills.

Internationally, A/Prof Tan co-leads the Genetic Literacy Taskforce of the International League Against Epilepsy (ILAE), which is the global organisation for epilepsy neurologists. He conceptualised the ILAE Genetic Literacy Series, aimed at educating fellow neurologists about epilepsy genetics, using evidence-based techniques to enhance learning. By coordinating content and writing with international teams of authors, his efforts have led to nine publications in the series that have been well-received, with international readership and global impact.

As a believer of a scholarly approach to education, A/Prof Tan has 22 education publications, focusing on assessment, clinical reasoning, interprofessional education, and collaboration. These publications were co-authored with broad groups of authors across the three healthcare clusters, MOH, the three medical schools, and with international co-authors, attesting to his ability to collaborate with diverse groups in the pursuit of education scholarship. He has also received four awards for his education research, as well as awards locally and internationally for his teaching.

A/Prof Tan is also a respected clinician and epilepsy neurologist, who remains actively involved in the care of epilepsy and neurology patients. He has served on the council of the Singapore Medical Association and continues to serve on committees of the ILAE to advance patient care. He continues to actively publish as a clinician, with an additional 42 neurology or medicine biomedical research publications.

For his tireless dedication and leadership in advancing the education and training of clinicians in Singapore and internationally.

A/PROF NIGEL TAN CHOON KIAT

Senior Consultant
Department of Neurology
National Neuroscience Institute

Group Director Education (Undergraduate)
SingHealth

Associate Dean
MD Programme
Duke-NUS Medical School

NATIONAL CLINICAL EXCELLENCE TEAM AWARD 2023

THE EAGLEcare PROGRAMME

The Enhancing Advance Care Planning, Geriatric care and End-of-Life care in Nursing Homes in the East (EAGLEcare) programme by Changi General Hospital (CGH) was established in 2015 to provide coordinated health and social support for residents in nursing homes through a collaborative model of care delivery and training. Its goal was to ensure that nursing home residents may receive the care that matters most to them and their families towards their end of life.

The EAGLEcare programme trains nursing home staff to provide quality geriatric and end-of-life care to their residents in partnership with acute and community hospitals as well as General Practitioners (GPs). More than 460 staff have been equipped with Advance Care Planning (ACP) facilitation as well as geriatric and end-of-life skills, guided by customised care paths to respond to common geriatric and end-of-life conditions. These activities are complemented by bedside teaching and case discussions at regular multidisciplinary meetings with the EAGLEcare team.

With strengthened knowledge and professional care capabilities, nursing home staff engage residents and their caretakers on ACP conversations throughout their care journey. Such conversations can be difficult and emotional but are important in explaining the underlying disease processes and clarifying goals, priorities, and preferences. Staff are also able to regularly and systematically identify and manage EOL residents through a digital screening assessment tool developed by the EAGLEcare team. Suitable residents who express a preference for comfort measures or limited interventions in their Preferred Plan of Care (PPC) are enrolled into the EAGLEcare programme.

Enrolled residents are cared for by their regular GPs and a core EAGLEcare team, comprising physicians and community nurses from CGH who are trained in geriatric and palliative care. They are complemented by clinical support from St. Andrew's Community Hospital (SACH), which also provides the Violet Programme on-call palliative team service after office hours. This collaborative and synergised model of care delivery provides residents with access to 24/7 clinical care and establishes regular psychosocial support in identifying and managing symptomatic care of residents at the end of life. This builds confidence and enables a mindset shift for nursing home staff, residents and their families, emphasising that quality palliative care can also be received in the homes.

The programme's effectiveness is anchored on the close partnerships between the CGH EAGLEcare team, SACH, GPs, and nursing home staff, as they co-manage residents according to their PPC wishes. To date, approximately 1,500 nursing home residents have been screened by the EAGLEcare-trained staff, and more than 500 residents have been identified and enrolled into the EAGLEcare programme to receive end-of-life care, support, and resources such as ACP and tele-geriatric consultations. From 2019 to 2021, the nursing homes saw a reduction in hospital admissions among their residents, including Emergency Department admissions, inpatient admissions, and Specialist Outpatient Clinic visits, as well as shorter hospital stays.

The decrease in avoidable hospital admissions also improved residents' quality of life at the end of life by allowing them to be comfortably cared for at the homes. From 2020 to 2022, the EAGLEcare programme honoured 99% of enrolled residents' wishes in terms of treatment preferences, and 91% in terms of preferred place of death, at nursing homes.

Two other nursing homes—Lions Home for the Elders (Bedok) and Apex Harmony Lodge—have come onboard the programme, with plans to reach out to 12 more nursing homes in the East. The EAGLEcare programme has also been identified for implementation across SingHealth institutions such as Singapore General Hospital and Sengkang General Hospital.

For their outstanding commitment in establishing a collaborative model of care with nursing home partners to enable meaningful and quality care to nursing home residents and their families towards their end of life.

CLINICAL ASST PROF CHRISTOPHER LIEN TSUNG CHIEN

Senior Consultant
Department of Geriatric Medicine
Changi General Hospital

Director
Community Geriatrics
Changi General Hospital

Programme Director
The EAGLEcare Programme
Changi General Hospital

MS YEE KAI YING

Executive
Intermediate and Long-Term Care Integration
Changi General Hospital

DR SHAUN GERALD NATHAN

Senior Resident Physician
Medical Services
St. Andrew's Community Hospital

MS JESSLYN ANG LAY TENG

Senior Staff Nurse
Community Nursing
Changi General Hospital

NATIONAL OUTSTANDING CLINICIAN AWARD 2024

Prof Tan Ban Hock always puts his patients first. He is a leader in infectious diseases (ID) and a champion for patient safety at Singapore General Hospital (SGH).

He began his career as one of two ID physicians in the hospital. Prof Tan built and developed the ID department, which now runs a Transplant ID (TID) service, the Outpatient Parenteral Antibiotic Clinic, a Travel and Vaccination Clinic, and the Antibiotic Stewardship programme, in addition to providing regular inpatient and outpatient care. The department is actively involved in epidemic preparedness, oversees the isolation ward, and is increasingly recognised for its research. Prof Tan collaborates closely with microbiologists in the hospital in clinical ID, which has significantly shaped the practice in SGH and beyond.

