

# PULSE

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COVER STORY

## Building A Legacy

IN THIS  
ISSUE

PG 10  
Live Transmission  
Of Knowledge

PG 18  
Artificial Intelligence  
In Healthcare

PG 26  
Leadership In  
Cardiology

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# TABLE OF CONTENTS

## 04

### Editor's Message

## COVER STORY



COVER STORY |  
Building A Legacy

## 05

### Building A Legacy

New goals for NUHCS paediatric cardiac surgery



## EVENT

## 10

### Live Transmission Of Knowledge

AICT-AsiaPCR 2021 follows the hybrid phy-gital model



## 12

### The HEART Truth 2021

NUHCS held its English biannual public symposium in July 2021

## 14

### Structural Heart Disease In The Modern Era

First public webinar on structural heart diseases

## 16

### Cardiology Heavyweights Gather For Innovative Education

ACC Asia 2021 Together With SCS 32nd Annual Scientific Meeting Virtual

## CLINICAL

18

**Artificial Intelligence  
In Healthcare**

Opinion piece by A/Prof James Yip on the adoption of AI in healthcare

20

**The Underdog In Cardiology**

A lookback at the cardiac electrophysiology service in NUHCS



22

**Nurses Level Up**

Cross-training strategy increases nursing competency



23

**Learning Across Space  
And Time**

Proctor guides first Amplatzer Amulet LAA occluder implant remotely

## EDUCATION

24

**NUHCS Cardiology Senior  
Residency Programme**

New initiatives and updates to the programme fellowship experience at NUHCS



25

**What Is Atrial Fibrillation?**

Heart fluttering? Don't ignore it. Learn about AF.

## FACES OF NUHCS

26

**Leadership In Cardiology**

A/Prof Yeo Tiong Cheng on his new leadership role



28

**A Devotion To Research**

Prof Lee's affinity for research is straight as an arrow



30

**Answers Within Research**

Life as a cardiologist is more than just being in a clinic

## RESEARCH



32

**For Good Measure**

Pushing the boundaries of technology in cardiac haemodynamics

## NEWSBYTES

33

**Awards & Promotions**

Congratulations to all our award-winners and newly-promoted doctors!

36

**Publications & Abstracts**

## ERRATUM NOTICE:

In our story, "The New Cath Labs", published in Pages 10-11 of Pulse Issue 37, we said NUHCS first set up its cardiac invasive catheterisation laboratories facility in 1992. We wish to clarify that the Department of Cardiology was established on 1 Sep 1989. Prior to that, it was a division under the Department of Medicine, NUH where the single cath lab was a shared facility with the Department of Diagnostic Imaging (DDI). We apologise for any confusion caused.

# EDITOR'S MESSAGE

Dear readers,

2021 passed quickly as we continue to battle the pandemic. Some may choose to forget what has passed. I choose to chronicle the significant events so that I would not forget, even as I look forward to the day when the pandemic is over.

We went from near-zero Covid-19 cases in the community to the worst outbreak with an escalated mortality rate in nine months. Waves of Covid-19 patients came through our Accidents & Emergency department required hospitalisation. On top of having to care for patients, the ever-changing advisories added pressure and frustration, causing stress and burnout amongst our staff.

Nonetheless, the push for excellence within National University Heart Centre, Singapore (NUHCS) continues unabated, despite these difficult times. Many programmes were rolled out in line with our Group National University Hospital System's (NUHS) vision across four strategic thrusts – Care for our People, Care for our Staff, Centre of Choice, and Ensuring Sustainability.

Clinical care of patients at NUHCS is being developed across our cluster from enhancing the primary care network of general practitioners,

secondary care in our three hospital campuses (at Kent Ridge, Jurong and Alexandra), quaternary care and the region.

Some of our initiatives include setting up the Rapid Access Chest Pain Clinic which shortened hospital stays and the Cardiovascular Prevention and Integrated Chronic Care Outpatient Clinics in polyclinics to reduce waiting lists for specialists.

Further, NUHCS has launched new services including the advanced minimally invasive robotic surgical system for thoracic surgery; the expanded Women's Heart Health Programme which includes cardiovascular risk management and specialty disease management programmes, the set-up of our amyloidosis cardiomyopathy<sup>1</sup> clinic and revamping our paediatric cardiac surgery.

On the training and education front, NUHCS continues to participate in international meetings such as the EuroPCR, AICT-AsiaPCR, and organising our own highly popular minimally invasive surgery course.

In the area of research, NUHCS has been successful in renewing and winning new research



grants. Our young doctors and medical students have all been impressive and fruitful in getting their researches published. In fact, they all emerged as Young Investigators' Award finalists at the American College of Cardiology Asia Together With Singapore Cardiac Society 32nd Annual Scientific Meeting.

Wrapping up 2021, we were extremely honoured when Newsweek ranked us 57th out of 150 in their World's Best Specialized Hospitals for cardiac surgery 2022.

2022 certainly looks to be even more exciting with A/Prof James Yip at the helm, advancing NUHCS on its trajectory of growth and development as an academic heart centre of excellence!

*Tan Huay Cheem*

**Prof Tan Huay Cheem**  
Senior Consultant, Department of Cardiology, NUHCS

<sup>1</sup>amyloidosis cardiomyopathy – A condition, also known as stiff heart syndrome, where protein deposits build up in the heart, interfering with how the heart's normal function.

**“I think I had a very interesting start to this profession,”** shared A/Prof Laszlo Kiraly, the newly appointed Head of Congenital Heart Surgery Division in the Department of Cardiac, Thoracic and Vascular Surgery (CTVS) at the National University Heart Centre, Singapore (NUHCS).

He was nine years old when he was run over by a car. With a fractured skull, he had to wear a head bandage while he stayed home to recuperate. That was when he first saw a picture of Christiaan Barnard, the surgeon who performed the world's first human heart transplant, gracing the cover of a magazine wearing a surgical cap.

“I thought I looked like him, with my bandage,” said A/Prof Laszlo Kiraly, who then kept the magazine cover as a poster and declared that he too would become a cardiac surgeon one day.

“And I only wanted to focus on babies and children. Never adults.”

# *Building A* Legacy

ARTICLE BY  
NUHCS Pulse  
Editorial

*New goals for NUHCS paediatric cardiac surgery*

Unwavering in his determination, that nine-year-old boy has since accomplished much over the years. He graduated from Semmelweis Medical University in Budapest, Hungary, and completed his postgraduate medical training in the United Kingdom (UK), France, and the United States of America (USA), earning the Hungarian and European Board certification in Cardiothoracic Surgery.

He returned to Hungary in 1996, and in 2000, he was appointed the Chair of the newly set-up Congenital and Paediatric Cardiac Surgery/Intensive Care Unit at the Gottsegen National Cardiovascular Centre, a leading healthcare institution in Hungary dedicated to patient care, clinical practice, teaching, and research.

As a new unit, A/Prof Kiraly led his team in redesigning the surgical service to focus

on improving patient care and maximising hospital resources. Everyone had to pitch in

and he proudly recalled working on the logo design.

Following the success of the programme in Hungary, A/Prof Kiraly was invited to Abu Dhabi in 2007 to establish and lead a new tertiary-care paediatric cardiac service at the Sheikh Khalifa Medical City (SKMC) in the United Arab Emirates (UAE), which became the country's leading paediatric cardiac programme.

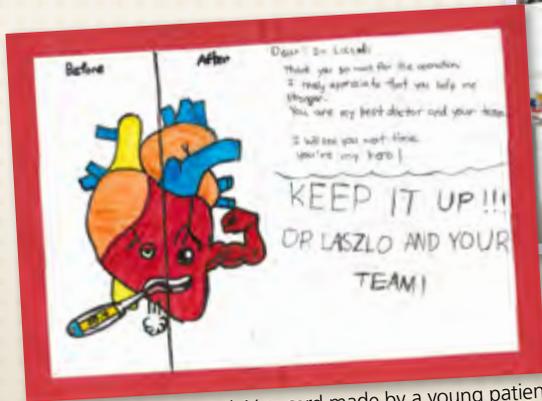
Before the programme was launched, children in the UAE had to travel abroad for operations. At SKMC, he built the paediatric cardiac surgery service from the ground up, including designing the operation theatre and outlining the care protocol from the prenatal to adulthood for congenital heart diseases.



A young patient with his parents after his surgery with A/Prof Kiraly and his team



A/Prof Kiraly with his patient and his patient's parents before surgery



Thank You card made by a young patient



A/Prof Kiraly with his surgical operations team

The programme launched in 2007 with the unit performing just around 100 operations. When he left in 2021, his team completed almost 5,000 procedures and achieved a survival rate of above 97%.

Most of the operations were performed on infants less than a year old, with the majority of patients being less than six months old. The programme has since expanded to serve patients across the entire Gulf region, keeping young patients close to home and their families.

A keen adopter of innovative techniques, A/Prof Kiraly and his team in SKMC had completed several first-of-its-kind surgeries using the latest imaging and 3D printing technology to diagnose a patient's condition and devise an appropriate surgical plan.

In the case of a one-year-old Jordanian boy who was born with multiple cardiac malformations, 3D printing technology gave his surgical team clari-

ty of his heart anatomy before proceeding with the procedure. After braving 11 hours of surgery and three months of post-surgical care in 2020, the boy is now able to lead a normal healthy life.

Uprooting after 14 years in Abu Dhabi was not an easy choice for him. "I miss my colleagues the most as they have become close friends," said A/Prof Kiraly. "But NUHCS made it easier because it was a chance for me to share my legacy."

Now 61 years of age, A/Prof Kiraly felt a moral responsibility to pass on his experience. He explained that paediatric cardiac surgery is a vocation that demands an extensive amount of training with a very steep learning curve, making it very challenging for a young surgeon to master the skills without proper guidance.

"As a surgeon, I do not wish to take my secrets to the grave," he joked, half-serious. "It would

be a disservice to patients, my colleagues, and the practice as a whole if I cannot pass on my failures and triumphs for the next generation to learn and improve on."

For this reason, to train and educate the next generation of surgeons has been on his key agenda when he joined NUHCS in April 2021.

Bringing with him video recordings of his past surgeries, A/Prof Kiraly is looking to build a vault of paediatric cardiac surgery knowledge where doctors will have access to a myriad of systematically documented surgical procedures for learning and training.

This builds on the investment NUHCS has made in recent years to digitalise and equip operation rooms with high-resolution cameras as well as surgical training simulations where surgical teams can practice and rehearse before complex operations.



One of the digitalised operation rooms with live video feed capabilities. New detailed surgery protocols are pinned on the wall (right) for easy reference.



A team briefing before the surgery

“NUHCS is well-known in the medical community for its high standards in surgery and adoption of advanced technology,” remarked A/Prof Kiraly, who hoped the vault will serve as a teaching tool for future surgeons as well as a resource for scientists and researchers developing new medical technology.

