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PULSE

Issue 29 • July 2017

The Evolution of Cardiovascular Research



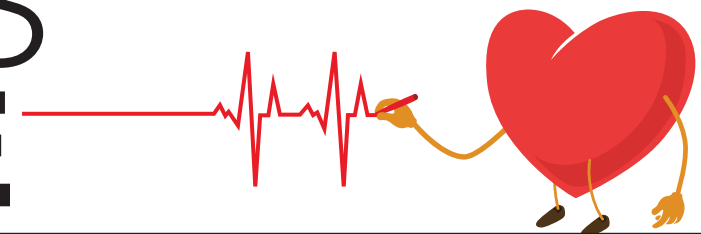
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**Beyond the
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Lending a Hand on Flight

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Tell us what you like and not like
about this issue of Pulse and the
best entries will stand to win
**a pair of 4GB USB wrist
band worth \$20!**

Send your entry to nuhcs@nuhs.edu.sg with your name.
Winning entries will be featured in the next issue of Pulse!



Reaching New Milestones

The Evolution of the Cardiovascular Research Institute (CVRI)

CVRI, the research arm of National University Heart Centre, Singapore (NUHCS), has come a long way since its inception in 2009. Prof. A. Mark Richards gives his take on the development of CVRI and its research grants from then till now.



Prof. A. Mark Richards (seated on the right) with the team at the CVRI.

What was CVRI's research work like in the beginning?

When I first joined CVRI in 2009, there wasn't a dedicated research centre focusing on basic science or cardiovascular disease. My first task was to recruit basic scientists and clinicians interested in and able to undertake heart research. A/Prof. Mark Chan and A/Prof. Roger Foo, Senior Consultants, NUHCS; Asst. Prof. Chester Drum, Consultant, NUHCS; and A/Prof. Carolyn Lam, Senior Consultant, National Heart Centre Singapore (NHCS) were one of our first team members.

Key clinician scientists within NUHCS also included A/Prof. Ronald Lee and A/Prof. Poh Kian Keong, Senior Consultants, NUHCS. Basic scientists who have helped build our laboratory "wet lab" capacity from the ground up in-

About Cardiovascular Research Institute (CVRI)

Since late 2009, CVRI has evolved from an aspirational concept to a formidable and expanding infrastructure (engaging over 100 basic scientists, clinician scientists and support staff) with a growing capacity to pursue a primary mission – the conduct of translational research in Heart Failure.

clude Dr. Liew Oi Wah, Dr. Wang Peipei, Dr. Wong LeeLee, Dr. Chen YT and Prof. Tan Huay Cheem, Director, NUHCS. He has been very proactive in supporting the development of NUHCS's research. The emergence and strengthening of each new team member has been very special for me.

What are some of the key milestones achieved by CVRI with regards to research grants?

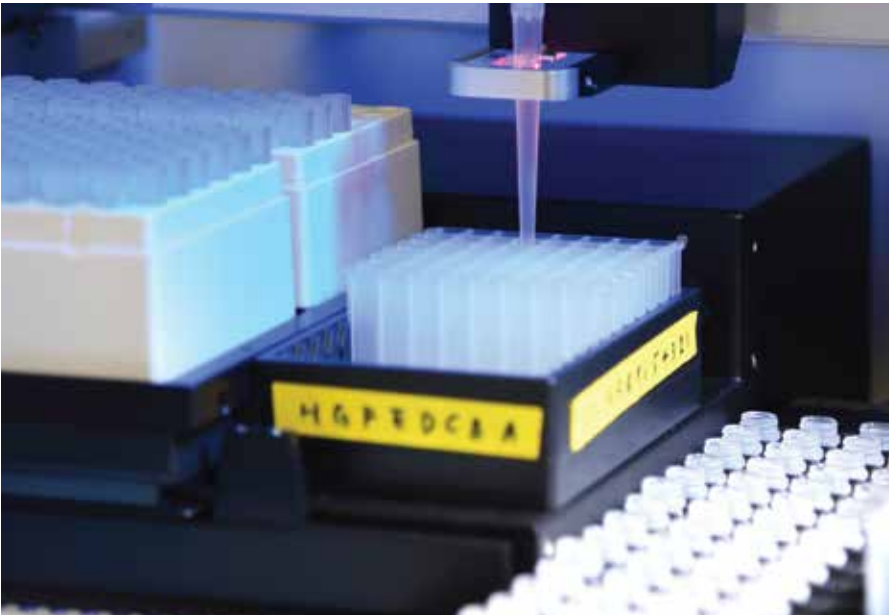
We clinched our very first National Medical Research Council (NMRC) Centre Grant in 2010, having started the planning and writing for the grant throughout the mid to late part of 2009.

The Centre Grant, along with NUHCS's start-up support, helped build CVRI's foundation.

Worth S\$6 million for three years (2010-2013), the grant provided us a springboard to establish key infrastructure for both clinical and basic research.

The grant helped equip and staff the immunoassay laboratory and enabled us to set up our Singapore-wide clinical cohorts in heart failure, heart valve disease and coronary heart disease.

This clinical network of research coordinators and cardiologists has enabled recruitment of a total of more than 10,000 patients with heart failure, coronary disease and heart valve disease both within and beyond Singapore's borders. We have also recruited healthy participants from the Singapore Longitudinal Ageing Studies to provide a control group.



The first grant also enabled us to develop our capacity and generate initial findings to apply for other grants. Subsequently, we successfully won our second (2013-2017) and third Centre Grants (2017-2021) each worth S\$10 million over four years.

Other grants include multiple Clinician Scientist Awards to our key clinical scientists (A/Prof. Lam, A/Prof. Chan, A/Prof. Foo, Asst. Prof. Drum and A/Prof. Lee); a Singapore Translational Research Investigator Award (STaR) award to myself; multiple individual research grants (IRGs); the Translational and Clinical Research (TCR) Flagship Programme; and partnership contracts with the industry, all totaling over S\$50 million over the last seven years.

In collaboration with NHCS and NUHCS, we have now acquired one of NMRC's newly created collaborative Centre Grants.

Worth S\$7 million over four years, the grant specifically supports clinical research projects conducted in partnership between NUHCS and NHCS, emphasising a new era of productive cooperation between the country's two Heart Centres.

What are some of the other achievements of CVRI?