Over the years, he recruited and nurtured successive cohorts of ID specialists who are now prominent physicians in both public and private institutions.

With his special interest in caring for immunocompromised patients, Prof Tan's efforts entrenched TID as a quaternary service in SGH. He has been a local pioneer in this field, closely involved in the writing and the revision of many ID protocols in various transplant programmes in SGH. The TID team attracts doctors beyond SGH, including those from several Asian countries. He has been widely recognised for his efforts in TID, serving as President of the TID section of The Transplantation Society from 2021 to 2023. He also branched into medical mycology, and was Co-Chair of the Asia Fungal Working Group (AFWG) from 2008 to 2018.

Prof Tan's foresight in developing epidemic preparedness enabled SGH to respond nimbly to international outbreaks, such as during the MERS, H7N9, and Ebola events. In the early days of the COVID-19 pandemic, he conceived and successfully championed the concept of the Acute Respiratory Infections wards to segregate patients with suspicious symptoms outside the official definitions of a suspected case.

As Chief Quality Officer of SGH, Prof Tan was committed to infection prevention and patient safety, introducing innovations and changes to the existing structures to enhance governance. He brought about several changes to the way Root Cause Analysis (RCA) was conducted, and introduced the concept of thematic RCA, where events were clustered and reviewed collectively. This approach allows for a broader perspective to emerge, thus allowing for impactful change. As a practising clinician, he connects easily with ground staff, personally reinforcing attention to safe practices.

Knowing intuitively that research would elevate the department, Prof Tan sent his first two Registrars on research fellowships abroad. He supported his doctors pursuing research careers. The result is an outstanding research team in the ID Department, which collaborated with Duke-NUS Medical School to form the Viral Research and Experimental Medicine Centre.

Prof Tan is also committed to teaching and training. He has won numerous Best Teacher/Best Faculty awards and is a regular speaker at local and international conferences. Working with the Australasian Society for Infectious Diseases through the AFWG, he jointly started the Fungal Frontiers webinar series, bringing mycology education to the region.

Above all, Prof Tan remains a clinician at heart. He continues to be respected for his bedside skills and is regularly consulted on difficult clinical cases in and beyond SGH. He practises holistically, giving his best to patient care. In recognition of his skills and efforts, he was awarded the top-tier Superstar award at the SingHealth Service Quality Awards 2013, conferred Master Physician (Internal Medicine) in 2017, and was the youngest inductee of the inaugural Duke-NUS Hall of Master Academic Clinicians in 2021. His unwavering dedication to patient care and his significant impact on the ID landscape make him a true clinician leader.

> **For his dedication to patient care and his outstanding contributions to elevating the infectious diseases service in Singapore General Hospital to world-class standards.**

PROF TAN BAN HOCK

Chief Quality Officer
Singapore General Hospital

Senior Consultant
Department of Infectious Diseases
Singapore General Hospital

Physician Faculty
SingHealth Internal Medicine and SingHealth Infectious Diseases Senior Residency Programme

Clinical Professor
Duke-NUS Medical School

Clinical Senior Lecturer
Yong Loo Lin School of Medicine
National University of Singapore

NATIONAL OUTSTANDING CLINICIAN SCIENTIST AWARD 2024

Prof Jerry Chan Kok Yen is a clinician scientist in obstetrics and gynaecology. His expertise lies in unravelling the scientific mysteries of diseases as well as developing and implementing treatments in the realm of maternal and child health.

Prof Chan's notable contributions include research on foetal stem cells and gene therapies targeting inherited diseases, breakthroughs in foetal immunology, advances in preconception health, and pioneering contributions in reproductive medicine.

Foetal stem cell/gene therapy can be an effective cure for inherited diseases that cause irreversible damage to the baby before birth. Prof Chan and an international team performed a foetal stem cell transplant to cure a baby of brittle bone disease, a genetic disease that causes stunted growth and repeated painful fracturing. Together with other scientists, he also discovered that Gaucher disease, a neurodegenerative disease, can be prevented with foetal gene therapy. He is now pushing the boundaries of medical science by experimenting with nanoparticles to deliver gene editing therapies for a range of inherited genetic diseases.

Additionally, Prof Chan is part of a team of local and international scientists who have advanced the understanding of the developing foetal immune system. Some of their discoveries include the early development of foetal immunity from the second trimester, the molecular basis for maternal-foetal transmission of allergies, the early foetus' response to bacteria, and the liver cancer cells' ability to mimic foetal-like cells to evade immune rejection. These findings have enabled global scientists and researchers to understand the optimal window for foetal intervention to achieve the best treatment outcomes.

As the Director of the SingHealth Duke-NUS Maternal and Child Health Research Institute, Prof Chan champions a life-course approach towards better population health. He leads his teams to identify the best opportunities to prevent and control diseases at key stages of life, from preconception through pregnancy, infancy, childhood, and adolescence to adulthood. This strategy aims to transform population health, by setting a strong foundation at the preconception stage for a healthy pregnancy, to give the baby the best start in life. One of his main programmes is HELMS (Healthy Early Life Moments in Singapore), an interventional study designed to improve the health of women who are planning pregnancies.

Prof Chan's interest in addressing the global decline in fertility rates has led him to pioneer numerous advances in the field. This includes using letrozole, traditionally used to treat breast cancer, and oligozoospermia (low sperm count) as an alternative to *in vitro* fertilisation (IVF). He has also led the development of a device to automate IVF laboratory processes.

Drawing on an outstanding track record of leading and contributing to impactful research projects, Prof Chan has secured over $100 million in research funding, including $6 million in 2023 under the Singapore Translational Research Investigator Award, NMRC's pinnacle talent award for clinician scientists. His extensive publication record comprises over 300 articles in peer-reviewed journals, many of which are globally renowned high-impact factor publications including *Cell* and *Nature*. Additionally, he is recognised globally as one of the world's Highly Cited Researchers by the Institute for Scientific Information at Clarivate.