He was impressed with NUHCS’ achievements in minimally invasive techniques, where the results have been published widely in several medical journals; particularly after reading the first comprehensive practical guide book on minimally invasive cardiac surgery authored by A/Prof Theodoros Kofidis, Head and Senior Consultant, Department of CTVS, NUHCS.

These methods however, have limited applications in his specialised field where his patients are much smaller in size. However, if complemented with augmented visualisation, he believes several advantages could be achieved

such as reducing the morbidity rate of patients without jeopardising the quality of heart repair and patient safety.

To that end, A/Prof Kiraly intends to cultivate a learning culture to advance the standards of paediatric cardiothoracic surgical practice here.

Research has proven that surgeons in solo practice with less opportunity to interact with their peers scored lower compared to surgeons in group practice. Surgeons need to learn from others to enhance their practice, consider various operative options and improve patient outcomes. They need to interact with their peers to share videos of different techniques, post questions, analyse data, and discuss to learn vicariously from one another.

At NUHCS, he established multidisciplinary teams where hospital staff from related disciplines would participate in weekly cardiothoracic conferences includ-

ing those from cardiac imaging, cardiac anaesthesia, intensive care as well as allied health professionals responsible for risk-stratification and public data reporting to international databases.

Every operation is preceded by a detailed briefing package that covers details including patient pathways, scenario-planning, and continuum-of-care plan to ensure the team is kept informed on the patient’s condition.

He intends to inculcate a strong spirit of team ownership based on transparent communication within the multidisciplinary team. He also introduced new avenues of training and education such as a journal club to cultivate the culture of continual improvement where various techniques surgical options could be analysed and discussed in a team.

A/Prof Kiraly with the paediatric intensive care unit which forms part of the multidisciplinary team caring for young cardiac patients.



Performance reviews are held monthly where factors such as surveying patient outcomes, team dynamics, and other key indicators are monitored and tracked to ensure accurate up-to-date assessment of the case-mix, an essential element of outcomes reporting, quality assessment, and improvement initiatives.

Aside from documenting surgical procedures, he is working with his team to review and introduce new protocols where procedures are formalised and standardised, including guidelines for patient management and care protocols for extracorporeal membrane oxygenation<sup>1</sup>, post-operative care, and for hybrid procedures which could become more common in future.

"NUHCS already has the elements of a centre of excellence in place," noted A/Prof Kiraly. "My goal is to look for efficiencies and marry these elements in developing a long-term strategy where the outcomes of our paediatric cardiac surgery programme can be measured against international benchmarks."

He is hoping to achieve the next milestone for NUHCS' paediatric cardiac surgical practice – to gain recognition as a Centre of Excellence. Various published studies showed that the achievement of a Centre of Excellence status offers many advantages for patients and their families as well as healthcare providers.

Achieving this status promises a sustainable solution where limited hospital resources and capital are maximised by concentrating exceptionally specialised expertise in one place, and combining related resources to deliver the service in a comprehensive, interdisciplinary fashion, achieving improved outcomes that would serve the patient population better.

This further explains his emphasis on transparency in communications, and a robust quality control system to be implemented with continuous recording and reporting of the expected and observed outcomes for measurement and evaluation. Doing so would help to achieve a rigorous performance improvement culture that will help to deliver a

consistently high level of clinical quality outcomes for all patients.

Ahead of this herculean task, A/Prof Kiraly is excited to be in Singapore. With the pandemic putting some of his surgeries on hold, he intends to get back to cycling which he had given up when living in Abu Dhabi.

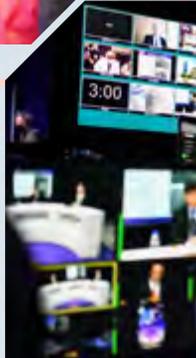
"I'm excited to meet new friends," said the Hungarian, "and learn more about Asian cultures."



<sup>1</sup>extracorporeal membrane oxygenation – A technique where a machine is connected to the patient to take over the functions of the heart and lungs to allow the organs to heal faster.



*AICT-AsiaPCR 2021 follows the hybrid phy-gital model*



Pivoting to the world circumstances where physical distancing and travel restrictions were still in place, the official course of the Asian Pacific Society of Interventional Cardiology (APSIC), AICT-AsiaPCR 2021 was a milestone event for the interventional cardiovascular community where huge efforts went into the set-up of a hybrid event to allow participants to reconnect with their peers across the Asia Pacific for two days, from 8 to 9 October.

2021 was the second year the event was held virtually. However, it was also the first hybrid meeting where there was both

digital and physical elements incorporated.

TV studios were set up across three locations -- Singapore, Kuala Lumpur, and New Delhi where segments of the programme were broadcast live simultaneously to all three locations. Due to limitations on crowd size, speakers and participants who could not attend in person at any of the three locations could participate virtually.

Broadcasting live from Singapore, Prof Tan Huay Cheem, Senior Consultant, Department of Cardiology, National University Heart Cen-

tre, Singapore (NUHCS) and a course director of AICT-AsiaPCR hosted the opening ceremony and welcomed 100 participants who were present physically in the Singapore studio.

From Singapore, Prof Tan connected to the New Delhi studio where course directors Dr Ashok Seth and Dr Upendra Kaul welcomed 100 participants in the studio with them. Lastly, course director Dr Mohd Ali Rosli greeted the participants from Kuala Lumpur where he was broadcasting.

“

*Having pulled off a hybrid phy-gital event once, we will be able to reach many more colleagues in the region for future editions. This programme is highly interactive, informative, relevant and will benefit anyone in our practice.*

*Prof Tan Huay Cheem, Senior Consultant, Department of Cardiology, NUHCS*



The two-day programme was packed with content on various topics relevant to practicing cardiologists in the region. Topics included contemporary challenges in ST-segment elevation myocardial infarction (STEMI)<sup>1</sup> management, tips and tricks to tackle complex bifurcation lesions<sup>2</sup>, optimising outcomes in complex percutaneous coronary interventions (PCI)<sup>3</sup>, discussions on innovative technology in cardiology, and more.

More than 125 speakers joined in the discussions and presented live from one of the studios or connected virtually from another part of the world, including Germany, Spain, Mexico, New Zealand, Indonesia, Ireland, and the Philippines. Participants who joined virtually could engage with the speakers through a live chatbox function on the upgraded user-friendly digital platform.

*To watch the replays, visit PCR Online at [www.pcronline.com](http://www.pcronline.com) where selected content and video recordings have been uploaded to the platform.*

<sup>1</sup>STEMI – A severe form of heart attack where a part of the heart muscle has died due to the obstruction of blood supply to the area.

<sup>2</sup>bifurcation lesions – A narrowing that occurs at or near a major coronary artery.

<sup>3</sup>PCI – Refers to a group of minimally invasive procedures used to open clogged coronary arteries.



## ABOUT AICT-ASIAPCR

Formed in 2019, AICT-AsiaPCR is an educational platform built by local practitioners, with the support of centres of excellence in the Asia Pacific and Europe, to focus on the diverse needs of patients in the interventional cardiology landscape. The platform allows for the knowledge exchange between peers and the opportunity for health-care professionals to showcase their research and innovation, aimed at contributing to the development of treatment and care possibilities to better serve the region's patients.

## KEY FIGURES FOR AICT-ASIAPCR 2021



2 channels  
live streaming  
7 hours/day



50% of the time  
set aside for live  
interaction



125+ Speakers



139 received  
submissions for  
abstracts and  
clinical cases



89 accepted  
submissions for  
abstracts and  
clinical cases

### ARTICLE BY

**Prof Tan Huay Cheem**  
Senior Consultant,  
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Prof Tan is a Professor of Medicine, Yong Loo Lin School of Medicine, National University of Singapore and has a master of Medicine in Internal Medicine. He is an active clinical researcher, visiting professor at several hospitals in China, and invited speaker at many international cardiology meetings.

# THE HEART TRUTH 2021

*NUHCS held its English biannual public symposium in July 2021*



National University Heart Centre, Singapore (NUHCS) has been active in public education and outreach activities to educate the public about cardiovascular health. On 17 July 2021, NUHCS held its biannual English Public Symposium, The HEART Truth virtually where over 400 viewers engaged with four doctors about heart health live on YouTube.

Through this symposium, NUHCS hopes to increase awareness about cardiovascular health and keep the public informed about the latest medical developments available to patients here.

According to the World Health Organisation (WHO), an estimated 17.9 million lives are lost to cardiovascular diseases each year globally. More than four out of five are due to heart attacks and strokes while one-third of these deaths occur pre-

maturely in people under 70 years of age.

In 2020, cardiovascular diseases accounted for about 31.7% of deaths in Singapore with an estimated 4.5% of the population living with heart failure. Also concerning is the incidence of acute myocardial infarction (heart attack) in younger age groups (30-60 years) appears to be rising over the last few years.



Over the last few decades, vast advancements made in medical technology offer physicians and patients a myriad of treatment options to manage heart failure effectively. These include cutting-edge medical devices which allow patients' heart health to be monitored remotely, new medication as well as innovative procedures including minimally invasive techniques and innovative high-precision robot-assisted surgery to address complex heart conditions.

These developments have led to a significant decline in the mortality rate of cardiovascular patients from 1990 to 2017, and improved the survival rate of patients.



“

***With no dearth of misinformation and untruths circulating (especially on the internet) about health issues, it is of paramount importance that proven scientific facts and data should be shared with the public.***

*Prof Tan Huay Cheem, Senior Consultant, Department of Cardiology, NUHCS*

With appropriate treatment and lifestyle changes, many patients have been able to lead symptom-free and regular lives after the diagnosis of their condition.



Dr Chai Ping, Head Senior Consultant, Department of Cardiology, spoke on the utility of tomography coronary angiogram in diagnosing coronary artery disease, a non-invasive test for diagnosing coronary artery disease.

Dr Lin Weiqin, Consultant, Department of Cardiology elaborated on what heart failure is, the symptoms to look out for, how it is diagnosed, and the latest treatment strategies available for patients.

Prof Tan Huay Cheem, Senior Consultant, Department of Cardiology took the audience through 40 years of journey in the development of coronary angioplasty and how the treatment has evolved to become the gold standard in treating obstructive coronary artery diseases.

A/Prof Laszlo Kiraly, Senior Consultant, Department of Cardiac, Thoracic and Vascular Surgery, covered current therapeutic possibilities and outcomes in congenital cardiac surgery.

Viewers who watched the live stream on YouTube were actively engaging the doctors with their queries through a chat box where they could post questions and comments for the doctors to answer dur-

ing the event. Questions about improving cholesterol levels, advice on reducing one's risk for heart attacks, and possible complications related to the heart with the Covid-19 vaccine reiterated the public's clear interest in heart health issues.