We have also developed a national community of cardiovascular researchers with excellent integration between the two Heart Centres and a collaboration with Nanyang Technological University (NTU) and Prof. John Chambers, Professor of Cardiovascular Epidemiology, Imperial College London.

Other milestones include sophisticated screening techniques to discover and measure multiple circulating markers (e.g. proteins and peptides); cardiac epigenetics¹ development by A/Prof. Foo and Genome Institute of Singapore; and a spread of world-class publications including A/Prof. Lee's sleep apnoea research (featured in Pulse Issue 27, page 31). I feel heartened when our team makes a major step forward.

Today, we have a laboratory that can measure heart-related biomarkers² and set up our own measurement methods. We now have a growing team of clinician scientists with remarkable abilities and talent. They include approximately five senior staff and 70-80 assistant staff in the wet lab facilities based on the 8th floor of the Centre for Translational Medicine building (MD6), a clinical network throughout Singapore's major hospitals and a regional collaborative network of more than a dozen Asia-Pacific nations involving another 200 staff.

In this way, NUHCS and CVRI have become a premier cardiovascular research entity within Asia-Pacific.

I am gratified and proud to make new discoveries that can make a difference to Singapore and the world. For instance, we have prospectively demonstrated for the first time that certain types of heart failure are less common and carry better outcomes.



Being a young discipline in this country, relative to eye and cancer research, for example, we have managed to raise cardiovascular research to greater heights in Singapore.

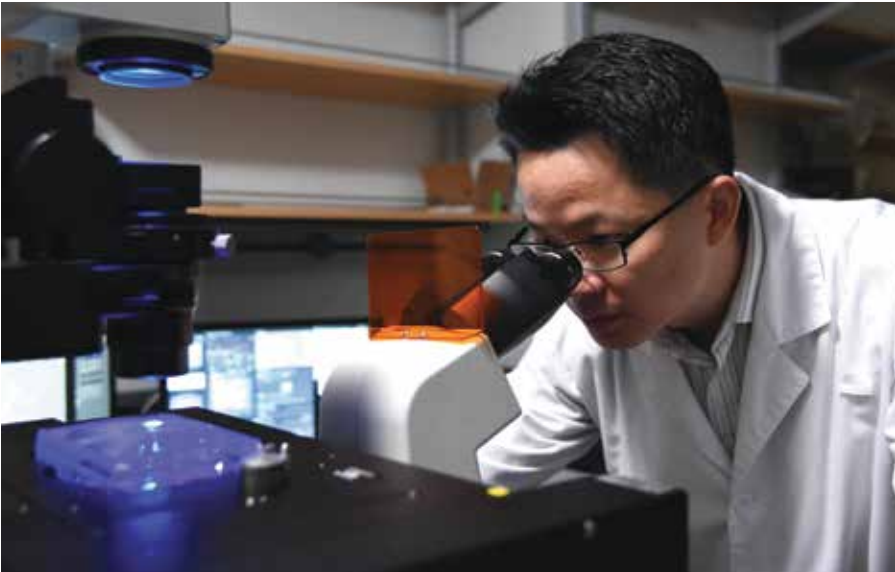
What are CVRI's plans moving forward?

We will continue playing to our strengths and focus on heart failure.

With the third grant, we aim to improve the heart's ability to recover from injury and regenerate itself, which we envisage will become a clinical reality within the next 10 years.

To tackle a national issue, the cardiovascular research community needs to come together to fight on the same side. Thus, we wish to next clinch a S\$25 million Open Fund - Large Collaborative Grant under National Medi-

cal Research Council working alongside NHCS, NUHCS, NTU, multiple A*STAR research institutes and multiple industry partners. This grant will launch a major national research initiative addressing Singapore's emerging epidemic of premature arterial disease from epidemiology and basic vascular biology all the



By Prof. A. Mark Richards
Director,
Cardiovascular
Research Institute
(CVRI), NUHCS

Prof. Richards has taken up the Directorship of the Cardiovascular Research Institute, Singapore, since October 2010. He leads a group focused on discovery and assay of cardiovascular biomarkers to assess an array of cardiovascular conditions including acute and chronic phases of heart failure, heart valve disease and coronary artery disease.

way through to therapeutic interventions.

This will inevitably overlap with underlying problems including diabetes and high blood pressure. The two domains of heart failure and arterial disease are intimately related to one another and Singapore requires this broadening of its cardiovascular research focus.●

¹ Changes in a chromosome that affect gene activity and expression.
² A measurable indicator of a biological state or condition.



Keeping Patients Safe in Our Premises

Inter-Professional Crisis Management Simulation Programme

Strengthening patient safety especially for high-risk patients has always been a key aim for National University Heart Centre, Singapore (NUHCS). Ms. Tay Miao Qin and Ms. Janice Kee show how the Patient Safety (PS) team achieves this aim through a well-designed simulation programme.

In alignment with NUHCS's patient safety guidelines, four facilities were identified as key service units that require rapid coordinated care due to their high-risk patient profiles and complexity of procedures performed there. The units are Angiography Centre, Diagnostic Cardiology Lab, Diagnostic Nuclear Lab and Coronary Care Unit.

The Simulation Programme

The PS team, led by Asst. Prof. Edgar Tay, Senior Consultant, NUHCS, developed our Inter-Professional Crisis Management Simulation Programme with support from Nursing and Operations and Administration divisions.

Launched in October 2016, the programme adopts patient safety strategies, team strategies and tools to enhance performance and patient safety (TeamSTEPPS).

Team STEPPS is an evidence-based teamwork system which improves patient outcomes by optimising communication and teamwork among healthcare professionals.

Both strategies seek to enhance staff's awareness towards the prevention of

medical errors and adverse event occurrence. The programme also harnesses key concepts on teamwork, leadership, situation monitoring, mutual support and communication.

Trainings and Discussions

Since its initial launch, the PS team has conducted five in-situ simulation programmes with 40 participants including clinicians, nurses, medical technologists, radiographers and patient service associates.

In-depth discussions were held with site supervisors and participants before the initiation of the programme. The PS team created realistic clinical scenarios as training platforms with the utilisation of manikins. The simulations were then video recorded for the trainers to review and identify areas for improvement.

Future Plans

The programme has been warmly received, with marked improvements in team performance and communication during crisis.