To build a robust community of clinician scientists and investigators dedicated to driving innovation and translational cures in healthcare, Prof Chan mentors and supervises numerous researchers, many of whom have gone on to make significant contributions in their respective fields. He was also the most recent past president of the Singapore Obstetrics and Gynaecology Network which promotes synergy and high-quality translational research among public maternity hospitals.

> **For his innovative discoveries and translational research, and dedication in transforming the maternal and child health research community in Singapore and globally.**

PROF JERRY CHAN KOK YEN

Senior Consultant
Department of Reproductive Medicine
KK Women's and Children's Hospital

Director
KK Research Centre
KK Women's and Children's Hospital

Vice Chair (Research)
SingHealth Duke-NUS Obstetrics and Gynaecology Academic Clinical Programme

Director
SingHealth Duke-NUS Maternal and Child Health Research Institute

NATIONAL OUTSTANDING CLINICIAN SCIENTIST AWARD 2024

Prof Jodhbir Mehta is a highly accomplished clinician scientist who has made significant contributions on both global and regional levels. Clinically, he is one of the world's leading specialists on corneal diseases and refractive surgical procedures, while academically he has demonstrated a remarkable track record in publications and securing competitive research grant funding. His research interests span across all aspects of corneal external disease and refractive surgery, with corneal transplantation research as the key focus.

He currently holds multiple leadership positions with the SingHealth Duke-NUS Academic Medical Centre. He is the Deputy Chief Executive Officer (Research) for the Singapore National Eye Centre (SNEC), the Executive Director of the Singapore Eye Research Institute (SERI) and co-heads its Regenerative Therapy Research Group. He also serves as Senior Consultant and was the former Head of the Corneal and External Eye Disease Department at SNEC. Additionally, he is a tenured Distinguished Professor at the Duke-NUS Medical School.

Directing a strong multi-disciplinary team and partnering with a wide network of collaborators, Prof Mehta has driven various research projects to success, including the development of new instruments for keyhole corneal transplantation, artificial corneal devices, lenticule implantation for stromal enhancement, sustained drug delivery devices for allergic eye diseases, and new laser procedures for the cornea and ocular surface.

Prof Mehta exhibits a prolific publication record, with over 520 peer-reviewed papers in acclaimed international journals. He has also authored over 24 book chapters. He has a Hirsh index of 73 with over 20,500 citations and has published in top journals such as *The New England Journal of Medicine*, and *The Lancet*, as well as high impact eye journals such as *Progress in Retinal and Eye Research*, and *Ophthalmology*. He has filed 24 patents from his research work, of which six have been commercialised and licensed to companies. These include an antibody to identify corneal endothelial cells, a nanoparticle coating for artificial cornea device, and a liposome delivery system for sustained delivery of tacrolimus.

As a leader of one of the top research programmes at SERI, he has received several competitive research grants, achieving over $15 million as Principal Investigator. He is also the recipient of the NMRC Clinician Scientist Award for Senior Investigators. As a further reflection of his high standing in the global ophthalmology community, he is currently ranked first in the world for expertise in Cornea and second for Refractive Surgery by Expertscape for the last five years. He has delivered over 350 invited lectures and 19 named lectures and also serves on the editorial boards of several ophthalmic and visual sciences journals.

Beyond research, Prof Mehta is a committed educator. Apart from lecturing and teaching various local and international courses, he also supervises and mentors junior clinicians, fellows, researchers and undergraduate students. Several of his mentees have received NMRC awards like the Transition Award, Clinician Scientist Award, and New Investigator Grant. They have also gone on to hold leadership roles in cornea departments and the Singapore Eye Bank.

Prof Mehta has received many international awards for the excellent contributions and achievements from his research, clinical and educational endeavours. Some of his accolades include the Nakajima Award (Asia Pacific Academy for Ophthalmology, 2013), Doug Coster Lecture (Australia and New Zealand Cornea Society, 2018), Charles Tilett Lecture (Fuchs Society, USA, 2020), Charles McGhee Medal (British Society for Refractive Surgery, Oxford, UK, 2023), Senior Achievement Award (Asia-Pacific Academy of Ophthalmology, 2023), and the ACE Award (Asia-Pacific Association of Cataract and Refractive Surgeons, 2023). He is also the current Vice-President of the US Corneal Society.

For his remarkable contributions to global ophthalmology, and unwavering dedication to research and innovation and leading the next generation of ophthalmic professionals.

PROF JODHBIR SINGH MEHTA

Deputy Chief Executive Officer (Research) and Senior Consultant
Singapore National Eye Centre

Executive Director
Singapore Eye Research Institute

Academic Vice-Chair (Research)
SingHealth Duke-NUS Ophthalmology & Visual Sciences
Academic Clinical Programme

NATIONAL OUTSTANDING CLINICIAN MENTOR AWARD 2024

In a career spanning more than three decades, Prof Tan Suat Hoon has consistently demonstrated excellence in clinical practice, a deep commitment to mentoring the next generation of clinician leaders and championing research to advance the dermatology specialty.

Widely recognised as a pioneer and expert in establishing the subspecialty of dermatopathology and developing the training programme for it in the National Skin Centre (NSC), Prof Tan grew the unit to a team of five highly trained dermatopathologists, raising Singapore's international standing in this field and attracting numerous visiting fellows from the region to undertake training programmes and fellowships in dermatopathology. Prof Tan also guided and nurtured clinicians in NSC's cutaneous lymphoma unit, a subspecialty she spearheaded, enabling them to run the clinic independently. Her approach to mentorship is characterised by a deep personal investment in her mentees' success, providing them with not only clinical and research guidance but also career and personal development support. Several of these clinicians have contributed to impactful translational research and become respected names in areas including photobiology, epidemiology, health utilities and health services research, and atopic dermatitis. They have described Prof Tan as an inspiring role model who embodies the highest standards of professionalism, empathy and dedication.

Prof Tan was instrumental in advising and identifying key problems in research, and unmet clinical needs. She played a pivotal role in nurturing clinician scientists by ring-fencing institutional reserves to provide salary and administrative support, ensuring protected time for budding clinician scientists to do research. These clinician scientists would go on to secure competitive NMRC grants, including nearly $10 million through the Open Fund-Large Collaborative Grant awarded in 2023. Under her leadership, four NSC clinician scientists clinched NMRC talent awards, including Clinician Scientist Award and Transition Award.