Modern medical technology allows patients to lead good quality lives if they seek for medical help to diagnose and treat their conditions early. Those with queries seeking further advice about their conditions should consult with a cardiologist or a qualified medical professional.

*The event was recorded and is available for viewing on NUHCS' YouTube channel at [www.youtube.com/NUHCS](http://www.youtube.com/NUHCS).*



ARTICLE BY

*Prof Tan Huay Cheem  
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Cardiology, NUHCS*



Prof Tan is a Professor of Medicine, Yong Loo Lin School of Medicine, National University of Singapore and has a master of Medicine in Internal Medicine. He is an active clinical researcher, visiting professor at several hospitals in China, and invited speaker at many international cardiology meetings.

# STRUCTURAL HEART DISEASE IN THE MODERN ERA

*First public webinar on structural heart diseases*



The heart is a muscular organ made up of four chambers that receive and discharge blood. These chambers are separated by a wall of tissue called the septum. Four valves open and close in rhythm to the heart pumping to ensure that blood flows in the correct direction and to prevent backward flow.

When an abnormality or defect occurs in the structure of the heart, the condition is referred to as a form of structural heart disease (SHD). SHD can be present at birth (congenital) or develop over time in an adult due to ageing, infections, or other diseases which cause the wear and tear of the heart.

In babies, prenatal and post-natal screening tools can help detect structural heart conditions early and be treated. However, SHD may show no symptoms in adults, especially in the early stages. If left undiagnosed or untreated, SHD can cause serious health problems including heart failure, stroke, and sudden cardiac arrest.

With an ageing society, the incidence of SHD is expected to rise. It is estimated that one in eight people above 75 years of age in Singapore is likely to have a heart valve problem.

The National University Heart Centre, Singapore (NUHCS) organised its first public webi-

nar on 25 September 2021 on “Structural Heart Disease in the Modern Era”, to educate the public about SHD.

Hosted by local media personality, Daniel Martin, senior consultant Asst. Prof William Kong Kok as well as consultants Asst. Prof Yeo Tee Joo, Dr Ivandito Kuntjoro, and Dr Lim Yinghao from the Department of Cardiology, NUHCS discussed the detection of SHD, current treatment options available, the quality of life patients can enjoy after treatment, and the prevention of SHD.

One of the most common SHD in Singapore is the degenerative problem of the aortic

**“As Jules Renard puts it – it is not how old you are, it’s how you are old. Structural heart diseases should not hinder the way of enjoying life as we age.**

*Dr Ivandito Kuntjoro, Director of Structural Heart Disease and Consultant, Department of Cardiology, NUHCS*

valve due to calcium deposition which narrows the valve opening. This condition, known as aortic stenosis, reduces the blood flow from the heart to the rest of the body.

As with other SHD, the symptoms of aortic stenosis may only appear when the condition is severe. Possible symptoms include feeling faint or dizzy and experiencing shortness of breath during light activities,

irregular heartbeats or palpitations, swelling of the abdomen, ankles or feet, chest pain, and fatigue.

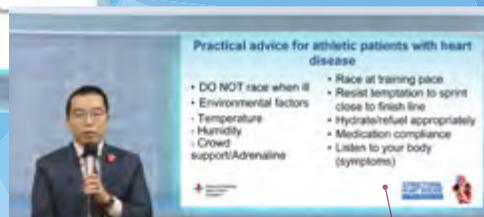
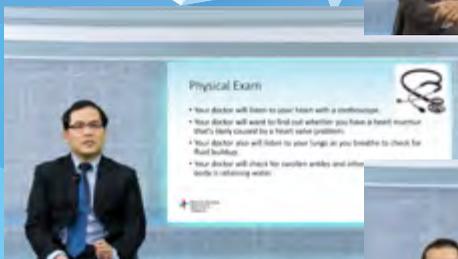
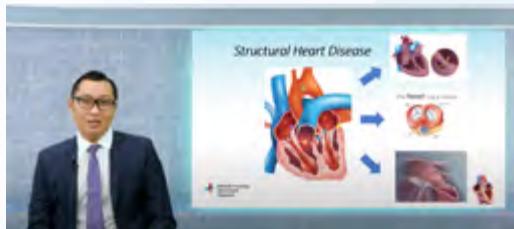
Treatment options for SHD generally fall under surgery, medication, percutaneous intervention, and/or post-therapy rehabilitation. For older patients, the challenge in treating SHD is the complexity of co-morbidities, surgical risks as well as psychosocial factors which influence the patient’s postoperative healing process.

Thankfully, the field of SHD treatment has evolved rapidly in the past decade and saw the advancement of minimally invasive techniques and percutaneous-based catheter interventions, providing patients safe and effective alternatives to surgery.

One of the modern procedures, known as transcatheter aortic valve implantation (TAVI), is a minimally invasive technique where a replacement valve is delivered through a catheter through a small incision made in the femoral artery or the chest. While the procedure carries some risks and is not suitable for all patients with SHD, it has shown to provide patients with comparable results to those who go through conventional open-heart surgery. As the whole TAVI procedure takes up to two hours, patients tend to have a better recovery and require a much shorter hospital stay.

In this modern era, patients with SHD can lead good quality of lives with early diagnosis and treatment. Furthermore, patients are encouraged to exercise regularly and lead healthy lifestyles despite their condition, to lower their risk of mortality and morbidity.

*Videos from the webinar are now available for replay on NUHCS’ YouTube channel at [www.youtube.com/NUHCS](http://www.youtube.com/NUHCS).*



#### ARTICLE BY

**Dr Ivandito Kuntjoro**  
Director of Structural Heart Disease and Consultant,  
Department of Cardiology,  
NUHCS



Dr Kuntjoro first joined NUHCS in 2012 as a cardiology fellow and is currently the Director of Structural Heart Disease. As a Consultant, he sees patients specialising in complex valvular heart disease, congenital heart, and pulmonary hypertension. He has authored or co-authored a few papers in peer-reviewed journals and has written a book chapter in Structural Intervention. He is actively involved in medical education as a core faculty of the Cardiology Senior Residency Programme. Before NUHCS, he worked as an internal medicine attending physician in the United States of America (USA) at the Cleveland Clinic Hospital in Ohio as well as at the Memorial Hermann Hospital in Houston.

# CARDIOLOGY HEAVYWEIGHTS GATHER FOR INNOVATIVE EDUCATION



## *ACC Asia 2021 Together With SCS 32nd Annual Scientific Meeting Virtual*

The American College of Cardiology (ACC) Asia 2021 together with the Singapore Cardiac Society (SCS) 32nd Annual Scientific Meeting (Virtual) was held from 9 to 11 Jul 2021. Helmed by co-chairs A/Prof Poh Kian Keong, Senior Consultant, Department of Cardiology, National University Heart Centre, Singapore (NUHCS) and Prof Fred Kusumoto, Associate Dean of Faculty Affairs at Mayo Clinic Alix School of Medicine, the three-day conference brought together top professors from America, Asia, and Singapore with the goal of providing an innovative educational experience.

This was the first time that ACC Asia was held in Singapore. Shanghai and Nagoya hosted the previous events. It was at an ACC annual meeting in New Orleans that A/Prof Poh and Dr Ong Hean Yee (then President of SCS) approached the ACC and secured the hosting opportunity for Singapore. At the SCS, there was initial hesitancy but these were ironed out as a planning committee

was formed. Dr Yeo Tee Joo, Consultant, Department of Cardiology, NUHCS is the organising chairman of the SCS side of the conjoint event.

The action-packed weekend involved 810 participants from 25 countries. There were 163 faculties from America, Singapore, and the Asian region. 139 abstracts from 23 countries were showcased, highlighting a strong interest to share knowledge and expertise despite the Covid-19 pandemic.

The conference opened with the Journal of the American College of Cardiology (JACC) Asia session. JACC Asia is a new addition to the JACC family. The Editor-in-Chief is Prof Jian'an Wang from China. Prof Roger Foo, Senior Consultant, Department of Cardiology, NUHCS, and A/Prof Poh were the only Singaporeans on the editorial board. The session was followed by the presentation of the SCS Lifetime Achievement Award and the FIT Jeopardy, a cardiology quiz that was organised successfully for the first time, virtually.

The main conference was opened by the two Chairs as well as the Presidents of respective societies – Dr Ong and Dr Dipti Itchhaporia for ACC. This was immediately followed by an opening plenary entitled 'Subclinical Cardiovascular and Cerebrovascular Disease: An Imaging Challenge of the Decade' by none other than Prof Valentin Fuster, Editor-in-Chief, JACC.

The conference then split into four channels with six clinical pathways incorporated into the program, including a plenary session on "Is Artificial Intelligence Ready for Cardiovascular Care" by Prof John Rumsfeld, then chief innovation officer of the ACC.

There was also 'Best of ACC.21' which discussed top clinical trials such as the PARADISE-MI, EXPLORER HCM, ISCHEMIA, and RAFT-AF.

Foreign luminaries who graced ACC Asia included Professors David Maron, Athena Poppas, Jonathan Lindner, James



Thomas, Aaron Kugelmass, Michael Picard, Judy Hung, Paul Mather, Pam Morris, and many others. With preeminent professors from the region, the conference was highly enjoyable and educational.

For the SCS Young Investigator Award segment, Dr Ryan Leow, an internal medicine resident from the National University Health System, clinched the coveted top prize for his project on mitral stenosis, while Mr Teo Yao Neng, a third-year medical student from the Yong Loo Lin School of Medicine, won one of the best abstract awards (in the entire ACC Asia) for his meta-analysis on heart failure medications.

The conference would not have been successful without the strong support and showing from sponsors. All the ACC staff and SCS secretariat, especially Ms Cortney Hale, Ms Robin Young, Ms Alyssa McCormick, and Ms Cherine Wan worked tirelessly to ensure the meeting ran seamlessly.

Dr Sia Ching Hui, Associate Consultant, Department of Cardiology, NUHCS was part of the Jeopardy committee that included counterparts from the National Healthcare Group and SingHealth. He was also invited to moderate in one of the virtual discussion sessions on valvular heart disease. In addition, he was deeply involved in working with a slew of talented junior doctors – from medical students to senior residents – who believe in the nurturing environment of NUHCS to groom them into learning the ropes of research from scratch. Their work was presented in the YIA as abstracts/cases.

With the conclusion of a successful conference, the bar has been set high as everyone will be eagerly anticipating future editions of the conference. Proceedings from the conference can be accessed in play-back mode, together with the virtual learning lab consisting of heart songs, electrocardiogram drill and practice as well as the Adult Clinical Cardiology Self-Assessment Program (ACCSAP) on <https://asia.virtual-acc.org>.