The PS team has made future plans for the programme, which includes:

- Bi-annual simulations for each critical unit;
- Simulations on inter-department complex cases such as operative theatre nurses, cardiothoracic surgeons, anaesthetists and perfusionists;
- Train-the-trainer programme to empower teams and ensure continuity of safe quality care for patients. •



By **Ms. Tay Miao Qin**
Assistant Manager,
Operations &
Administration,
NUHCS

Miao Qin oversees the operations of Diagnostic Vascular Lab and Heart Rehabilitation services. She also supports the Patient Safety Officers on patient safety initiatives in the Department of Cardiology.



By **Ms. Janice Kee**
Senior Nurse
Educator,
Coronary Care Unit
(CCU)
Ward 28, NUHCS

Janice joined NUH in 2003 and has been working in CCU Ward 28 since 2004. Joining the Intensive Care Unit/High Dependency team of educators in 2008, she fulfilled her passion for training and sharing knowledge and skills with others. She hopes to venture more into simulation training so that others can benefit from what she has learnt.

“Communication is of utmost importance to enable a team to function effectively. I would recommend my fellow colleagues to undergo this programme as well.”

– Hoe Kwei Fong, Senior Staff Nurse
(Angiography Centre)

Importance of an Athlete's Heart Health

Pursuing Sports Safely

Anomalous Coronary Artery¹ is a rare condition that can cause sudden cardiac death particularly in those with abnormal blood vessels. In the USA, this condition accounts for nearly 17 per cent of sudden cardiac deaths in competitive athletes. Asst. Prof. Yeo Tee Joo shares the case of a local athlete.

Mr. K* is a 20-year-old national serviceman with no significant medical history. He was also a keen athlete and a competitive water polo player.

Warning Signs

One day after a route march, Mr. K suddenly experienced chest pain and was found to have mildly elevated Troponin I, indicating stress to the heart and its surrounding structures.

His cardiac MRI scan showed a small layer of fluid around the heart but the contractility was unaffected and there was no scarring or damage to the heart muscle. These changes suggested Pericarditis² which is often self-limiting. Mr. K was discharged with anti-inflammatory painkillers to relieve his symptoms.

One month after discharge, the exertional chest pain still plagued Mr. K although he did not experience any fainting episodes. His treadmill test also turned out fine with no evidence

of abnormal electrical rhythm or inadequate circulation to the heart muscle. Given his persistent symptoms, however, a CT coronary angiogram was performed and it revealed an anomalous right coronary artery arising from the left coronary sinus with an inter-arterial course.

This abnormal course puts the right coronary artery at risk of being compressed between the aorta and pulmonary artery, particularly during strenuous physical activity. This leads to reduction or even complete cut-off of blood supply to the heart muscle. Consequently, abnormal heart rhythms and even sudden cardiac death may occur.

Treatment and Changes to Lifestyle

Mr. K was updated on the diagnosis, its impact on physical activities and risk of sudden cardiac death. He was also advised to limit physical exertion including ceasing competitive sports³. This meant that he had to withdraw from competitive water polo. However,

this extremely difficult decision was made less painful with clear guidance on safe exercise boundaries and strong family support. Mr. K continues to enjoy recreational water polo games at moderate intensity.

Mr. K's case illustrates the importance of uncovering potentially serious underlying illnesses and a structured approach to management in a dedicated Sports Cardiology clinic. The goal, wherever possible, is to enable athletes to continue pursuing their passion in a safe and moderated manner.●

5

Tips to Fight Heart Diseases

TIP 1



Engage in aerobic activities such as brisk walking and cycling.

TIP 2

Incorporate physical activities into your daily lives (e.g. take the stairs instead of the lift).

TIP 3



Exercise at least five days a week, 30 minutes each day.

TIP 4

Quit smoking, modify your diet and take time to relax.



TIP 5

Eat a Mediterranean style diet rich in olive oil.



By **Asst. Prof. Yeo Tee Joo**
Consultant,
Department of
Cardiology

Dr. Yeo completed subspecialty fellowship trainings in Cardiovascular Prevention and Rehabilitation at the Toronto Rehabilitation Institute and Sports Cardiology at St George's, University of London. He is now focused on improving the NUHCS Cardiac Rehabilitation experience for patients and establishing the Sports Cardiology service in NUHCS.

National University Hospital Sports Centre

The Sports Cardiology service at the NUH Sports Centre offers holistic management of athletic individuals with heart disease, including personalised guidance on participation and resumption of physical activities. Active individuals with cardiovascular disease are advised to seek medical evaluation.

To find out more or make an appointment, please email us at **Ortho_Sports@nuhs.edu.sg** or call us at **6772 2100**.

¹ Coronary artery with an abnormal origin.

² Inflammation of the lining of the heart.

³ Based on the 2015 American College of Cardiology Eligibility and Disqualification Recommendations for Athletes with Cardiovascular Abnormalities.

*Not his real name.

ECMO Retrieval Service

Temporary Life Support for the Heart and Lungs

National University Heart Centre, Singapore's (NUHCS) Extracorporeal Membrane Oxygenation (ECMO) Retrieval Service was created to help patients from other hospitals that do not offer ECMO.

One such patient is 44-year-old Mr. Seet Seng Khoon, who was able to receive continuous ECMO support after he was transferred to NUHCS by the ECMO Retrieval Team.



Background of ECMO Retrieval Service

When a heart patient's condition deteriorates, he or she may require ECMO support before and after surgery. To assist such a patient, NUHCS established the ECMO Retrieval Service in 2000 and extended it to other institutions by forming the ECMO Retrieval Team in 2016.

The team comprises Dr. Winn Maung M Aye (Director of Surgical ECMO Services), Dr. Hardip Singh, Dr. Ooi Oon Cheong, Dr. Harish Muthiah, Dr. Senthil Subbian and Dr. Darren Lee. One team member is scheduled to be on-call daily and he or she is tasked to gather the team and respond to all requests for the initiation of ECMO within and outside NUHCS.

To date, we have successfully instituted ECMO in 34 patients in 2016 – 24 in-patients of NUHCS and 10 retrievals from other hospitals.