Today, in addition to her clinical work, Prof Tan regularly teaches at Continuing Medical Education rounds and is consulted on complex cases for dermatopathology and lymphoma diagnosis and management. She has worked with and guided senior residents and subspecialty teams to formulate management guidelines for evidence-based treatment, contextualised to local needs and cost effectiveness.

During her tenure as Director of NSC, Prof Tan established the Skin Research Clinic, offering a dedicated space for patient-involved research and trials. She led major accessibility enhancements including provisions for elderly patients and persons with disability, earning NSC the Universal Design Mark (Gold Award) from the Building and Construction Authority. Under her leadership, NSC became a reputable dermatology centre in Singapore and the region, offering comprehensive range of subspecialty services and serving about 70% of dermatology outpatient attendance among public healthcare institutions in Singapore.

Prof Tan's influence reaches beyond NSC. Through the Health Manpower Development Plan, she enabled dermatologists to train in reputable overseas dermatology centres to build up local capabilities. She also hosted various experts under the HMDP visiting expert scheme to enable sharing of best global practices. Recognised for advancing the subspecialty regionally, she was elected President of the Asian Society of Dermatopathology for 2023–2025. Nationally, she has chaired the Residency Advisory Committee in Dermatology since 2015, shaping the development of future specialists. As a member of the Steering Committee for the Skin Research Institute of Singapore since its inception in 2015, she played a pivotal role in defining strategic priorities and launching key initiatives. Her contributions also extended to global platforms—she served as Vice President of the National Organising Committee for the World Congress of Dermatology 2023, which successfully drew over 12,000 delegates to Singapore.

For her outstanding mentorship and judicious leadership in developing a pipeline of competent clinicians and leading scientists, and elevating the dermatology specialty in Singapore and beyond.

PROF TAN SUAT HOON

Senior Consultant
National Skin Centre

Adjunct Professor
Lee Kong Chian School of Medicine
Nanyang Technological University

Clinical Associate Professor
Yong Loo Lin School of Medicine
National University of Singapore

Adjunct Associate Professor
Duke-NUS Medical School

NATIONAL OUTSTANDING CLINICIAN EDUCATOR AWARD 2024

Since graduating NUS Medicine in 1994 and attaining membership of the Royal College of Physicians (UK) in 1999, A/Prof Gerald Chua Seng Wee has taught numerous cohorts of medical students and doctors in training in internal medicine, respiratory medicine, and intensive care medicine.

Starting in 2000 as a registrar in National University Hospital (NUH), he pioneered—together with his consultants—the use of medical simulation for teaching Crisis Resource Management to multi-professional clinical teams. Over the years, these workshops have been honed and expanded regionally to healthcare professionals and trainers in Malaysia, Thailand, India, Sri Lanka and China.

In his roles as Residency Associate Designated Institutional Official of National University Health System, Associate Dean and Education Director of Alexandra Hospital (AH), Vice Chairman Medical Board, Clinical Education, and as Chairman, Medical Board of Ng Teng Fong General Hospital (NTFGH), he oversaw the establishment and expansion of undergraduate and postgraduate medical training in AH, NTFGH and Jurong Community Hospital from 2010 to 2024.

For doctors, nurses and allied health professionals at JurongHealth Campus, he envisioned and implemented training programmes in high-stakes clinical interactions – in partnership with EffectiveArts (USA), and human factors for healthcare professionals—in partnership with MedLed (UK).

A/Prof Chua was part of the teaching faculty and then was Executive Director at the Singapore Medical Association (SMA) Centre for Medical Ethics & Professionalism from 2008 to 2019. Over the span of 12 years, he contributed significantly to the centre's development and delivery of programmes and workshops on medical professionalism, health laws and clinical ethics. In recognition of these contributions, he received the SMA Merit Award in 2021.

He has been directly involved in Intensive Care Medicine (ICM) training in Singapore since 2009, first as a member, then as the chair of the ICM Sub-Specialty Training Committee (SSTC). He was part of the team that oversaw the inception of ICM as a Specialists Accreditation Board (SAB)-accredited sub-speciality and then the development from scratch of a local training and assessment framework. Today, the ICM SSTC sustains a robust high-quality training pipeline that serves the needs of all public health institutions in Singapore.

A/Prof Chua has represented the NUS Division of Graduate Medical Studies on the MRCP(UK) Part 1 Examination Board since 2015. On the board, he ensures the examination's high standards of quality and relevance to clinical practice for candidates worldwide are upheld.

A/Prof Chua's personal and collective contributions to medical education, training and ethics have profoundly impacted healthcare professionals and institutions locally and internationally. We honour his exemplary service and commitment to advancing the field of medicine.

For his visionary leadership, unwavering dedication, and exceptional mentorship in internal medicine, respiratory medicine and intensive care medicine, and his pivotal role in the teaching of clinical crisis resource management and high-stakes clinical interactions for healthcare professionals.

A/PROF GERALD CHUA SENG WEE

Senior Consultant
Division of Respiratory Medicine, Department of Medicine
Ng Teng Fong General Hospital

Clinical Associate Professor
Department of Medicine
Yong Loo Lin School of Medicine
National University of Singapore

NATIONAL OUTSTANDING CLINICIAN EDUCATOR AWARD 2024

Adjunct Prof Lau Tang Ching has been a dedicated leader and educator in the field of healthcare, particularly in the areas of medical education, continuous education and training, learner wellbeing, quality improvement, patient safety, and technology-enabled healthcare education. Throughout his career, he has held various leadership roles across multiple levels both locally and internationally, demonstrating a commitment to developing strategies to enhance clinical training and patient care.

In the realm of postgraduate and continuous education, Adjunct Prof Lau has played a pivotal role in establishing the Centre for Medical Excellence (CoME) under the National University Health System (NUHS) Academy. CoME focuses on equipping healthcare staff with future-ready skills through educational programmes covering data and digital literacy, quality improvement, behavioural and implementation science, and nurturing junior staff. Notably, he guided the development of the "Starting on the Right Foot" course to aid junior doctors in transitioning to hospital life.