**“** *Aside from contributing a huge majority of faculty, NUHCS is involved in the important science presented - all six projects shortlisted for the SCS Young Investigator Award Abstract Presentations were projects from NUHCS!*

*A/Prof Poh Kian Keong, Senior Consultant, Department of Cardiology, NUHCS*

#### ARTICLE BY

*A/Prof Poh Kian Keong  
Senior Consultant,  
Department of Cardiology,  
NUHCS*



A/Prof Poh is presently a Senior Consultant and Research Director at the Department of Cardiology, NUHCS. He is the current Chair of the American College of Cardiology's Assembly of International Governors.

*Dr Sia Ching Hui  
Associate Consultant,  
Department of Cardiology,  
NUHCS*



Dr Sia is an Associate Consultant cardiologist at NUHCS with a keen clinical and research interest involving multi-modality cardiac imaging to investigate mechanisms of disease, diagnose, prognosticate, and guide management of patients, as well as a special interest in cardio-neurology and cardiomyopathies. He has published over 100 papers in peer-reviewed journals and currently serves as the Associate Editor for the European Heart Journal Case Reports. He also holds a concurrent appointment as a Senior Lecturer at the Department of Medicine, Yong Loo Lin School of Medicine, National University of Singapore.

# ARTIFICIAL INTELLIGENCE IN HEALTHCARE

*Opinion piece by  
AIProf James Yip  
on the adoption  
of AI in healthcare*

**Artificial intelligence (AI) is transforming every aspect of everyday life and cardiovascular medicine is no exception. The humble stethoscope invented in 1816 has now been given an AI boost to analyse cardiac murmurs and breath sounds, displaying phonocardiograms as a visualisation.**

Whilst this may seem redundant to the experienced clinician, these tools prove useful in clinical education and telemedicine when deployed in remote areas for health screening and as an Internet of Medical Things (IoMT) device for monitoring potential heart failure and asthma incidents in the home.

Another area where AI is transforming our practice is the century-old technology of the electrocardiogram (ECG). Traditionally, cardiologists perform a blood test to detect fluctuations in blood potassium levels which indicated the possibility of life-threatening arrhythmias and sudden death. These tests required patients to visit a clinic for the procedure to be carried out. Using AI, the engineers at AliveCor sought to develop a new way of detecting such fluc-

tuations. The goal was to create a “bloodless blood test” that could be easily done by patients at home which would help to detect abnormal blood potassium levels for an early diagnosis.

This powerful technology is now a device I carry in my wallet which is the world’s only six-lead, clinically validated personal ECG, and cleared by United States Food and Drug Administration (FDA), to detect six of the most common arrhythmias.

Closer to home, National University Health System (NUHS) has been using AI for research and clinical care through its Discovery AI (DAI) platform.

The DAI platform allows researchers and clinicians to work together to build AI models for tasks such as predicting the cardiovascular risk of an individual, provide image analysis with augmented reporting platforms, and build advanced home monitoring tools for the early diagnosis of diseases.

For one of our models, we connected all the data from the intensive care unit (ICU) man-

agement system to develop a Sequential Organ Failure Assessment (SOFA) score predictor in a 24-hour window. The SOFA Score is a mortality prediction score that is based on the degree of dysfunction of six organ systems.

We gave the app to all the doctors working in the ICUs but found that only the junior doctors used it to help them predict which patients would turn bad during their calls. Senior doctors preferred to rely on their clinical judgement.

In my own experience with the app, I found that the AI accounted for my actions according to different events that could occur. For example, it knew that when the blood pressure of a patient in ICU dropped, protocol requires the care team to start some inotropic agent to boost the blood pressure and that the patient’s condition would transiently improve in the following 12 hours.

I dreaded the thought that the AI would see my name as the consultant on call and predict that a patient would do worse, as part of its algorithm.

NGEMR has been rolled out in Ng Teng Fong General Hospital and across National University Polyclinics, with National University Hospital and Alexandra Hospital following suit before the end of February 2022.

With the data from the full health ecology being fed into the platform, EAI will then be launched. I am excited to see how our clinicians, collaborating with computer and data scientists, work with these new technologies even as AI makes quantum leaps forward.

*This opinion piece was written by A/Prof Yip Wei Luen James, Director and Senior Consultant, NUHCS, sharing his perspectives on the adoption and application of artificial intelligence in an attempt to gain deeper insights and better outcomes in healthcare.*

In building such models, we start with known correlations and identify what factors influenced the AI decision making process. However, the neural networks in AI process a lot more data faster than a human and sometimes, reaches an algorithm that we may not immediately understand. This is where experts need to contextualise the conclusions drawn by the AI and validate the results before widespread implementation of the AI can occur.

In the field of imaging, our team started using AI models for mammography<sup>1</sup> and spinal stenosis<sup>2</sup> imaging diagnosis with an accuracy above 90% when compared to a human radiologist. This was achieved when we fed the AI with raw data, enabling it to find meaning in the data and draw bias-free evidence-based conclusions.

Even in cardiovascular medicine where images are moving, there are already AI models which automate stenosis assessment for coronary angiography<sup>3</sup>, M-mode<sup>4</sup> analysis, and ventricular function in echocardiography and volume assessment in magnetic resonance imaging.

AI will initially augment the current reporting framework with many components built into current medical technologies. As we feed more data and information into AI models, they will evolve to become less reliant on human interpretation for anatomy and physiology, and have prognostic information on disease diagnosis, progression, and precision treatments.

***AI is unfettered by the knowledge of previous human experience and seeks to create its own world view based entirely on data without prejudice.***

A/Prof Yip Wei Luen James,  
Director and Senior Consultant, NUHCS

Already, NUHS has invested in a platform called Endeavour AI (EAI), which supports the integration of real-time medical data from our Next Generation Electronic Medical Records (NGEMR) and perform machine learning models tested in DAI to provide aggregated predictions and visualisation of insights, enhancing patient care and services.

<sup>1</sup>mammography – A X-ray procedure to examine the human breast for diagnosis and screening of cancer.

<sup>2</sup>spinal stenosis – A narrowing of the spaces within your spine.

<sup>3</sup>coronary angiography – A X-ray procedure to examine the heart's blood vessels.

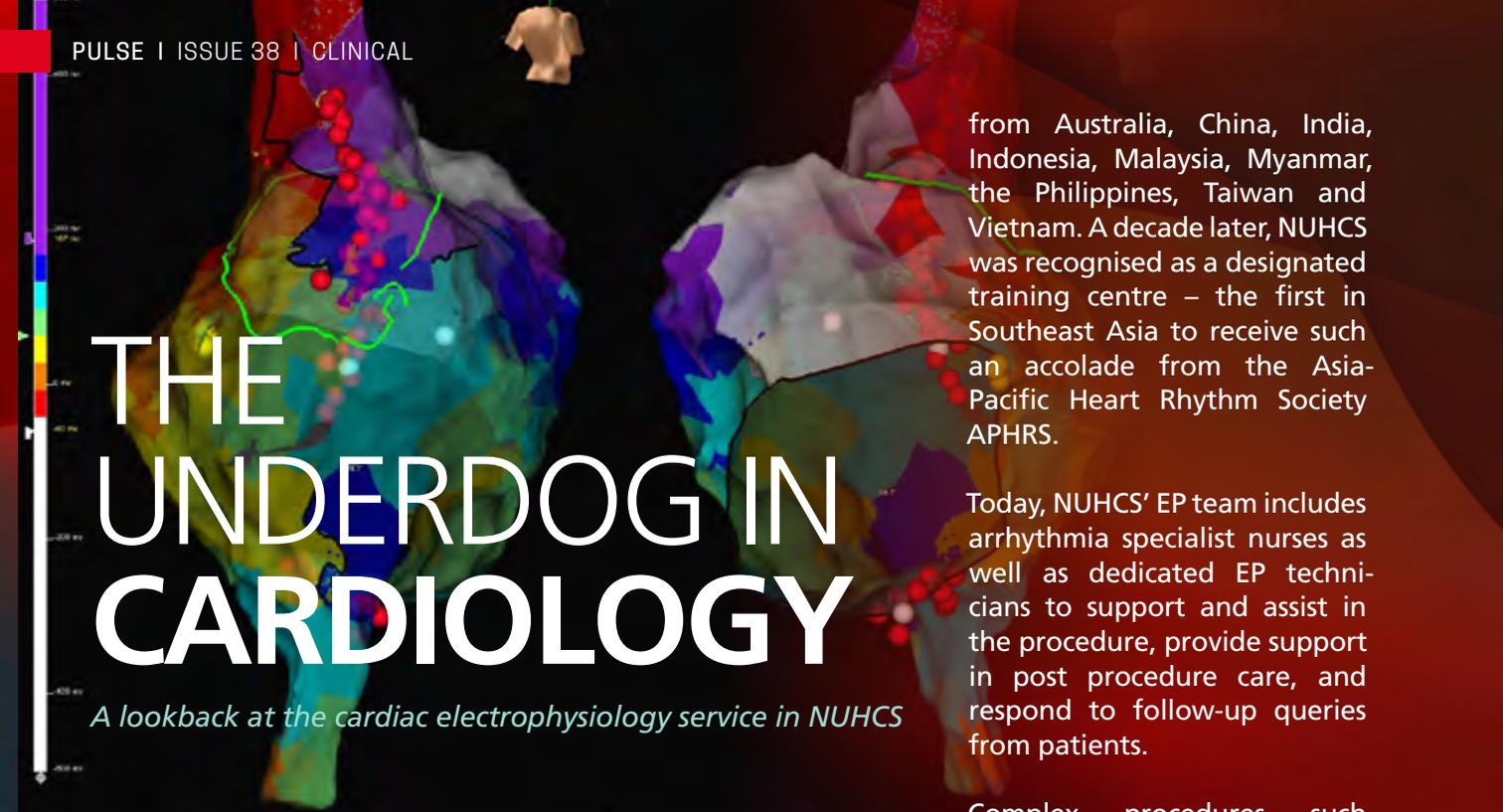
<sup>4</sup>M-mode – A time motion display of an ultrasound wave which provides a monodimensional view of the heart.

ARTICLE BY

A/Prof Yip Wei Luen James  
Director and Senior Consultant, National University Heart Centre, Singapore (NUHCS)



A/Prof Yip is presently the Director of NUHCS and Head Academic Informatics Office at NUHS. He spearheaded the Cardiology Information System which is in use across four public hospitals in Singapore as well as the structural heart disease programme in NUHS from 2003-2017. He currently holds four patents on occlusion devices for closing anatomic cardiac defects and continues to be active in research and education. For his contributions, he has been conferred the Public Administration Medal (Bronze) in 2018 and the Distinguished Senior Clinician Award in 2019 from Singapore's Ministry of Health.