A Patient's ECMO Journey to NUHCS

Mr. Seet was one of the patients who benefited from the ECMO Retrieval Service. He was admitted to Tan Tock Seng Hospital (TTSH) in October 2016 when he suddenly experienced breathing difficulties. His condition deteriorated rapidly within a few days and his respiratory status progressively worsened. He was then intubated and ventilated. However, his condition continued to worsen, requiring increasing ventilatory support. Despite this support, his respiratory status could not be optimised. Thus, the decision was made to support him on ECMO.

Mr. Seet was subsequently transferred to NUHCS on ECMO support for further management. He was kept on Veno-Veno¹ ECMO support to allow his lungs to recover and optimise respiratory status during the course of ECMO support.

"Although it was really emotionally disturbing to see my brother being connected to a machine, it really saved his life!" said his sister, Ms. Cecilia Seet.

A possible complication during an ECMO is bleeding from any part of the body. He developed colonic bleeding, which required multiple interventions by the Colorectal Surgical teams on several occasions. The anticoagulant², heparin infusion, was turned off due to colonic bleeding. Running ECMO circuit without heparin infusion has a high tendency to form clots within the circuit, which can be fatal. He also underwent multiple endoscopic interventions by the Colorectal Surgical team.

The Road to Recovery

During the ECMO support, Mr. Seet's condition began to stabilise and gradually started to improve.

He underwent tracheostomy in preparation of weaning off the ECMO support. It was gradually weaned down and on his 42nd day of ECMO support, he

was able to come off from Veno-Veno ECMO support.

He remained stable and his respiratory status gradually improved on conventional ventilatory support via tracheostomy. He was finally weaned off the ventilator. The tracheostomy tube was also removed during his recovery period.

Mr. Seet underwent rehabilitation in Senja Hospital and was regularly reviewed by the multidisciplinary team in NUHCS's outpatient clinic.

He was at last discharged from the hospital and was transferred to Senja Hospital for convalescence 122 days after discontinuation of Veno-Veno ECMO Support.

Eventually, he recovered completely and was discharged home two months after rehabilitation in Senja Hospital. Ms. Seet complimented the medical team and was touched by their concern during the most trying times. •

What is the ECMO Retrieval Service?

Launched in January 2016, the service provides the transfer of patients from other hospitals. When ECMO needs to be initiated, the team brings the equipment needed and assists to transfer the patient to NUHCS via an ambulance.



Benefits



Provides mechanical support for the heart and lungs



Delivers biventricular support to the heart



Executes easier and faster than other mechanical support



Allows faster recovery and supports brain and organ function

Which Other Hospitals is the Service Offered to?

The service is offered to Ng Teng Fong Hospital, Khoo Teck Puat Hospital and Tan Tock Seng Hospital.

¹ Blood is removed from the venous side and then pumped back into it.

² A substance that prevents blood from changing to a solid or semi-solid state.

NUHCS-NCIS Thrombosis Forum 2017

Emerging Therapies in Anticoagulation and Lipid Lowering

Held on 8 April 2017 at National University Health System Tower Block Auditorium, National University Heart Centre, Singapore (NUHCS) organised a Thrombosis Forum in collaboration with National University Cancer Institute, Singapore (NCIS).

The forum focused on all aspects of polyvascular thrombotic (blood clot found in a blood vessel) and non-thrombotic disease, including acute coronary syndromes (heart conditions), atrial fibrillation (irregular heartbeat), stroke and peripheral arterial disease (plaque build-up in the arteries).



By **Ms. Angeline Tan**
Senior Assistant Manager,
Communications &
Development, Ops &
Admin, NUHCS

Angeline's key roles involve creating new partnerships, fostering community outreach, fundraising and video production. As a team lead, she works hand in hand with her team to raise the profile and publicity of NUHCS through social media, campaigns and events. Believing that content is king, Angeline embodies this mantra as the editor of Pulse magazine.

The polyvascular thrombosis community came together to engage in an interactive forum where they had the opportunity to gain new knowledge and present their personal and region-specific insights.



Bringing their years of experience and expertise to the table, distinguished speakers from various local hospitals spoke about current concepts and practical strategies in managing thrombotic and non-thrombotic conditions effectively.

Go **RED** for Women 2017

Global Campaign on Women's Heart Health Awareness



Go Red for Women is a global annual campaign that aims to raise awareness of the issues of women and heart disease. In light of Mother's Day on 6 May 2017, the Women's Heart Health Clinic of the National University Heart Centre, Singapore (NUHCS) hosted/co-hosted two events to bring important heart health messages to women in Singapore.

In collaboration with Singapore Heart Foundation (SHF), we organised a public symposium aimed at imparting knowledge on the prevention and identification of women's cardiovascular disease.

We also held the country's first women's heart health preceptorship course which aimed to educate healthcare professionals on the presentation, pathophysiology and management of cardiovascular disease in women.

'Healthy Mummy, Healthy Family' Symposium



Held at Marina Mandarin Singapore, Ms. Valerie Teong, a Dietitian representing NUHCS Women's Heart Health Clinic (pictured on the left), shared nutritional tips for the family. The event also saw the soft launch of NUHCS's Facebook page. Participants who liked and shared our page had a chance to play the Plinko Machine and learn heart health tips through activities at our booth.



'The Heart of a Woman' Preceptorship Course



The interactive seminar addressed gender-specific differences in cardiovascular disease and aimed to educate clinicians on the pathophysiology and management of women's cardiovascular disease as well as teams focused on women's heart health and disease.

Three Days of Groundbreaking Science

ACC 66th Annual Scientific Session

Continuous learning is a deep-rooted culture in NUHCS as the medical industry advances rapidly. Dr. Christopher Koo shares NUHCS's experience at the American College of Cardiology (ACC) 66th Annual Scientific Session.

An International Platform
NUHCS was once again well represented with the largest delegation from Singapore at ACC's 66th Annual Scientific Session from 17 - 19 March 2017.

A/Prof. Adrian Low, Senior Consultant, NUHCS, was invited to speak at the International Perspectives joint session with the Hong Kong and American College of Cardiology on 'Lessons from the Early Adoption of Bio-absorbable Vascular Stents Use'.

Dr. Jeanette Ting was also interviewed on her study, 'Prevalence and Evolution of Sleep Disordered Breathing in Acute Myocardial Infarction'.

Our Latest Research Work
NUHCS also showcased our research strengths through multiple presentations across different topics.

