

# PULSE

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COVER STORY

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Leadership changes hands at NUHCS

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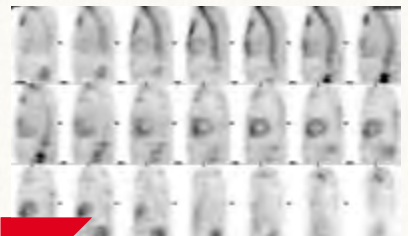
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# OUTGOING DIRECTOR'S MESSAGE

*Parting words from Prof Tan Huay Cheem after serving as the Director of National University Heart Centre, Singapore (NUHCS) for the past 13 years.*



Dear readers and colleagues,

To many, NUHCS is not just a medical heart centre. It is known for its soul where a strong cohesiveness and a collegial working culture permeates, where strong bonds and friendships are forged amongst the people working in and with NUHCS.

Many of the staff, including doctors, nurses and medical technologists have committed the best parts of their lives to working here, devoting their time and energy to care for patients. I am eternally grateful for the support and contribution of each staff, and wish I could embrace each individual with thanks.

One of the key highlights of my year has always been our annual Family Day celebrations when I get to meet colleagues and gather with their families for fun and food, bonding together as part of the larger

NUHCS family. It has always been my belief that our team can only be as strong as we are, because of the support we receive from our families. Besides, the enthusiastic performances have been always been a crowd wow factor!

The time has now come for me to step aside for another to take the helm. But certainly, this is not a farewell. I will always be a strong supporter of NUHCS as I take on other roles outside of the Centre.

I have worked with James on numerous occasions, and there is no doubt in my mind that he is one of the best cardiologists that we are blessed with. With his gifts in digital science and technology, I cannot wait to see the digital transformation of NUHCS in the years ahead.

While no leadership is perfect, I can say with all honesty that I have done my best to contribute towards the building of

NUHCS into what it is today, a heart centre which all of us and Singapore can be proud of. This has been my legacy.

It has been my privilege and honour to have the opportunity to lead the Centre as its director. I found my calling here, and every day has truly been a joy for me, to work alongside some of the most talented and passionate people you can find in healthcare.

To James, I wish you good health and luck. May you retain your sense of humour and contagious laughter as you take on the Directorship.

*Tan Huay Cheem*

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



# INCOMING DIRECTOR'S MESSAGE

*A/Prof Yip Wei Luen James takes on the role of Director, National University Heart Centre, Singapore (NUHCS) with effect from 1 July 2021.*

Dear colleagues,

It is my privilege to address you, for the first time, as Director of NUHCS. Prof Tan Huay Cheem has left me with big shoes to fill, to say the least.

I remember feeling this way back in 2003 when I was newly promoted to be a consultant in cardiology. I was feeling a little overwhelmed and perhaps it showed. Prof Tan, who was just taking over the mantle of chief then, looked at me reassuringly and said, "The only difference between the two of us is just a little experience."

Those words assured me that with the passage of time, we would become better prepared for all of life's challenges. I have had the privilege of standing on the shoulders of the ones who have come before me — Prof Tan included — and what a view it has been!

Having benefited from their tutelage, I aspire to pay it forward; to continue their good work and pave the way for those who will come after me.

During my term, I will continue my lifelong focus on People, Process and Technology, in this order of priority. I believe that as an organisation, we must put our people first if we are to expect our people to put patients first. We will give you the support and skills you need to ensure that the right workflow, organisational structure and technology are in place, so that, together, we can fulfil National University Health System's tripartite mission of patient care, education and research.

I look forward to working with each and every one of you in the days to come.

*James Yip*

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

# At The Helm

**A**fter serving five years as the Chief of the Cardiac Department, and the next 13 years as Director of National University Heart Centre, Singapore (NUHCS), Prof Tan Huay Cheem is passing on the leadership role to senior consultant cardiologist, A/Prof Yip Wei Luen James.

*Leadership changes hands at NUHCS*

Stepping into the new director role, A/Prof Yip says of the transition, "With the passage of time, we would become better prepared of all of life's challenges. I have had the privilege of standing on the shoulders on the one who has come before me and what a view it has been!"

Two defining moments in Prof Tan's tenure was when the Severe Acute Respiratory Syndrome (SARS) epidemic hit Singapore in 2003, and more recently, the ongoing coronavirus pandemic that broke out in 2020, requiring NUHCS to pivot and respond quickly in efforts to contain the outbreak. Few other leaders can claim the same of steering a heart centre through two global health crises.

Not only has NUHCS survived the stress tests of these infectious disease outbreaks, the Centre has evolved and emerged stronger, transforming itself into the world-class academic heart centre, as it is known today.

Prof Tan's leadership at NUHCS was one that has led the path

”  
*It is not only about adding years to life but life to years – that would be our Centre's mission*

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



of the Centre on an upwards trajectory. From fewer than eight cardiology consultants, and just two surgeons in the department, NUHCS has grown into a team of over 60 cardiologists and 20 surgeons over three hospital sites, managing almost three times its patient load in a span of 17 years.