# THE UNDERDOG IN CARDIOLOGY

*A lookback at the cardiac electrophysiology service in NUHCS*

Catheter-based radiofrequency (RF) ablation<sup>1</sup> became the standard of care for the treatment of arrhythmias over open-heart arrhythmia surgery when the procedure was pioneered in 1998. In parallel, implantable pacemakers were first described in 1958, followed by the first cardiac defibrillator in 1980.

Singapore was far behind the curve when it came to cardiac electrophysiology (EP), but the practice in the country has since made huge strides in the last two decades.

In 2002, EP procedures at the National University Heart Centre, Singapore (NUHCS) were limited to one afternoon session a week, which only allowed for either a supraventricular tachycardia<sup>2</sup> ablation or a pacemaker implantation to be carried out. Patients typically waited for weeks before a procedure was scheduled, which also meant that junior

doctors rarely had the opportunity to learn more about the practice.

Asst. Prof Seow Swee Chong, then a Senior Registrar, was earmarked to specialise in this area and went to Westmead Hospital in Sydney, Australia for his specialist training. On his return in 2007, he established NUHCS' EP team which became the cornerstone for the transformation of cardiac EP in NUHCS.

Doctors were sent to different centres in Australia, Canada, the United Kingdom and the United States to train under the world's leading cardiac electrophysiologists to achieve a wide breadth of experience and approaches.

In 2008, the young team hosted the first Asia Pacific workshop on cardiac resynchronization therapy (CRT). The workshop, now an annual event, is attended by physicians

from Australia, China, India, Indonesia, Malaysia, Myanmar, the Philippines, Taiwan and Vietnam. A decade later, NUHCS was recognised as a designated training centre – the first in Southeast Asia to receive such an accolade from the Asia-Pacific Heart Rhythm Society APHRS.

Today, NUHCS' EP team includes arrhythmia specialist nurses as well as dedicated EP technicians to support and assist in the procedure, provide support in post procedure care, and respond to follow-up queries from patients.

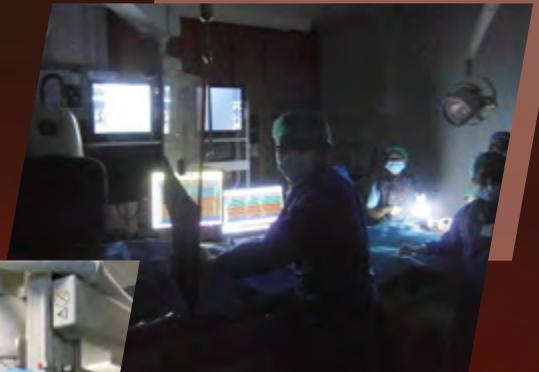
Complex procedures such as ventricular tachycardia<sup>3</sup> ablation, atrial fibrillation<sup>4</sup> ablation as well as complex cardiac device implants including CRT and conduction system pacing have now become routine procedures carried out by the EP team every day.

In 2019, 239 EP/ablations and 418 device implants were carried out at NUHCS – more than 12 times the number of procedures carried out in 2009, indicating that patients were previously underserved.

Looking ahead, heart arrhythmia conditions are expected to increase in tandem with the incidence of coronary artery disease, for which arrhythmias are common complications. As such, an arrhythmia service has been set up at Ng Teng Fong General Hospital (NTFGH) under the OneNUHS cluster to spread out the patient load. Helmed by Asst. Prof Pipin Kojodjojo and Dr Elaine Boey, the service at NTFGH is currently capable of device implantation, whilst



First CRT Workshop in 2008



Working through a blackout in Myanmar 2016



Trip to the Philippines 2013

“

***I am grateful to Dr Ng Kheng Siang who trained me to implant pacemakers and Prof Tan Huay Cheem for his faith in me then, plus his support and backing as I carried out my duties.***

Asst. Prof Seow Swee Chong,  
Senior Consultant, Director of  
Cardiac EP and Pacing, NUHCS

EP and ablation procedures are being referred to NUHCS.

Committed to raise practice standards in the region, NUHCS has been active in accepting international fellows as well as making overseas trips to guide and proctor physicians in cardiac EP and device implantation in countries including China, Taiwan, India, Myanmar, India, the Philippines and Vietnam. The EP team is particularly active in the Asia Pacific Heart Rhythm Society, contributing and supporting its regional meetings and conferences to facilitate the furtherance of arrhythmia management in the region.

A lot has since been achieved since the early days of its inception.

“As the EP service grows in maturity and capability, we envisage our role as a beacon in this region of the world. It is our hope that we would be able to give the very best treatment to our patients, to nurture and train other physicians and contribute to the furtherance of arrhythmia management in the Asia-Pacific,” says Asst. Prof Seow Swee Chong, Senior Consultant, Director of Cardiac Electrophysiology and Pacing, NUHCS.

<sup>1</sup>ablation – A procedure to restore the heart’s normal rhythm by destroying abnormal heart tissues.

<sup>2</sup>supraventricular tachycardia – Condition where the heart beats much faster than normal and begins above the ventricles.

<sup>3</sup>ventricular tachycardia – Condition where there is abnormal heart rhythm in the lower chambers of the heart.

<sup>4</sup>atrial fibrillation – Condition where the heart beats irregularly, increasing the risk of stroke, heart failure and/or other complications.



### Cardiac Electrophysiology (EP)

is a sub-specialised field in cardiology which deals with heart rhythm disorders (arrhythmia) and the electrical system of the heart. It involves elucidating the conduction properties of the heart, mechanism of arrhythmias and curative ablation using radiofrequency energy or cryotherapy. It also includes the implant and management of cardiac implantable electronic devices (CIEDs) like pacemakers, defibrillators, cardiac resynchronization devices and loop recorders.

#### ARTICLE BY

Asst. Prof Seow Swee Chong  
Senior Consultant, Director  
of Cardiac EP and Pacing,  
NUHCS



Asst. Prof Seow is an accredited cardiac electrophysiologist under the Interventional Cardiac Electrophysiology and Cardiac Pacing/Defibrillation under the European Society of Cardiology. He helps the Heart Rhythm Programme (Arrhythmia Service) in NUHCS as the Director, oversees the management of the cardiac EP and pacing practice, as well as runs the Heart Failure clinic in NUHCS. He further specialised in heart rhythm disorders, pacemaker, loop recorder, cardiac devices as well as cardiac resynchronisation therapy for heart failure. He is also an active member of the European Heart Rhythm Association, and the Singapore Cardiac Society.

# NURSES LEVEL UP

*Cross-training strategy increases nursing competency*



Significantly increased demand for general anaesthesia involvement in electrophysiology (EP) procedures<sup>1</sup> in recent years is attributed to the increased complexity of procedures and patient co-morbidity.

At the National University Heart Centre, Singapore (NUHCS), the global trend was similarly experienced which consequently saw a sharp demand for general anaesthesia (GA) nursing support that could not be immediately filled.

For a nurse to qualify as an anaesthetic nurse, it typically takes specialised training as well as sufficient practical experience to manage responsibilities which include assisting the anaesthetist in the administration of anesthetic drugs during surgery, assisting ventilation and respiratory support throughout and after surgery, closely monitoring the patient's condition and their ongoing parameters to prevent any potential complications which are critical in patient care.

With the background and familiarity of cardiology interventional procedures as well as comprehension of critical parameters affecting cardiac patients, the invasive cardiac laboratory (ICL) nursing team was approached to take on the challenge of cross-training to render anaesthesia nursing support for patients going through EP procedures.

In kind, interventional EP trained nurses took on GA duties so they

could cross-over to provide GA nursing support when needed.

The cross-training of EP nurses and ICL nurses began in August 2020 in small batches to avoid straining manpower resources which were already strained by the on-going COVID-19 pandemic. Their training included job shadowing, practical training in the operating theatres as well as in the ICL. The nurses were also rotated on attachments and their training completed after achieving competency tests scrutinised by the department head.

By the end of 2021, the cross-training was complete. Now, NUHCS boasts an expanded network of competent nurses ready to better support a bigger spectrum of EP patients. This will relieve the manpower strain within the anaesthetic department, resolves the immediate shortfall of specialised trained anaesthetic nurses, and concurrently enhancing the skills and competency of ICL nurses.

<sup>1</sup>EP procedure – A procedure to treat the heart's abnormal rhythm.

#### ARTICLE BY

Ms Susan Lam So Shan  
Senior Nurse Manager,  
Ward 28, Coronary Care  
Unit (CCU) & Angiography  
Centre (ICL), NUHCS



As a Senior Nurse Manager, Ms Lam directs nursing service operations and development for the CCU and ICL at NUHCS. With over 20 years of clinical and management experience in coronary care nursing, she is also the ICL supervisor since 2014. In her role, she is responsible for the patient assessment and symptom management across the two units.

**“Only with the full support and commitment from our nursing teams to centre their efforts on patient care were we able to work in close collaboration and be able to rely on our colleagues to ensure our patients will have the care and support they need to recover.”**

Ms Susan Lam, Senior Nurse Manager,  
Ward 28, CCU & ICL, NUHCS

# LEARNING ACROSS SPACE AND TIME

*Proctor guides first Amplatzer Amulet LAA occluder implant remotely*



Proctor in Hong Kong communicating live and directly with doctors in NUHCS via cameras

The worldwide pandemic has dramatically changed almost all aspects of life perhaps, more so within the medical industry.

Quoting Vivian Greene, artist, author, and visionary, Dr Ivandito Kuntjoro, Director of Structural Heart Disease and Consultant, Department of Cardiology, National University Heart Centre, Singapore (NUHCS) echoed, "Life isn't about waiting for the storm to pass. It's about learning how to dance in the rain."

With the rapid advancement in telecommunications, one can connect with many others around the world with just a click.

People have been using technology to transmit huge packets of data to all corners of the world with no significant delay.

Medical conferences and meetings have been conducted in virtual reality within the medical community acclimatising to this approach, especially in the wake of the pandemic.

The heart structural team at NUHCS are amongst the first few using the live proctoring approach to learn new interventional procedures with the guidance of expert physicians based overseas.

On 27 Jul 2021, the team successfully implanted the Amplatzer Amulet left atrial appendage (LAA)<sup>1</sup> occluder device for the first time with guidance from an expert physician in Hong Kong through live streaming. The Amplatzer Amulet occluder is designed to work by blocking the LAA at its opening, minimising the opportunity for blood clots

ARTICLE BY

**Dr Ivandito Kuntjoro**  
Director of Structural Heart Disease and Consultant,  
Department of Cardiology,  
NUHCS



Dr Kuntjoro first joined NUHCS in 2012 as a cardiology fellow and is currently the Director of Structural Heart Disease. As a Consultant, he sees patients specialising in complex valvular heart disease, congenital heart, and pulmonary hypertension. He has authored or co-authored a few papers in peer-reviewed journals and has written a book chapter in Structural Intervention. He is actively involved in medical education as a core faculty of the Cardiology Senior Residency Programme. Before NUHCS, he worked as an internal medicine attending physician in the United States of America (USA) at the Cleveland Clinic Hospital in Ohio as well as at the Memorial Hermann Hospital in Houston.