These include novel indices for aortic stenosis led by A/Prof. Poh Kian Keong, imaging advances with three-dimensional echocardiography by Dr. William Kong, various stent outcomes post percutaneous coronary intervention by Asst. Prof. Joshua Loh, and the

effects of obstructive sleep apnoea on coronary artery disease by A/Prof. Ronald Lee, Dr. Jeanette Ting, Dr. Koo Chieh Yang and Ms. Cheung Yan Yi.

Dr. Nicholas Ngiam, Resident, NUHCS, was also one of the authors who won the best abstract from Singapore for their research work on non-invasive left ven-



By Dr. Christopher Koo
Senior Resident,
Department of
Cardiology

Dr. Koo is a cardiologist in training who believes in providing the best care for patients. He is also involved in several research projects and is often on the lookout for new research ideas.

tricular stiffness index. He received a certificate in recognition of the excellent work.

Held in Washington, DC, USA, the conference addressed medical professionals of different levels. We look forward to making NUHCS proud again at next year's session in Orlando!•



“ There were breaking trial sessions for the avid researchers, practical seminars on how to apply results from new trials to routine clinical practices, as well as revision sessions for those preparing for their examinations. ”

A Multidisciplinary Approach to Cardiovascular Care

SCS 29th Annual Scientific Meeting

Asst. Prof. Joshua Loh brings the highlights of Singapore Cardiac Society (SCS) 29th Annual Scientific Meeting (ASM). Themed 'Multi-disciplinary Approach to Cardiovascular Care', the ASM reflected a patient-centric approach as healthcare professionals work together to provide holistic care.

A Held from 31 March - 2 April 2017, the ASM attracted a record 530 participants and encapsulated a comprehensive programme addressing multiple levels of treatment for cardiac patients.

Guest of Honour Mr. Chee Hong Tat, Senior Minister of State, Ministry of Communications and Information and Ministry of Health, gave a speech at the opening ceremony.

Mr. Chee alluded to the changing trends in healthcare which included a multidisciplinary approach, use of tele-health tools and the expansion of community care.

Symposium and Key Sessions
Among the exciting programmes was a multi-disciplinary heart failure symposium helmed by Dr. Raymond Wong, Senior Consultant, NUHCS.

Other key sessions included dyslipidaemia management (with Endocrinology); stroke prevention in atrial fibrillation (with Neurology); current



By Asst. Prof. Joshua Loh
Consultant,
Department of
Cardiology

Asst. Prof. Loh is a Council Member of Singapore Cardiac Society and Organising Chairperson for its 29th Annual Scientific Meeting. He has contributed to more than 40 journal papers and presented at many international scientific meetings. His interests include coronary artery disease and acute coronary syndromes. He supervises the post-myocardial infarction clinic, managing post-heart attack patients.



controversies in antiplatelet and diabetic treatment; pre-hospital cardiac care (with Emergency Medicine); treating heart failure with drugs, devices and transplant; using tele-health in cardiac rehabilitation; having a 'heart team' approach¹ to manage complex coronary artery disease; and hearing translational research success from our clinician-scientists.

Competition Winners
NUHCS also shone at the competitions. Our senior resident team comprising Dr. Christopher Koo, Dr. Sim Hui Wen and Dr. Eugene Tan won the inaugural 'C-factor: A Pulsating Cardiac Challenge' quiz.

At the Young Investigator's Award, we garnered the 1st and 2nd prize for Basic CV science and 2nd and 3rd prize for Clinical abstracts. We also won the free paper abstract sessions in Basic CV Science, Interventional and Multi-disciplinary categories.

We were honoured to have A/Prof. Poh Kian Keong, Senior Consultant, NUHCS, named as this year's SCS Lecturer. He delivered a talk on 'Contemporary Management of Aortic Stenosis and Beyond'. This year's ASM also marked my third and final year as Organising Chairperson. I would like to thank everyone in NUHCS for your support and participation.•

¹ Cardiologists and Cardiac, Thoracic and Vascular Surgery surgeons discuss complex cases and decide the best treatment for patients.

Mastering Interventional Skills

12th Percutaneous Coronary Intervention Simulator Course

With a strong belief in imparting skills and knowledge, National University Heart Centre, Singapore (NUHCS) organised the 12th Percutaneous Coronary Intervention (PCI) Simulator Course on 22 - 23 April 2017. Prof. Tan Huay Cheem gives his insights on this event.

The immensely popular PCI simulator course has been well received over the decade and has trained more than 290 candidates. Many of these participants have also gone on to become renowned interventional cardiologists locally and overseas.

Course Objectives

The course offers objective, effective and scalable training of PCI in a safe environment.

Trainees are taught hands-on technical and psychomotor skills and simulation dedicated to practice in decision making and judgement. They are also given ample interaction with proctors who offer instant feedback.

Key Learning Points

This year, the two-day intensive course attracted not just local clinicians, but also those from the region (Indonesia, Malaysia, China, Nepal, Philippines). Coupled with a series of didactic lectures, participants were offered hands-on training on various systems, namely the Cathi Simulator, Terumo Trans

Radial and NUH's latest state-of-the-art Siemens Biplane Artis Q-Zen.

They were also exposed to actual image interpretations of Intravascular Ultrasound and Optical Coherence Tomography (OCT).

Strong Partner Support

The PCI Simulator Course has been strongly supported by long-term partners of NUHCS – Siemens, Terumo,



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

Prof. Tan is a Professor of Medicine, Yong Loo Lin School of Medicine, National University of Singapore and has a Masters 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.

Boston Scientific Corporations and Abbott Vascular. Its long-standing existence undoubtedly reinforces our raison d'être as a centre of learning and excellence.●



“**The PCI Simulator Course is sophisticated, informative and well organised. I recommend all cardiac surgeons to attend this course to learn from the practices of their cardiology counterparts.**”

Crossing Borders

NUHCS's First South American Fellow

Dr. Leonardo De Carvalho moved to Singapore from Brazil five years ago to start a new career in NUHCS. While initially apprehensive, he soon assimilated comfortably into the hospitable sunny island.



By **Dr. Leonardo De Carvalho**
Interventional
Cardiology Fellow,
Department of
Cardiology

Dr. Carvalho graduated with a PhD in Molecular Biology from the Federal University of Sao Paulo, Brazil in 2010 and became a National University Hospital research fellow in 2011. He was involved in the translational and clinical research at Cardiovascular Research Institute from 2011 to 2014 before taking up a two-year Cardiac Interventional Cardiology Programme from 2015 to 2017.