In the undergraduate domain, Adjunct Prof Lau spearheaded the development of an enhanced Bachelor of Medicine, Bachelor of Surgery (MBBS) curriculum, focusing on producing community-minded and humanistic physicians. Adjunct Prof Lau collaborated with other academic entities to continuously promote interdisciplinary and interprofessional education, leading to the successful implementation of the NUS Common Curriculum for Healthcare Professional Education and the introduction of two new minor programmes, one in biomedical informatics and another in integrated health, preparing learners for AI-driven digital medicine and interdisciplinary health efforts.

Recognising the role of technology in education, Adjunct Prof Lau advocates for its increased use. He supported the establishment of the Medical Education Technology and Enterprise Committee, promoting technology-enabled learning through virtual reality, augmented reality, and gamification. His leadership facilitated the adoption of online and technology-enabled learning during the COVID-19 pandemic.

Adjunct Prof Lau emphasises a holistic approach to clinician training, incorporating not only knowledge acquisition but also the cultivation of personal and professional values. He advocates for experiential learning and has actively participated in team activities to foster values-based education. His leadership extends to overseeing the NUHS Residency Programme and establishing new education programmes, such as the Medical Education Distinction Track in Residency. Cultivating a community of educators is another facet of Adjunct Prof Lau's work. He actively engages in medical education enhancement efforts, supports faculty development, and fosters collaboration across institutions. His efforts include establishing the NUHS Education Office to strengthen ties and improve pedagogy and curriculum design.

Adjunct Prof Lau's contributions were acknowledged through various awards and recognition on both institutional and national levels. His leadership in clinical practice and education has garnered accolades such as the NUS Teaching Excellence Awards, NUHS Teaching Excellence Award, and Public Healthcare Clinician Special Recognition Award. The NUS Yong Loo Lin School of Medicine, under Adjunct Prof Lau's strategic leadership, became the first local medical school to achieve national accreditation by the MOH-appointed external review team in October 2023. This accreditation affirms the quality of medical education at the institution, with the new curriculum being a highlighted strength.

Adjunct Prof Lau's achievements as a rheumatologist stand out, particularly in improving the care of osteoporosis patients through fracture liaison programmes and research. He has actively contributed to clinical practice guidelines, chaired committees, and played a pivotal role in patient advocacy through organisations like the National Arthritis Foundation.

For his multifaceted contributions to healthcare education, continuous learning and patient care, and a comprehensive and impactful career dedicated to shaping the future of healthcare professionals and inspiring health for all.

ADJUNCT PROF LAU TANG CHING

Senior Consultant
Division of Rheumatology
Department of Medicine
National University Hospital

Adjunct Professor
Department of Medicine
Yong Loo Lin School of Medicine
National University of Singapore

Vice-Dean (Education)
Yong Loo Lin School of Medicine
National University of Singapore

Group Director
Education Office
National University Health System

NATIONAL CLINICAL EXCELLENCE TEAM AWARD 2024

Neighbours for Active Living Programme

With a visionary concept focus on community activation and place-based population care, Changi General Hospital (CGH) pioneered the Neighbours for Active Living Programme (Neighbours) in 2013, in collaboration with the South East Community Development Council (SECDC). The programme aims to care for the community and address the socio-determinants of health by empowering seniors to get well, keep well and age well in the community, while fostering supportive relationships within communities. Through an innovative and integrated health and social model, Neighbours continues to play an instrumental role today in meeting the evolving healthcare needs of the population and fulfilling the roles required for holistic care.

An early champion of preventive care with a strong foundation in healthcare delivery in the community, CGH identified the need for continual care and support for an increasing number of seniors who lack adequate support to care for themselves or who live alone. Social isolation and loneliness are associated with higher risks for health problems, making this support critical. A holistic person-centred approach was developed by the CGH Neighbours Community Care Team to ensure that seniors with complex health-social needs continue to receive timely care after their discharge from the hospital.

The CGH Neighbours Community Care Team has conducted more than 100,000 care calls and home visits to assess seniors' medical conditions and formulate care plans to support seniors in addressing long-term social and health care needs. They also built an extensive community network of care support with national agencies, health and social care providers, and grassroots and faith-based organisations.

The programme leverages the close-knit ties of volunteers and neighbours to provide companionship and social support to vulnerable seniors while looking out for their wellbeing, thereby forging meaningful relationships that enrich everyone's lives. The volunteers also alert the Neighbours Community Care Team of anomalies that may require medical attention and interventions. For some of these patients, the volunteers provided essential support during the final stage of care, helping to reduce hospital readmission patterns and encouraging them to stay healthy in their own community.

Over the past decade, Neighbours has provided place-based care and personalised support to over 14,000 residents spanning 18 communities in the eastern part of Singapore. Working in collaboration with over 70 community partners, the programme has significantly improved health outcomes and reduced hospital readmissions for seniors. Under the Neighbours Friend-A-Senior @ South East programme, over 900 volunteers have been trained and matched with seniors by the CGH Neighbours Community Care Team and SECDC, with 26,000 hours of volunteer hours put in to date.

The programme's success led to its adoption by the National Healthcare Group (NHG) in 2016, with training provided by the Neighbours Community Care Team. To better assist patients with health and social needs, Neighbours collaborated with SingHealth Polyclinics to pilot the Primary Care-Based Integrated Care Team (PACE-IT) programme at Marine Parade Polyclinic and teamed up with two Active Ageing Centres on Assisted-Living pilot projects to help residents age-in-place.

With the launch of Healthier SG in 2023, Neighbours seamlessly transitioned to a data-driven, place-based, population health approach, with its community care team members taking on the role of Wellbeing Coordinators to manage the care of the population in the east. The Neighbours team continues to be the anchor in the community, with community nurses, primary care doctors and partners connected in one health ecosystem coordinating care and supporting patients at home and in the community. By understanding the resources available, these place-based care teams can then identify emerging needs and gaps while strengthening the social fabric of the community.