Live streaming devices outside catheterisation lab with operator overseeing the live transmission of data

to form and migrate into the bloodstream.

Data such as hemodynamic, transesophageal echocardiography (TEE)<sup>2</sup>, and flow images were broadcast to Hong Kong. In addition, the first and second operator hand maneuvering and device preparation were monitored by the proctor based overseas as well. Due to the availability of such technology, the procedure carried on successfully, almost akin to having the proctor on site.

In this new era of technology advancement, proctoring as well as the implementation of new procedures and techniques can now continue across space and time, when in-person training cannot.

<sup>1</sup>LAA – A small sac connected to the left atrium which can become a source of blood clots, especially in patients with atrial fibrillation.

<sup>2</sup>TEE – A test using ultrasound to make detailed pictures of your heart by inserting an endoscope down the esophagus.

# NUHCS CARDIOLOGY SENIOR RESIDENCY PROGRAMME

## *New initiatives and updates to the programme*

The Cardiology Senior Residency programme at the National University Heart Centre, Singapore (NUHCS) is internationally accredited by the Accreditation Council for Graduate Medical Education-International (ACGME-I) and has been running for the past 18 years with 24 alumni working in various cardiology departments in hospitals across Singapore.

The programme was recently updated to reflect present-day resources that are essential for practicing cardiologists. Taking feedback from faculty members, alumni, as well as senior residents, three core areas were enhanced – curriculum review, competency assessment, and faculty development.

## CURRICULUM REVIEW



The Core Cardiovascular Training Statement 4 (COCATS 4), an ACGME-based cardiovascular training curriculum, was incorporated to provide granularity as well as the expected depth of knowledge to the current curriculum. In addition, the posting briefs for all clinical rotations were updated to provide clearer guidance to the various training opportunities and resources available. A library of the important guidelines and references for the major cardiovascular conditions was also created.

## COMPETENCY ASSESSMENT



In line with the Ministry of Health's (MOH) move to assess residents' competency following the Entrustable Professional Activity (EPA) concept, the assessment structure was modified to allow more workplace-based assessments via mini clinical evaluation exercises (Mini-CEX). This is expected to provide a clearer assessment of the resident's clinical abilities to allow faculty to guide continued improvement.

## FACULTY DEVELOPMENT



The roles and responsibilities of the various faculty members were defined per MOH's Revised Faculty Development Framework for Postgraduate Training. In addition, there is a greater emphasis on faculty training in medical education. Appropriate courses were identified to facilitate faculty registration for the appropriate online learning sessions.



*With these initiatives, we expect to achieve better training outcomes for our residents so that they will be well-poised to provide critical cardiovascular care.*

Asst. Prof. Yeo Wee Tiong,  
Senior Consultant, Department  
of Cardiology, NUHCS



### ARTICLE BY

Asst. Prof. Yeo Wee Tiong  
Senior Consultant,  
Department of Cardiology,  
NUHCS



Asst. Prof. Yeo is one of the few certified electrophysiologists with experience in adult congenital heart disease arrhythmia management which he trained for during a fellowship at Royal Brompton Hospital in the United Kingdom (UK). He is an active medical educator in his role as the Programme Director of the Cardiology Senior Residency Programme as well as an assistant professor at the Yong Loo Lin School of Medicine, National University of Singapore.

# WHAT IS A TRIAL FIBRILLATION

*An Irregular Heart Rhythm*

Electrical impulses in a healthy heart tell it to contract and relax in a regular rhythm, with a heartbeat about 60 to 100 times per minute, at rest.

During atrial fibrillation (AF), the electrical signals are chaotic. Erratic impulses cause the heart to contract irregularly and the heart to beat very fast up to 200 beats per minute.

AF may last a few hours for some people or could persist much longer in others, lasting for years. AF increases your risk of stroke, heart attack or heart failure, sometimes leading to death.



## SYMPTOMS

- Heart palpitations, i.e. heart is pounding or fluttering
- Shortness of breath
- Dizziness or light-headedness
- Feeling weak or lethargic
- Pain or discomfort in your chest
- Increased frequency of urination
- Some may not experience any symptoms



## INCREASED RISK OF AF

- Age over 60
- High blood pressure
- Heart diseases or prior open heart surgery
- Sleep apnea
- Thyroid disease
- Diabetes
- Chronic lung disease
- Excessive alcohol or stimulant use



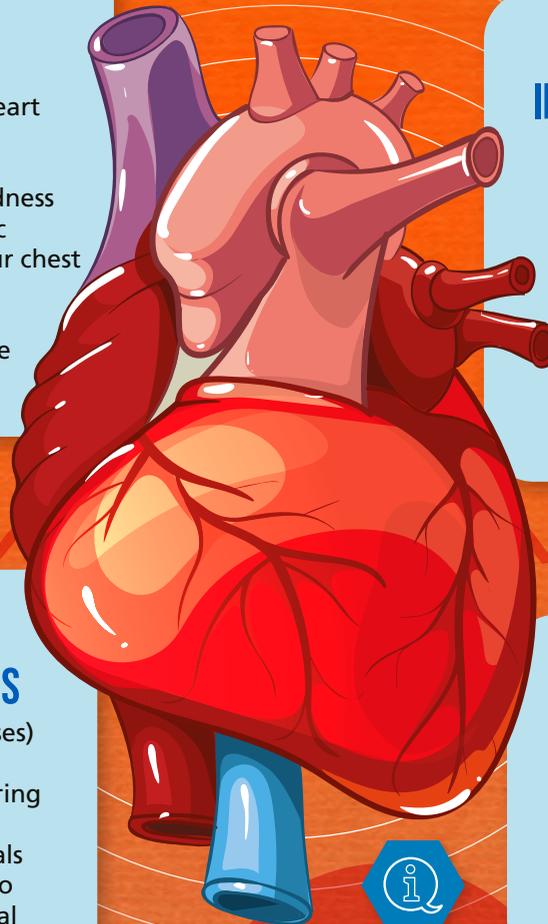
## TREATMENT OPTIONS

- Medication (for most cases)
- Device implantation
- Ablation procedure scarring heart tissues to block abnormal electrical signals
- Electrical cardioversion to restore the heart's normal rhythm
- Surgery including various minimally invasive options



## PREVENTION

- Healthy lifestyle
- Avoid smoking
- Avoid excessive caffeine and alcohol
- Manage stress



AF is a progressive disease that gets worse if left untreated over time.

*Please see a doctor if you suspect that you may have AF.*

ARTICLE BY

NUHCS Pulse  
Editorial

# LEADERSHIP IN CARDIOLOGY

ARTICLE BY  
 NUHCS Pulse  
 Editorial



*A/Prof Yeo Tiong Cheng on his new leadership role*

**A/Prof Yeo Tiong Cheng, Senior Consultant, Department of Cardiology, National University Heart Centre, Singapore (NUHCS) has recently been appointed to a newly-created role, Group Chief Cardiology, National University Health System (NUHS).**

In his role, he will be leading and directing staff and programmes of the cardiology departments across NUHS Cluster, overseeing the entire spectrum of patient care services from primary care in the polyclinics and with general practitioners (GPs) partners, to those with chronic conditions and require intermediate or long-term care.

As a cardiologist for more than 30 years, he has witnessed many changes to how doctors treat and hospitals manage patients and diseases, including an explosion of innovative medical technologies in the past decade which have shifted how doctors treat cardiovascular diseases.

Despite the vast changes, one thing remains the same – people get sick and they look for hope in a cure or at least to be relieved of their suffering. While the adult mortality rate of Singapore has fallen signifi-

cantly from the 1970s to 2010, deaths from cardiovascular diseases have risen in proportion.

In this interview, A/Prof Yeo shared his thoughts about the imminent challenges cardiologists face today, some of the transformative changes he has witnessed in healthcare, and how he hopes to better patient care in his new role.

**Pulse: What has been the most remarkable achievement in cardiology over the last decade?**

**A/Prof Yeo:** Cardiology is a rapidly advancing field in medicine. Every cardiologist has his or her own opinion on the most remarkable achievement be it an achievement in interventional cardiology, structural intervention, electrophysiology, or cardiac imaging.

For me, I find the rapid advancement made in percutaneous valve intervention particularly remarkable. For many

*“Importantly, AI may free up time for ‘doctoring’, a soft skill which we must continue to hone while improving patient care and outcomes.*

A/Prof Yeo Tiong Cheng, Senior Consultant Cardiologist at the Department of Cardiology, NUHCS

years, percutaneous transvenous mitral valve commissurotomy<sup>1</sup> has remained the only percutaneous option available for adult patients with valvular heart disease. Now, we have percutaneous options for patients with aortic valve stenosis<sup>2</sup>, mitral regurgitation<sup>3</sup> and possibly tricuspid regurgitation<sup>4</sup> in the near future. This has given our patients with valvular heart disease more treatment options.

**What is a key influential trend in the practice of cardiology today?**

Artificial intelligence (AI) touches many facets of modern living including the practice of medicine. AI can improve the practice of cardiology by providing more accurate diagnosis faster, detecting cardiac abnormality earlier, and predicting outcomes more accurately. There are some concerns that AI may make cardiologists redundant but we should embrace AI if it can aid in the diagnosis, risk prediction, and disease management decisions, for the good of our patients.

**What are your top three aspirations as Group Chief of Cardiology?**

One, strengthen the NUHCS identity amongst our staff so that each one of us can be proud to be a member of the NUHCS family. Two, collectively provide the best clinical service to our patients. Importantly, our patients must be able to receive the same level of care, and expect an equally excellent outcome no matter which NUHCS hospital they go to. Three, contribute to cutting-edge cardiovascular research that can translate to better outcomes for our patients.

**What are your secrets to juggling the demands of your professional and personal life?**

I try not to think about work once I leave the office. Unfortunately, those who have received WhatsApp messages or emails from me after hours can attest to my not-so-successful endeavour in this. I find that regular exercise helps to keep me sane and is good for mental health.

**What has been the most remarkable achievement in NUHCS?**

In the short span of just over 10 years, we have been able to build an excellent team of clinicians, clinician educators, and clinician scientists. For any organisation to succeed, it must have good people. NUHCS has managed to build a team of excellent people who can propel NUHCS into the future.

**What keeps you awake at night?**

I am sorry to disappoint you but work matters do not keep me awake at night. Usually, it is football. As I grow older, I try not to keep late nights. Instead, I record the games and watch them early in the mornings, before anyone can tell me the score.