Invaluable Training

I joined NUHCS as a research fellow and have since transitioned to interventional fellow which lengthened my programme by two years.

Throughout this time, my interactions with fellows from institutions around the world, great preceptors and a high-volume Percutaneous Coronary Intervention (PCI) Centre have trained me sufficiently to perform independent procedures.



Welcoming Environment

A I first moved to Singapore on the encouragement of A/Prof. Mark Chan, Senior Consultant, NUHCS, and a great mentor who inspired my career. With two small luggages and an open mind to learn new things and meet new people, I was initially nervous about the cultural differences.

However, those fears soon dissipated as I gradually discovered the amazing

and unique culture, and people in Singapore, that made this island an excellent place to live.

Throughout the years that I was here, what impressed me the most about Singapore was the caring nature and generosity of its people.

In particular, my colleagues have looked beyond where I came from, welcomed me into the team and supported my educational endeavour.

The unfailing support I received from my teammates, especially from A/Prof. Chan, also inspired me to help other medical students to achieve their goals.

Singapore is more than just a workplace to me as this is also where I built a new family. I married my wife, Fabiana, in 2012 and in 2014, we welcomed our son, Tomas.

I believe that friendships are not built by accident. I would like to thank Prof. Tan Huay Cheem, Director, NUHCS who helped my aspirations come true.●

Beyond the Call of Duty

Lending a Hand on Flight

When a passenger on board a flight took ill, Assistant Nurse Clinician Ms. Woo Pei Yoong went beyond her call of duty to render medical assistance to the passenger. In recognition of her act of compassion, Pei Yoong was identified as one of the recipients of 'Our People, Our Pride', which honours staff for their dedication in providing quality care for patients.



A Sudden Call for Help

The incident happened on my flight home from Taiwan. I recalled hearing an announcement from the flight crew requesting medical assistance for a passenger who had taken ill.

Without a second thought and as if led by my natural instinct as a nurse, I responded to the call immediately.

Responding to the Call of Duty when You are off Duty

After identifying myself, a crew member led me to a passenger who looked pale and felt cold and clammy. I advised the crew member to let the passenger lie down on the seats while I checked with the passenger's husband on her medical history, drug allergies and related information that could have caused her condition.

As the patient was conscious and coherent, she was also able to relate her symptoms to me, which were diarrhoea and abdominal cramp. I examined her and took her vital signs, and I noticed that she was suffering from hypothermia¹.

I immediately requested for additional blankets to warm her up. Fearing that she may also be developing hypovolemia² due to the frequent diarrhoeas,



By **Ms. Woo Pei Yoong**
Assistant Nurse Clinician,
Ward 20,
Cardiothoracic Intensive Care Unit (CTICU)

After graduating with a Diploma in Nursing, Pei Yoong joined the nursing workforce in 2002 and has worked as an ICU nurse in several countries. She joined NUHCS in 2011.

I also got the crew member to make concentrated salt water to help her replenish the electrolytes in her body. I then checked to make sure that I had provided her with all the necessary care before handing her over to the flight crew to continue monitoring her vital signs half hourly to ensure that her condition did not deteriorate.

Upon reaching Singapore, I was glad to learn that her condition had improved.

Gratification as a Nurse

The passenger later wrote to National University Hospital to compliment and thank me. As a professional nurse, I felt deep satisfaction that I was able to help a fellow passenger in need. •



I would like to thank Ms. Woo for her care and support, and appreciate her kindness in taking care of me even though she was on a vacation. Ms. Woo is like an angel in the sky, extending her care beyond hospital beds to wherever she goes. I cannot imagine going through the ordeal without her.

– Ms. Amy Low, passenger who received medical assistance from Pei Yoong on flight

¹ A condition of having abnormally low body temperature.

² A decreased volume of circulating blood in the body.

Cardiac Arrest in a Supermarket at One@KentRidge

The Importance of AED during an Emergency

A sudden cardiac arrest may cause a person to lose consciousness within a mere 15 seconds and stop breathing within a minute. In such situations, the use of an automated external defibrillator (AED) may help save a life. Dr. Tan Ze Ying, Senior Resident, Respiratory and Critical Care Medicine, University Medicine Cluster, National University Hospital (NUH) recounts how she and other staff came to the rescue of an unwell shopper.



As a senior resident in critical care medicine, it is my responsibility to attend to 'code blue' which is indicative of a patient requiring resuscitation or in need of immediate medical attention.

The 'Code Blue' Alert

I recalled a vivid incident where my lunch was interrupted by the familiar 'code blue' alert. I immediately sprinted towards the incident site, at the FairPrice Supermarket one floor above.

As I neared the scene, I saw a Patient Service Associate (PSA) grabbing the AED from the wall and dashing towards the site, confirming my deepest fear that the collapse was real.

I arrived to witness a middle-aged man gasping for air on the ground.

Medical Officers, Dr. Jolene Kiew and Dr. Wesley Yeung, as well as Dr. Kuhan Venugopal, Senior Resident, Emergency Medicine Department (EMD), were rendering assistance. Dr. Yuan Yew Sen, an Ophthalmology Senior Resident, had also cleared the ground to make room for resuscitation.

Quick Rescue by the Medical Team

I performed a pulse check and we commenced cardiopulmonary resuscitation (CPR) immediately. While I obtained a quick medical history from the man's companion, we attached the AED and the first shock was delivered for ventricular tachycardia¹.

The nurses then arrived with the necessary medical equipment and I took over organising the resuscitation and

securing IV access, while Dr. Venugopal swiftly contacted the EMD team.

Thankfully, the patient came to after the first shock and with coordinated efforts, was sent to the EMD for further treatment. He has since recovered well.

Although rare situations like this plays out the glamorous phrase, 'One Life Saved', it was the quick thinking and flawless teamwork that made a difference as every second counts.●

What is an Automated External Defibrillator?

An automated external defibrillator (AED) is a lightweight and portable device that delivers electric shock through the chest to the heart on an unconscious victim. The shock can stop an irregular heart rhythm and allow a normal rhythm to resume during a sudden cardiac arrest. When applied promptly, the AED can prevent irreversible damage to the victim's brain cells caused by oxygen deprivation.