For their outstanding dedication and innovation in transforming care delivery through integrating health and social care, empowering communities, and improving the quality of life of seniors in Eastern Singapore.

MS SHIRLYN SU CHANG
Assistant Director
Department of Health and Social Integration
Changi General Hospital

MS CHERYL LAU MAY LING
Senior Manager
Department of Health and Social Integration
Changi General Hospital

DR LOW SHOU LIN
Senior Consultant
Department of Geriatric Medicine
Changi General Hospital

MR ROY CHEW PEI WEI
General Manager
South East Community Development Council

NATIONAL COMMUNITY CARE EXCELLENCE TEAM AWARD 2024

Social Prescribing Programme

Social prescribing is a novel approach to healthcare that aims to improve health outcomes by supplementing biomedical clinical prescriptions with tailored social prescriptions for patients. To effectively address the complex needs of Singapore's ageing population, SingHealth Community Hospitals (SCH) has been adapting the practice of social prescribing since 2019 for patients across its community hospitals.

Wellbeing coordinators at SCH—the integral non-clinical workforce behind social prescribing—will conduct assessments to screen patients for social determinants of health upon admission. Based on these assessments, they formulate social prescriptions to be included into their care plans. To date, more than 3,000 patients have been screened, with suitable patients successfully linked to activities, resources, and interest groups aimed at improving their overall wellbeing.

Capability building has also been established as a critical component of overall sustainability of social prescribing. In November 2022, the SCH Office of Learning (SCHOOL) was launched to develop competencies and integrate health and social care across the ecosystem. A few notable programmes under SCHOOL include the SGUnited Skills course in Health and Social Care Coordination which trained over 40 Singaporeans for the health and social sectors, with at least a quarter now deployed into health and social sectors; the WSQ-accredited course "Implementing Interventions in Health and Social Care" which has completed five runs; and the "Introduction to Social Connector for Social and Lifestyle Interventions" course which aims to train all 900 employees of Active Ageing Centres in social prescribing skills. Building capabilities in social prescribing was not limited to just the non-clinical workforce. In 2022, SCH partnered Duke-NUS Medical School to formally integrate social prescribing early into its medical curriculum for Year 1 students. This initiative aims to instil in medical students an understanding that social determinants are key drivers of patients' health outcomes.

To further advocate and share best social prescribing practices among the local health and social sectors, the team organised the first Asia Pacific Social Prescribing Conference in 2022, which was attended by more than 1,000 participants, including international participants from Australia, Canada, Japan and the United Kingdom (UK). The second edition of the conference will take place in November 2024. SCH has received international recognition for its efforts in social prescribing. The World Health Organization (WHO) has offered collaboration platforms to SCH to share its social prescribing practices, such as speaking at WHO webinars, inclusion of the team as co-developers in the WHO Social Prescribing Toolkit, and the co-development of an online course in social prescribing in WHO's Massive Open Online Course platform, OpenWHO. On the research front, collaborations were initiated to document and share SCH's implementation of social prescribing in peer-reviewed journals, including *The Lancet Regional Health* and *The British Medical Journal*.

Social prescribing has been steadily gaining traction in Singapore. Healthcare institutions across SingHealth are recruiting wellbeing coordinators and rolling out social prescribing to meet individuals' holistic needs. In 2023, SCH launched the Singapore Community of Practice in Social Prescribing platform to foster a dynamic and collaborative ecosystem to advance the understanding, implementation, and impact of social prescribing interventions and has nearly 1,000 members today.

Under the invitation of Ministry of Culture, Community and Youth, SCH has embarked on a living asset mapping project aimed at improving the wellbeing of elderly Singaporeans. The Singapore Land Authority serves as SCH's geospatial partner in this project. The methodology of the living asset map was also validated in the Geographic Information System space, and the team attained the GeoInnovation Award from Esri Singapore. In addition, SCH is partnering with the National Arts Council to study the impact of arts on wellbeing and develop a framework to promote the use of arts for health.

For their steadfast commitment and outstanding achievements in establishing and advocating for social prescribing practices locally to improve the wellbeing of Singaporeans.

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NMRC *AWARDS* CEREMONY *AND* RESE*A*RCH SYMPOSIUM 2023 *AND* 2024

The NMRC Awards Ceremony and Research Symposium is an annual event that brings the clinical and research communities together to celebrate scientific excellence and recognise the NMRC Talent Awardees' research achievements. The event also provides a platform for networking, promoting knowledge exchange and fostering collaborations among the participants, including industry partners.

Awards Ceremony

NMRC provides competitive funding support to clinician scientists at various stages of their careers, ranging from prestigious awards for more well-established clinician scientists to fellowships that sponsor budding clinician scientists for research training. Awards are presented to NMRC Talent Award recipients from grant calls launched in the preceding year to recognise their achievements.

Research Symposium

Plenary and concurrent sessions follow the Awards Ceremony, where local and overseas speakers share their work and experiences in human health and potential (HHP) research. Participants may also visit exhibition booths by HHP ecosystem partners.

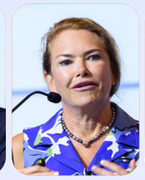
2023 Event Highlights

Held at the Raffles City Convention Centre on 27–28 April, the 2023 event was graced by guest of honour, Mr Chan Yeng Kit, then Permanent Secretary (Health) and attended by around 250 participants. NMRC recognised more than 115 Talent Awardees from the 2021–2022 grant calls. We were honoured to have two overseas experts—Dr Sharon Straus from St. Michael's Hospital and Prof Alex Sigal from University of KwaZulu-Natal—as well as Prof Nick Sevdalis from National University of Singapore for the plenary sessions; and several local experts discussing translational research, population health, scientific paradigm shifts and medical entrepreneurship.



2024 Event Highlights

The 2024 event was held at One Farrer Hotel on 23–24 May, with Mr Ng How Yue, Permanent Secretary (Services), Ministry of Health as guest of honour. The event, which was attended by around 350 participants, recognised more than 65 Talent Awardees from the 2023 grant calls. We were honoured to have four overseas experts—Prof Sir Peter Horby from University of Oxford, Dr Amy Abernethy from Highlander Health, Prof Uri Gneezy from University of California, and Prof Haibo Wang from Sun Yat-Sen University—for the plenary sessions; and local experts for the concurrent sessions who shared their insights on topics like population health, innovative technologies and strategic partnerships in healthcare.