**How could someone, who only has 10 minutes a week, focus on his/her cardiovascular health?**

10 minutes a week is too little to do anything meaningful. Achieving good cardiovascular health requires some effort and time investment. But if you really can only afford 10 minutes a week, then I would recommend that you do deep breathing exercises. Deep breathing exercises can help you to relax, improve sleep quality, and are good for cardiovascular health. You can do this anytime, anywhere.

<sup>1</sup>mitral valve commissurotomy – An open-heart surgery that repairs the mitral valve.

<sup>2</sup>aortic valve stenosis – Condition when the heart's aortic valve narrows.

<sup>3</sup>mitral regurgitation – Condition when the mitral valve in the heart does not close tightly causing blood to flow backwards into the left atrium.

<sup>4</sup>tricuspid regurgitation – Condition when the tricuspid valve in the heart does not close tightly causing blood to flow backwards into the right atrium.

# A DEVOTION TO RESEARCH

ARTICLE BY

NUHCS Pulse Editorial

*Prof Lee's affinity for research is straight as an arrow*

One year shy of two decades is how long Prof Lee Chi Hang, Ronald has been with the National University Heart Centre, Singapore (NUHCS). He moved here from Hong Kong in 2003.

Singapore was just beginning to make headway in the advancement of medical research. When the opportunity presented, avid researchers Prof Lee and his wife, took a leap of faith to move to Singapore. He has not looked back since.

Prof Lee counts on the support and guidance from his superiors and peers who kept him on his path when the future seemed fraught with uncertainty, especially when he first arrived. As English was not his first language, he repeatedly had to re-draft his manuscripts and grant applications.

Prof Lee always had an affinity with research. Three years after graduating from medical school, he published his first paper – a case report on myocarditis<sup>1</sup>.

Today, he has published over 200 articles in numerous peer-reviewed medical journals and is a recipient of several grant awards. He decided on carving out a niche when he came across an interesting

paper on the effect of obstructive sleep apnoea (OSA) on cardiovascular disease. The initial findings presented by the team of sleep physicians who published that paper piqued his curiosity and raised more questions for the cardiologist in him and the compulsion to find out more.

As a Senior Consultant Cardiologist at the Department of Cardiology, National University Heart Centre, Singapore (NUHCS), Prof Lee takes on clinical duties, where he treats patients, specialising in percutaneous coronary intervention. In April 2021, he has started treating patients with OSA.

In 2021, he earned a tenured professorship for his extensive research on OSA and its impact on cardiovascular diseases.

He shares, "The academic recognition is the reason I migrated to Singapore, inevitably it means a lot to my family, my research team, and me. I'm glad to have finally reached this milestone, with perseverance and some luck."

Prof Lee was also recently appointed as NUHCS Group Director for Clinical Research. With this new role, he will focus on strengthening the Centre's clinical research portfolio by devoting his time to support aspiring junior

clinician-scientists in NUHCS and encourage collaborative research between cardiologists, cardiothoracic and vascular surgeons for a more holistic approach to the cardiovascular disease burden.

At the moment, Prof Lee is focused on NUHCS' collaboration with the National University Centre for Oral Health (NUCOH) on a clinical trial to evaluate the role of treating OSA using a mandibular advancement device (MAD)<sup>2</sup> in blood pressure control. MAD targets the restrictive craniofacial phenotype common in Asians that affects the successful outcome of treatment. Hence, Prof Lee is determined

*“After many years of nurturing a research culture, we are seeing more and more juniors with immense potential and the talent to succeed in pursuing a career as clinician scientists. I hope to motivate and inspire more young talents down this path.”*

Prof Lee Chi Hang, Ronald,  
Senior Consultant Cardiologist at the  
Department of Cardiology, NUHCS



to investigate further to help clinicians make better decisions in prescribing the treatment for Asian patients.

Taking some time out, Prof Lee discussed juggling the roles of a clinician and a research scientist.

### ***What is currently the most pressing issue for you?***

Lack of awareness that OSA is a cardiovascular risk factor is the most pressing! Our study has shown that 30% of the Singapore population has OSA, yet 90% are not aware of their condition.

At this moment, continuous positive airway pressure (CPAP)<sup>3</sup>, a treatment for OSA, is considered a non-reimbursable expense in Singapore. This means that patients who choose to proceed with the therapy will have to bear the full cost. I hope my research will show evidence that treating OSA will improve cardiovascular health. Hopefully, that can influence policy changes in the long term.

### ***Did you always want to become an interventional cardiologist?***

This is embarrassing for me. The truth is interventional cardiology chose me. Back then, I worked in a small cardiology unit with one arrhythmia specialist and one heart failure specialist. However, the chief of interventional cardiology was the one who showed me kindness and offered me many learning opportunities. After passing my cardiology exit examination, he even supported my fellowship training under Prof Patrick W Serruys, one of the pioneers in interventional cardiology, in Rotterdam. Hence, I am where I am today.

### ***What are some of the biggest struggles a clinician-scientist would face?***

Perseverance, tenacity, and resilience are very important traits, including the ability to accept rejection. Academic publication is highly competitive. Even for senior clinician-scientists, having

manuscripts or grant proposals rejected is very common.

### ***What advice would you give to younger aspiring clinician-scientists?***

I think that now is the best time ever for anyone contemplating pursuing an academic career. The NUHCS leadership is committed to develop, nurture, and support young clinician-scientists. So, be bold and step out of your comfort zone—you will find lots of fun and satisfaction in being a clinician-scientist.

### ***Could you share how you juggle family and work commitments?***

Sacrifice is the keyword. Like many clinician-scientists, I spend most of my weekends and vacations writing manuscripts/grants and conceptualising new research ideas. I travel frequently to present at scientific conferences and for academic networking. Fortunately, my wife has a relatively regular working schedule; hence she has taken on the role of the primary caregiver for our children.

<sup>1</sup>myocarditis – An inflammatory disease of the heart muscle.

<sup>2</sup>MAD – An appliance that treats OSA by increasing the airway diameter with soft tissue displacement in the mouth.

<sup>3</sup>CPAP – The conventional method of respiratory therapy where a set pressure to the airways is maintained throughout the respiratory cycle by pressurization of the ventilator circuit.

# ANSWERS WITHIN RESEARCH

ARTICLE BY

NUHCS Pulse Editorial

*Life as a cardiologist is more than just being in a clinic*

As a newly promoted consultant within the Department of Cardiology at National University Heart Centre, Singapore (NUHCS), Dr Koo Chieh Yang Christopher is no rookie in juggling clinical duties and research work.

He has published several papers on coronary artery diseases and won many awards for his research. At age 31, he won the first prize in the Singapore Cardiac Society Young Investigator Award, which he won again three years later. At age 33, he earned his Master of Clinical Investigation from the National University of Singapore.

Dr Koo completed his medical education in the United Kingdom (UK) before returning to Singapore in 2011 to complete his cardiology training at NUHCS. He attributes his aptitude for research to his formative years in the UK, where there was a strong focus on research. His time there cultivated a habit of attending to patients during clin-

ical rounds and unearthing solutions to medical issues through research.

Recently, he turned his research focus to investigating the effects of cancer and cancer treatments on the cardiovascular system. He hopes the research could bring insight to provide better treatments for his patients.

Dr Koo discussed undertaking research amidst a busy clinic schedule, and how he still manages to keep his sanity.

***Did you always want to practice medicine?***

**Dr Koo:** Not really. Thankfully I did ok in school and could choose what to study, so I decided to choose something like Medicine which was less restrictive. That meant that if I didn't like medicine, I could still have the option to switch to business, teaching, etc.

***Could you share more about your research interest in sleep-disordered breathing and heart disease?***

This is purely due to my mentor, Prof Ronald Lee. Prof Lee is an expert on this topic and has extensive research in this field. He provided the opportunity to participate in his research within sleep-disordered breathing. This offered invaluable opportunities and I am very grateful to him for his continued guidance.

***How critical is being an active researcher for a cardiologist?***

I think research offers the opportunity for a doctor, or cardiologist, to seek answers to questions that we may ask ourselves during our daily practice. For example, before my exposure to research within sleep disordered breathing, I would have never thought that the impact of sleep on the heart could be so impor-



*In another life, I would perhaps have led a comparatively carefree life. But I am deeply humbled to be in a position today where I am able to help others and use my skills to lessen their pain.*

Dr Koo Chieh Yang Christopher,  
Consultant, Department of  
Cardiology, NUHCS

tant. There are still many more questions to be answered, and hopefully, with time and further research, the association between sleep and the heart will be even clearer.

**Could you share your secret to achieving these at a young age?**

No secret, just a lot of luck and having a good mentor. I remember Prof Ronald Lee would kindly spend his time after work hours to rehearse presentations with me. Even today, I still craft my presentations guided by the invaluable advice he has given.

**Where would you like to be in your career, five years from now?**

Currently, I am branching into research focusing on the intersection between

cancer and the heart (cardio-oncology). This is my personal interest and my tiny personal aim is that through research, we are able to understand the impact of cancer on the heart and vice versa, and improve the health of our cancer patients through individualised care.

**What are the biggest challenges in being a clinician as well as a scientist/researcher?**

Time. There just is never enough time. It is always a challenge juggling clinical work and research. It is something that I am still learning.

**What is the most misunderstood aspect of being a cardiologist/researcher?**

That you cannot be good at both. That you end up being a 'Jack-

of-all-Trades but master of none'. I think we have excellent examples within the department to aspire towards, such as Prof Ronald Lee and A/Prof Mark Chan.

**What are the best parts of your job?**

Interacting with people. Not many other jobs allow you to interact with a stranger on such a personal level, and thereafter have the opportunity to develop a relationship with for years, after earning their respect and trust. I think it is a very privileged position to be in.

**What is your secret to juggling the demands of your professional and personal life?**

No clue, still trying!

# FOR GOOD MEASURE

*Pushing the boundaries of technology in cardiac haemodynamics*

Precise evaluation of cardiac haemodynamics<sup>1</sup> is critical in accurate diagnosis and management of patients in cardiology. Cardiologists analyse intra-cardiac pressures, volumes as well as flow states to better understand their patients' heart conditions, and predict steps in optimising those who are critically ill.

Current techniques in the measurement of cardiac haemodynamics require the introduction of invasive lines for measurement of pressures. This includes right heart catheterisation<sup>2</sup>, central line insertion, as well as intra-arterial line insertion. These represent the gold standard for accuracy but are known to run the risk of complications such as bleeding or infections.

Dr Lim Yinghao, Consultant, Department of Cardiology, National University of Heart Centre, Singapore (NUHCS) is breaking new ground in his development of non-invasive methods

that can provide the same level of accuracy without the ensuing risks of an invasive procedure.