How to use an AED?

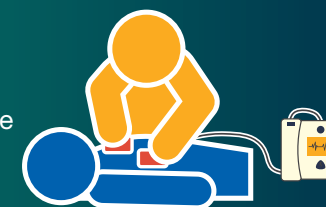
STEP 1

Turn on the device.



STEP 2

Wipe the chest dry. Place the pads on bare chest.



STEP 3

Ask everyone to stand clear.



STEP 4

Push the shock button when prompted.



¹ A very fast heart rhythm that begins in the ventricles, which are the two lower chambers of the heart.

临床心得第二集

A New Book by the Centre Director

Do you wish to find out how you can take better care of your heart? Filled with articles on different heart health topics, Prof. Tan Huay Cheem's second Chinese book offers an interesting and insightful read for all. Discover more about the book below!

Prof. Tan Huay Cheem has launched his second Chinese book – a compilation of articles which he had written for his personal column in Lianhe Zaobao, Singapore's largest-circulated Chinese newspaper, for the past ten years.

Educating on Heart Health

Titled <临床心得第二集>, the book comprises chapters on various cardiovascular topics ranging from heart attack recognition and treatment to the treatment of hypertension, heart failure and high cholesterol levels. It also

expounds issues such as doctor-patient communication, medical education, etc.

Written in layman's terms and easy to understand language, the book aims to educate Chinese readers on how to take better care of their heart.

Riding on the success of his first book launched five years ago and sold in



Singapore and China, Prof. Tan hopes that this book will continue to serve as an educational tool to raise heart health awareness among Singaporeans and beyond.

Purchasing a Copy

The book is sold at the pharmacy at Heart Clinic@Level 1 and all proceeds will go to The Heart Fund, a cause which was set up to help our needy heart patients to defray some of the costs of their medical treatment. •



Prof. Tan Huay Cheem, Director, National University Heart Centre, Singapore has launched a book comprising articles he contributed to Lianhe Zaobao for the past 10 years.

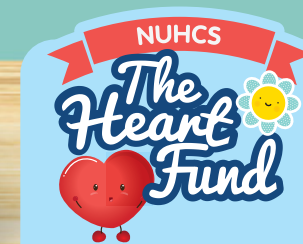
**This book is now available for sale at the Heart Pharmacy.
All proceeds will go to The Heart Fund to help underprivileged heart patients.**



新加坡国立大学心脏中心总监，陈准沁教授已发表他的第二本中文书籍。书中记载了近10年来他在联合早报个人专栏中的所有文章。

现已在新加坡国立大学心脏中心的药房出售。

**售价
\$22**



此书的所有收益将全数捐给 **The Heart Fund**, 来帮助经济困难的病人。



When a Patient Becomes a Donor

Giving Back to Other Heart Patients

After being diagnosed with heart disease, Nobel Laureate Dr. Sydney Brenner went through a transcatheter aortic valve implantation (TAVI) procedure at National University Heart Centre, Singapore (NUHCS). Feeling fortunate to be able to afford his treatment, Dr. Brenner wanted to give back to needy heart patients by endorsing the Sydney Brenner Fund. Dr. Brenner recalls his experience as both a patient and donor, and shares how other heart patients can benefit from the fund.

How was your experience with the TAVI procedure?

I was first diagnosed with heart disease when my doctors in Singapore noticed that I was having cardiac symptoms. These gradually worsened and it was discovered that they were due to mitral valve failure¹. Because of this, I've been immobilised and unable to travel.

When my condition got extreme, the NUHCS doctors recommended that I

try a new valve that was inserted non-surgically through an artery in the groin and then pushed into the ventricle. I subsequently recovered and have been much better since. I was impressed by the skilled operation conducted here in Singapore.

How has it benefited you and why are you grateful for it?

The procedure gave me a new lease of life.

One might ask why they should keep a 90-year-old person alive. For me, my brain is still working well and I have a job as a scientist. I can pass on my knowledge to young scientists.

I'm thankful for this because life would have become too boring otherwise and I'd be sitting around doing nothing. As I've been active all my life, with more than 70 years in science research, allowing me to continue my work is a great boon to me.

Why did you decide to become a donor?

I wanted others to be able to enjoy the benefits too so I was very happy to become a donor.

I think everyone can and should make a difference to not only individual lives but also to the society as a whole. If we can save someone's life, then we've also served the country.

Those who have the means to donate should be encouraged to help others who may not have been as fortunate as them. I'd like to thank The Heart Fund for providing this opportunity.●

You too can make a difference to underprivileged heart patients. Empower them today at [www.giving.sg/nuhs-fund-limited /sydney_brenner_fund](http://www.giving.sg/nuhs-fund-limited/sydney_brenner_fund).

¹A disorder of the heart in which the mitral valve does not close properly when the heart pumps out blood.

Eating to Your Heart's Content

Find out food that are heart-healthy

It may be clear to many of us that a healthy diet and lifestyle leads to better heart health, but are we really eating all the right food and in the right amount?



1. Healthy Food for Your Heart

Fruits and Vegetables

Fruits and vegetables contain dietary fibre which helps to reduce blood cholesterol, but a 2010 National Nutrition Survey (NNS) found that almost 85 per cent of Singaporean adults do not meet the recommended intake of two servings of fruits and two servings of vegetables daily.

Wholemeal/Wholegrain Products, Brown/Unpolished Rice, Legumes and Pulses

These are also high in dietary fibre to lower blood cholesterol. The Health Promotion Board recommends at least one serving of wholemeal product per day.

Beta-glucan, a type of soluble fibre that is found in oats, can help to lower blood cholesterol. If you consume oats, aim for eight to eleven tablespoons of oats daily.

Nuts and Seeds

Nuts and seeds contain fibre and unsaturated fats which are beneficial for the heart. However, consumption should be limited to a small handful as they may lead to unnecessary weight gain due to their high fat content. Always choose the unsalted raw/baked nuts instead of fried/added salt/sugar-coated nuts.

Oily Fish

Salmon, cod, tuna and mackerel are all examples of oily fish which are packed with Omega-3 fatty acids that contain anti-inflammatory properties and help to improve cardiovascular health. The recommended intake is to have at least 2 servings of 100g oily fish per week.