HUMAN HEALTH *AND* POTENTIAL INTERNATIONAL *ADVISORY* COUNCIL (HHP IAC) MEETING 2023 *AND* 2024

In 2023 to 2024, Singapore convened two HHP IAC meetings. The 26th meeting was held in-person at Shangri-La Hotel on 28–29 November 2023, marking Prof Victor Dzau's inaugural session as IAC Chair. The 27th meeting was conducted virtually on 24–25 July 2024. Both meetings focused on seeking IAC's guidance on the HHP Domain's Research, Innovation and Enterprise (RIE) 2025 Mid-Term Review, and areas where there had been significant developments/shifts in strategy.

Meeting Highlights

- IAC commended the significant progress made in the implementation of the RIE2025 HHP Domain strategies, affirming their continued relevance in adapting to emerging sector priorities.
- IAC highlighted Singapore's unique opportunity to pioneer a new health model based on precision health, preventive health, and outcomes, an approach that aligns with Healthier SG's vision and would be attractive to pharmaceutical, digital health, and nutrition companies.
- IAC expressed support for the Asian Biology and Disease Strategy and noted Singapore's commitment to collaborating with businesses and academia, recognising the potential to enhance effectiveness and efficiency in supporting its healthcare system.
- Given the increasing global concern regarding mental health, especially among young individuals, IAC recommended increasing support in mental health, particularly the translation of downstream clinical research to real-world interventions.
- IAC was supportive of Singapore's strategy in nucleic acid research and translation, which encompasses discovery, therapeutics, delivery, small-scale manufacturing, and clinical trials. They agreed that foundational research would help differentiate Singapore's efforts and felt there was a lot of promise in RNA modifications and host immunity (NIRBA Cluster 2) in particular. In addition, they noted that research on RNA delivery and distribution would have huge potential in terms of improved formulations and identification of new delivery vehicles.

- On developing and deploying artificial intelligence in HHP research, IAC advised Singapore to monitor developments in this current wave or make progressive investments to help build requisite capabilities, rather than jumping into major upfront investments as the AI field was still advancing at a very rapid rate.

In RIE2025, NMRC continues to fund and support foundational research while maintaining mechanisms to further enable the translation of research outputs into real-world applications and value capture. This strategic approach positions us well to transform and protect the health of Singaporeans.

NMRC CLINICIAN SCIENTISTS/INNOVATORS ENGAGEMENT SESSIONS

As part of strengthening our outreach to clinician scientists, NMRC Office conducts engagement sessions annually to better understand the needs of clinician scientists/innovators, and to gather insights to inform future funding strategies.

Led by Executive Director, Prof Tan Say Beng, NMRC Office had organised two talent engagement sessions on 5 July 2024. These sessions aimed to connect with junior clinician scientists/innovators who are recipients of NMRC Talent Awards, in particular, the NMRC Clinician Innovator Award, Clinician Scientist Award, HPHSR* Clinician Scientist Award, Transition Award, and NMRC Research Training Fellowship.

Held at MOH Holdings's new office at Elementum, the sessions involved 23 clinician scientists/innovators, including doctors, dentists, allied health professionals, pharmacists, and health economists from public healthcare institutions and medical schools. Prof Tan introduced NMRC's funding schemes and discussed how they support research careers. Representatives from the National Health Innovation Centre Singapore and Singapore Biodesign also shared insights into their programmes to further support clinician innovators.

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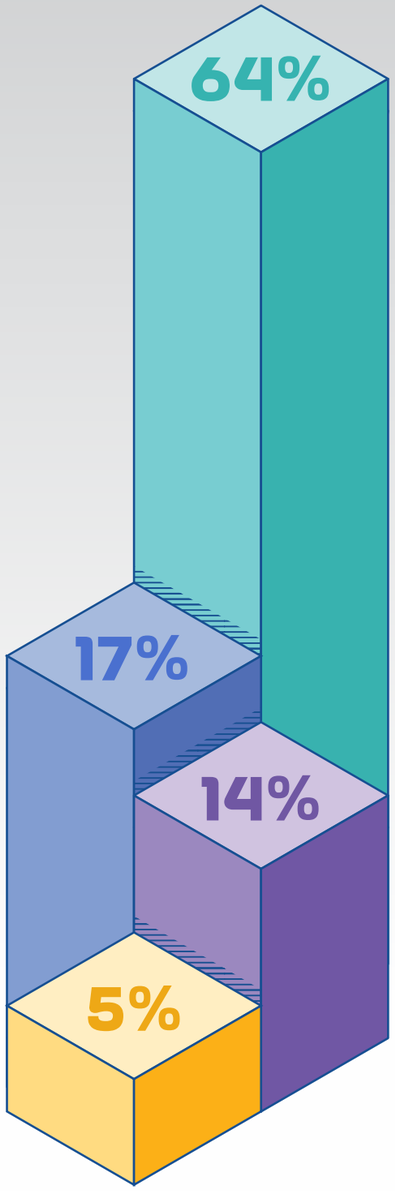
* Health Promotion, Preventive Health, Population Health and Health Services Research

OVERVIEW OF FUND COMMITTMENT

FUND COMMITMENT IN FY2023



RESEARCH GRANT PROGRAMMES (PROJECT-BASED)

$243.88MIL

CTG-IIT	*$5.80 mil*
CS-IRG	*$40.42 mil*
CS-IRG-NIG	*$3.98 mil*
PHRG	*$25.96 mil*
PHRG-NIG	*$1.02 mil*
HML	*$0.98 mil*

Open Fund Grants

LCG	*$94.98 mil*
IRG	*$56.47 mil*
YIRG	*$14.27 mil*

RESEARCH ENABLERS & INFRASTRUCTURE INITIATIVES

$66.14MIL

HUMAN CAPITAL AWARDS

$53.88MIL

STaR 3 Awardees	*$13.95 mil*
CSA 14 Awardees	*$29.03 mil*
HCSA 6 Awardees	*$6.85 mil*
CIA 9 Awardees	*$4.05 mil*

TALENT PIPELINE PROGRAMMES

$16.88MIL

TA 10 Awardees	*$9.09 mil*
RTF 25 Awardees	*$7.79 mil*

Figures are accurate at the time of print.
Funding sources: RIE2020 White Space and RIE2025.