Apart from his clinical interest of structural heart imaging and intervention, and adult congenital heart disease, he has a long-standing special interest in medical technology innovation. Dr Lim has been centering his efforts on research and development in medical device innovation through extensive collaboration with academic institutions and the medical industry. He has been involved in many projects as the principal and co-investigator in the development of devices that can help to improve diagnostic capabilities in the fields of phonocardiography<sup>3</sup>, remote monitoring and non-invasive pressure measurement.

In recognition of his achievements, Dr Lim was awarded the National Medical Research Council Clinician Innovator Development Award in 2021. He has

*“I'm extremely grateful to the support from A/Prof Leo Hwa Liang from the Department of Biomedical Engineering, National University of Singapore, my mentor Dr Edgar Tay, and the Department of Cardiology. Their support has been instrumental in my journey improving medical care through technological innovation.*

*Dr Lim Yinghao, Consultant, Department of Cardiology, NUHCS*

dedicated this grant award to support his ongoing medical technology endeavours, a few of which address the drawbacks in current measurement of intra-cardiac haemodynamics.

Recently, his research team developed a system to accurately acquire intra-cardiac haemodynamics measurements non-invasively, avoiding the need for procedures. His novel system has undergone heavy benchmarking and rigorous laboratory trials. Ex vivo studies have shown excellent accuracy even when compared to the current gold standard. This system is currently under a patent application and promises to provide cardiologists with a new precision tool for better care of their patients.

<sup>1</sup>cardiac haemodynamics – The study of blood flow in the cardiovascular system.

<sup>2</sup>right heart catheterisation – Procedure in which a fluid filled tube is inserted into the heart to measure pressure and flow within the heart.

<sup>3</sup>phonocardiography – The study of heart sounds and murmurs.

#### ARTICLE BY

Dr Lim Yinghao  
Consultant, Department  
of Cardiology, NUHCS



Dr Lim is presently a Consultant at NUHCS. He is the course co-director for the Chia Boon Lock Cardiology Review Course and the Cardiology PACES Course. He specialises in structural imaging and intervention, pulmonary hypertension, and adult congenital heart disease. He has taken a personal interest in medical device innovation and won numerous grant awards in support of his research.



# Awards

## SINGAPORE NATIONAL DAY AWARD

Established in 1962, the annual National Day Awards recognises various types of merit and service to the nation. Singaporeans and non-Singaporeans alike are honoured for outstanding contributions to the civil or military service, social and community work or excellent performance in their own field.

**A/Prof Yeo Tiong Cheng**  
received the Public  
Administration Media (Bronze)

**Ms Miao Shilan**  
received the  
Long Service Medal

## DISTINGUISHED SENIOR CLINICIAN AWARD 2021

A prestigious accolade, this award is conferred by the Ministry of Health (MOH) to recognise eminent senior clinicians in Medicine and Dentistry in the public healthcare sector who are known as key opinion leaders in their areas of expertise, and who have made outstanding contributions to the medical profession, public healthcare and the international community in the domain areas of clinical practice, education and research.

**A/Prof Yeo Tiong Cheng**  
Group Chief Cardiology, NUHS

## NUH MODEL ALLIED HEALTH PROFESSIONAL AWARDS 2021

This award recognises allied health professionals and pharmacists who have made significant contributions in total care delivery under four separate categories – Patient Centeredness, Clinical Effectiveness, Clinical Education, Research Contribution. Additionally, the pinnacle Excellence Award is given to one employee who excelled in all four categories.

**Ms Foo Chong Cha Florence**  
Senior Medical Technologist  
received the award for Patient  
Centeredness

## MOH NURSES' MERIT AWARD 2021

This award recognises nurses who have displayed noteworthy and exceptional performance, participated in professional development, and contributed to raising the nursing profession. Nurses are nominated for the award by their healthcare institutions and selected by a panel set up by MOH.

**Ms Fu Yong Xin**  
Nurse Manager

## ONENUHS NIGHTINGALE AWARD 2021

This award is given to nurses in recognition of their excellent performance and significant contribution to the nursing profession within the OneNUHS Group.

**Ms Maribel Galicinao Castro,**  
Senior Staff Nurse, Ward 7A

**Ms Pinto Julian Dong Oh,**  
Senior Staff Nurse, Ward 28,  
Coronary Care Unit

**Ms Saraswathy D/O Nadarajan,**  
Senior Staff Nurse, Heart Clinic

**Ms Toon Pei Jun,**  
Senior Staff Nurse, Ward 63

**Ms Wang Xi,**  
Asst. Nurse Clinician, Ward 20,  
Cardiothoracic Intensive  
Care Unit

### NUHS QUALITY IMPROVEMENT PROJECT

This recognition award was given to the project group in recognition for their solution to reduce the rate of site haematomas and related complications for patients undergoing cardiac catheterisation.

**Team Lead:**

Dr Gavin Ng Yeow Peng

**Sponsors:**

Asst. Prof Chai Ping  
A/Prof Low Fatt Hoe Adrian

**Team Members:**

Dr Chen Zhengfeng Jason  
Dr Chook Kah Hean Shaun  
Ms Gan Chew Huang Juvena  
Ms Hoe Kwee Fong  
Ms Yan Foong Yee  
Ms Lim Hooi San  
Ms Low Qi Yu

### NUHS EDUCATORS' DAY 2021

#### NUHS TEACHING EXCELLENCE AWARD (MEDICAL)

Dr Ng Yeow Peng Gavin  
Consultant, Department of Cardiology

#### NUHS TEACHING EXCELLENCE AWARD (NURSING)

Ms Chua Yi Ling  
Senior Staff Nurse II, Ward 63

Ms Owe Sze Ling  
Senior Nurse Educator,  
Ward 7A

# Congratulatory Announcements

## Congratulations



to A/Prof Poh Kian Keong, *Senior Consultant and Director of Research, Department of Cardiology, NUHCS*

On being appointed Chair of the American College of Cardiology's Assembly of International Governors (AIG).

AIG is the international arm of the American College of Cardiology to advise the College on ongoing international efforts in scientific collaboration, education and knowledge exchange. With 42 chapters in over 50 countries, it has more than 15,000 international members. A/Prof Poh is its first Asian Chair.

## New Appointments

These doctors take on new appointments within National University Health System (NUHS) and National University Heart Centre, Singapore (NUHCS):



**A/Prof Theodoros Kofidis,**  
Group Chief Cardiac, Thoracic and  
Vascular Surgery (CTVS), NUHS



**A/Prof Yeo Tiong Cheng,**  
Group Chief Cardiology,  
NUHS



**Prof Ronald Lee Chi Hang,**  
Group Director of Clinical  
Research, NUHCS

## Our Newly Promoted Doctors

**Dr Lim Yinghao,**  
Consultant,  
Department of  
Cardiology



With effect  
from 1 Jul  
2021:

**Dr Koo Chieh Yang  
Christopher,**  
Consultant, Department  
of Cardiology



**Dr Sim Hui Wen,**  
Consultant,  
Department of  
Cardiology



**Dr Chen Zhengfeng  
Jason,** Consultant,  
Department of  
Cardiology



**Dr Isabel Ahmad,**  
Consultant,  
Department of  
Cardiology

With effect  
from 2 Aug  
2021:



**Dr Qian Qi,**  
Associate  
Consultant,  
Department of CTVS



**Dr Li Yue,**  
Associate  
Consultant,  
Department of CTVS

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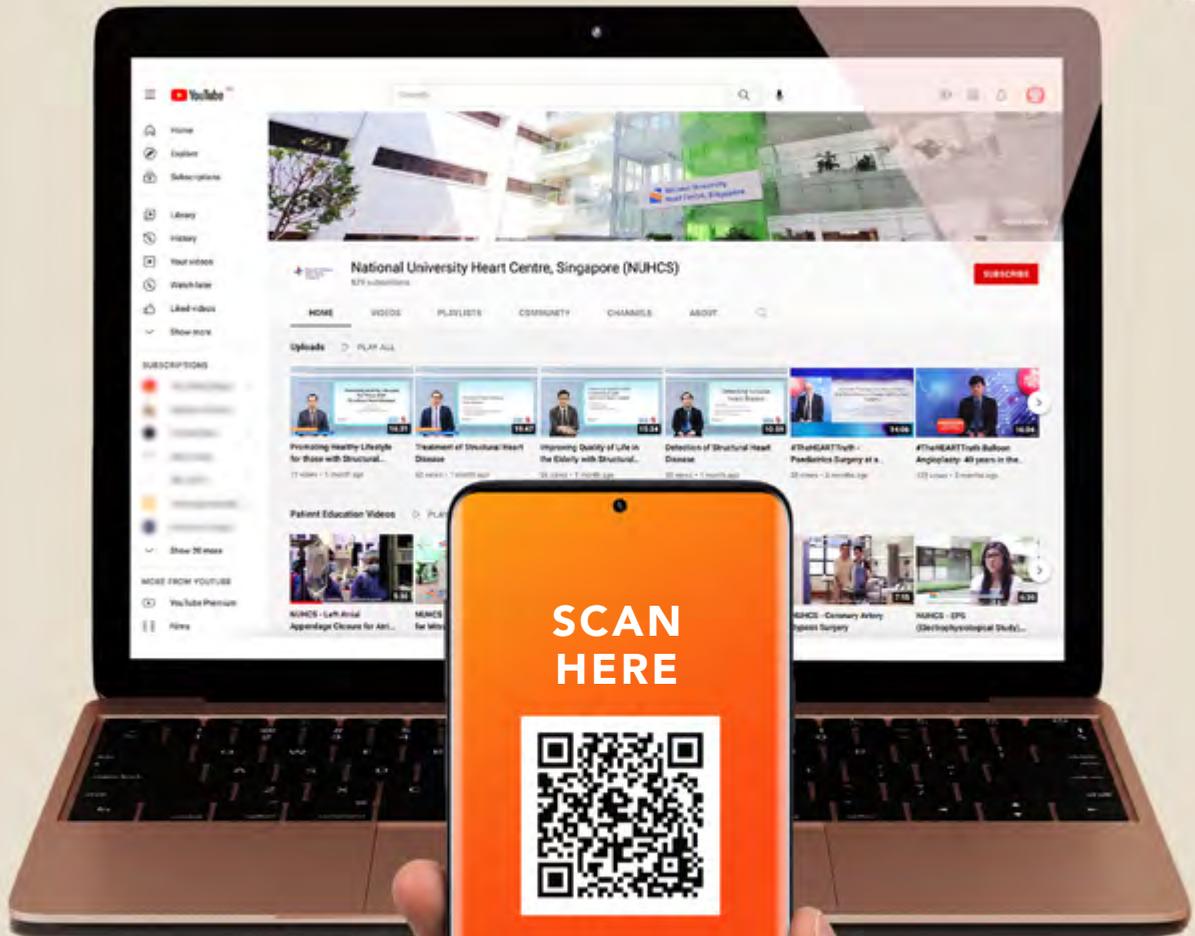
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