2. Shopping for Healthier Foods

- Choose products which are lower in sugar, saturated fat and salt, and higher in fibre and calcium.
- Choose products labelled 'fat-free', 'lower fat', 'reduced fat', and with the Healthier Choice Symbol.
- Avoid products that contain hydrogenated fats/oils/shortening, as these are high in saturated fat and trans fat.
- Look for skimmed/low-fat dairy products.
- Choose unsaturated oils such as canola, olive, rice bran and sunflower oil.
- Choose wholemeal/wholegrain/unpolished products.



3. Healthy Dining

When Cooking at Home:

- Choose lower fat cooking methods: steam, grill, bake, boil and stir-fry.
- Use a non-stick cooking pan to reduce the total amount of oil required.
- Replace coconut milk with low-fat yoghurt/evaporated milk.
- Choose natural herbs/spices to flavour food instead of adding salt, MSG, stock cubes and sauces.
- Remove skin and visible fats from chicken/meat prior to cooking.



When Dining Out:

- Choose healthier options (steamed, baked, grilled, stir-fried, boiled or soupy dishes) instead of deep fried ones.
- Ask for more vegetables in your meals.
- Request for less oil or no oil/lard in your dishes.
- Remove skin and visible fats from chicken/meat
- Choose fish, especially those rich in Omega-3s.
- Opt for plain rice instead of flavoured ones like nasi lemak and chicken rice.
- Limit the intake of gravies and sauces which are high in saturated fat and salt.

- Choose plain water, unsweetened tea/coffee or diet soft drinks instead of sugary drinks and juices.
- Eat a serving of fruits or a cup of low-fat yoghurt as dessert instead of cakes or ice-cream which are high in sugar.



4. Control How Much You Eat

- Before and during meals, drink water or zero-calorie beverages to fill up your stomach.
- Use a small plate so you do not overeat.
- For main meals, fill half of your plate with non-starchy vegetables, a quarter with lean protein (e.g. fish, skinless chicken/lean-meat or tofu cooked with low-fat cooking methods), and the remaining quarter with unrefined carbohydrates (e.g. brown rice/wholemeal bread).
- Chew your food properly before swallowing. Stop eating when you feel 80 per cent full.



By **Ms. Valerie Teong**
Dietitian,
Department of Dietetics

Valerie joined the National University Hospital's Dietetics Department in 2015 and has been an important member of the cardiac team. She is also the dietitian at the Women's Heart Health Clinic. Besides heart health, she also specialises in diabetes management and eating disorders.



HAPPENINGS at NUHCS



A - C

In celebration of International Women's Day, a talk was organised for the staff of NUS Business School on 10 March 2017 to empower women to take charge of their heart health. Themed **'Women, the Heart of the Matter'**, the talk was anchored by Dr. Low Ting Ting, Consultant and Co-Director, Women's Heart Health Programme, NUHCS, and Ms. Adeline Teo, Nurse Clinician, who also gave a live CPR demonstration.

D

Prof. Tan Huay Cheem, Director, held an **NUHCS Chinese Alumni Dinner** for former interventional cardiology fellows and nurses who had a training stint in the Coronary Care Unit and Catheterisation Lab. This get-together is held annually at the China Interventional Therapeutics meeting in Beijing to enable them to maintain their ties with NUHCS and catch up with one another. The alumni also reminisced their fond memories in Singapore as they looked through their photos in PULSE.



E

Members of the **Heart Rehab Support Group**, comprising NUHCS patients and their family, were all smiles as they were treated to a **New Year dinner** on 3 January 2017 at Seasonal Salad Bar at One@KentRidge. In our effort to help patients cope with their illness, the dinner was an opportunity for patients to bond together and get updated on the new support framework.

F

Asst. Prof. Chan Wan Xian, Senior Consultant, NUHCS, presented a **rare case of an absent left 'wall' of the heart** (known as congenital complete absence of the left-sided pericardium). Having an incidence of less than 1 in 10,000, most patients are asymptomatic and the diagnosis is generally incidental while 30-50 per cent of them have associated conditions that exist at or before birth. In the X-ray, it can be seen that the left-sided pericardium is completely missing!

G - H

A/Prof. Poh Kian Keong, Senior Consultant, NUHCS, and Prof. Tan Huay Cheem were **interviewed on Radio 93.8 Live's Body and Soul segment** on 23 February and 6 June 2017 respectively. A/Prof. Poh discussed the findings of an international study on statin-treated patients and the benefits of an effective alternative treatment while Prof. Tan shared about coronary and biodegradable stenting, its development and the new generation of pacemakers.



H





I Asst. Prof. Lim Toon Wei, Senior Consultant, NUHCS, was invited to be part of an illustrious panel for Channel News Asia's (CNA) "An Accessible Asia" programme. Panel members discussed on healthcare challenges in Asia Pacific, including the lack of quick and efficient access to quality healthcare. The programme was broadcast on 21 June 2017 at 8pm on CNA.

J-L Seniors from NTUC Health's SilverACE took part in "Healthy Eating, Healthy Living", a dietitian-led supermarket tour. On 18 and 22 May 2017, our dietitians brought the seniors around FairPrice at One@KentRidge to educate them on making heart-healthy choices during grocery shopping.



M-O

NUHCS performed our first-ever live satellite transmission of percutaneous coronary intervention at EuroPCR 2017, the world's largest interventional cardiology meeting. Attended by 12,000 international delegates, the event was held on 16 May 2017 in Paris, France. The live case demonstrations presented by Prof. Tan Huay Cheem, A/Prof. Mark Chan, A/Prof. Ronald Lee and Asst. Prof. Joshua Loh were positively received. They generated much discussion and provided useful insights to the audience.

P-Q

To promote health by supporting the learning of communities, Asst. Prof. Yeo Tee Joo, Consultant, gave a talk on "What You Need to Know about Cholesterol" for staff from Boston Scientific on 17 May 2017. Asst. Prof. Yeo enlightened the audience on managing their cholesterol levels and when they should seek medical help.

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Differential gene expression and activation of signaling pathway in aortic smooth muscle cells of patients with ischemic heart disease

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Young sudden cardiac death in England and Wales: a decade of change

T J Yeo, M Papadakis, S Sharma, S Cox, M Sheppard, E Behr. •

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