FUND COMMITMENT IN FY2024

RESEARCH GRANT PROGRAMMES (PROJECT-BASED)

$162.25MIL

CTG-ICT	*$5.38 mil*
CTG-IIT	*$7.71 mil*
CS-IRG	*$41.25 mil*
CS-IRG-NIG	*$5.38 mil*
PHRG	*$18.23 mil*
PHRG-NIG	*$1.02 mil*
HML	*$11.78 mil*

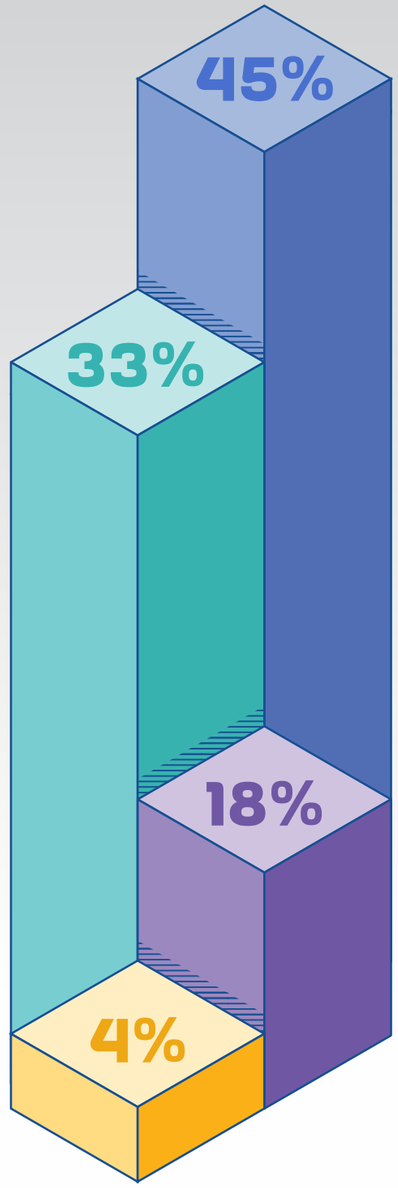
Open Fund Grants

IRG	*$57.28 mil*
YIRG	*$14.22 mil*

TALENT PIPELINE PROGRAMMES

$20.98MIL

TA 14 Awardees	*$12.64 mil*
RTF 25 Awardees	*$8.34 mil*



RESEARCH ENABLERS & INFRASTRUCTURE INITIATIVES

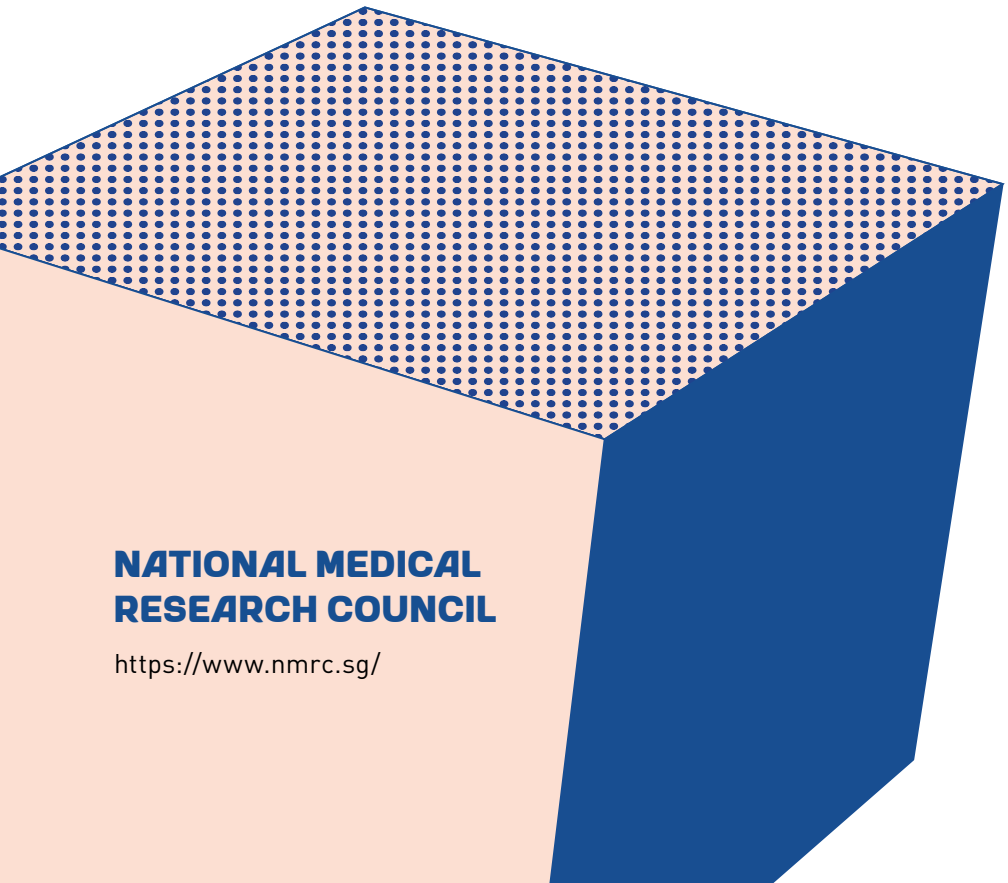
$221.64MIL

HUMAN CAPITAL AWARDS

$91.43MIL

STaR 4 Awardees	*$22.00 mil*
CSA 23 Awardees	*$54.37 mil*
HCSA 10 Awardees	*$10.82 mil*
CIA 9 Awardees	*$4.24 mil*

Figures are accurate at the time of print.
Funding sources: RIE2020 White Space and RIE2025.



NATIONAL MEDICAL RESEARCH COUNCIL

https://www.nmrc.sg/