“It is however not the number that matters, but rather the talents these individuals possess, the public service ethos and values they uphold that distinguishes the Centre,” affirms Prof Tan.

Leaning on the support and expertise from two international advisory panels, Prof Tan worked with his small team to conceive a heart centre designed to meet the growing cardiovascular disease burden, and provide higher quality care and treatment outcomes for patients in Singapore.



***The greatest fulfilment is the ability to effect change and make things happen***

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

Today, NUHCS provides a wide spectrum of tertiary and quaternary services organised uniquely into six different core clinical programmes with a focus on patient-centric care in a multidisciplinary and integrated set-up. The Centre has not only transform its facilities with modern technology incorporating the latest treatment techniques in the field of cardiovascular medicine, but has also expanded its capabilities offering specialised care such as geriatric cardiology, complex cardiac pregnancy management, pulmonary hypertension and vascular medicine with specialists trained cardiologists and cardiothoracic surgeons.

Furthermore, NUHCS has established a research arm, the Cardiovascular Research Institute (CVRI), which delves deeper into the issues of heart failure with wide ranging research areas including immunoassays, mass spectroscopy, molecular biology, epigenetic infrastructure, animal models and clinical cohort studies across several clinical sites.

In just over a decade, CVRI has already received notable commendations from other established institutions acknowledging the quality research it has put out, having published more than 50 papers in the top 10 percent of high impact medical and scientific journals in the last three years.



“There are strategic transformational plans that have been mapped out to take NUHCS to even greater heights, enabled by a solid organisation structure, a capable leadership team, and supported by rapid technological adoption and a strong corporate culture,” opined Prof Tan.

On A/Prof Yip as his successor, Prof Tan is in full support of his appointment. “There is no doubt in my mind he is one of the best cardiologists that NUHCS is blessed with. Besides his clinical competence, James is a genuine person with so much compassion for everyone around him.”

In particular, Prof Tan highlighted A/Prof Yip’s inclination

towards computer science and information technology has kept NUHCS ahead in digital science and applications, which will be instrumental in taking NUHCS to its next digital transformation, turning it into a future-ready medical centre.

As the current Group Chief Medical Informatics Officer within National University Health System (NUHS), it is no secret that A/Prof Yip is a firm advocate of technology and healthcare analytics as a means to improve healthcare standards for the people.

“It is always first about the patients and the people whom we need to look after; followed by developing the process and infrastructure to help our organisation function effectively,” expounded A/Prof Yip





on his top priorities as NUHCS' Director. "Finally, technology will be the answer to help us provide cost effective solutions for the public and to achieve the first two priorities."

The most concerning for A/Prof Yip is reaching the increasing number of people who are at risk of cardiovascular diseases in what he terms as the "hidden epidemic". "These are patients who do not know they are in trouble, or who think they are doing well until something happens."

On this front, NUHCS has already initiated the use of remote cardiac monitoring technology for some heart patients. However, epidemiological trends show that cardiovascular disease remains the biggest disease burden in

Singapore. Every new advancement in technology that potentially increases human longevity, brings on the added cost of caring for older, frailer and medically more complex patients.

Hence, it is A/Prof Yip's aspiration that NUHCS will be able to predict the value of interventions for healthy longevity and manage the cost effectiveness of therapies for the payors of healthcare, such as the government and insurance companies.

Enthusiastic about future possibilities in the field, A/Prof Yip quipped, "Cardiologists always seem to have one more trick up our sleeves to prevent death or disease progression that we often forget our responsibil-

ity is to help our patients fulfil their life goals and to prepare for the end."

As the baton of leadership passes onward, the evolution of NUHCS will continue on its trajectory -- improving community health with better and more cost-effective care that will empower people to take ownership of their own health; nurture the next generation of cardiovascular professionals and further expand on its world-class research facilities.

ARTICLE BY

NUHCS Pulse Editorial



# THE *New* CATH LABS

*NUHCS builds modern cardiac invasive catherisation laboratories with new upgrades*

National University Heart Centre, Singapore (NUHCS) first set-up its cardiac invasive catherisation laboratories (also known as “cath labs”) facility in 1992, sharing the same space with the radiology department. This meant that the time allowed for procedures in the facility has to be divided between the two departments.

Cath labs are specialised procedure rooms where doctors perform minimally invasive tests and procedures to diagnose and treat cardiovascular diseases. At that time, the shared facility was sufficient to support the relatively low volume of about 300 coronary angioplasty cases each year.

With the growing geriatric population and rising incidence of cardiovascular diseases, advanced diagnostic cardiac catherisation and angiography procedures have since been introduced to support the burden of coronary disease locally.

Coupled with the advent of minimally invasive cardiac surgery and innovative catheter-based approaches which have generally resulted in shorter recovery times

and improved clinical outcomes compared to traditional sternotomy procedures, the demand for modern cath lab facilities has since been on the rise.

In fact, many changes have been made to the standard requirements of a modern cath lab in the past decade alone. This precipitated an expert panel from the Society for Cardiovascular Angiography and Interventions to release a consensus statement this year, with specific recommendations on setting up, operating, maintaining the highest standards of quality and establishing current best practices of modern cath labs.

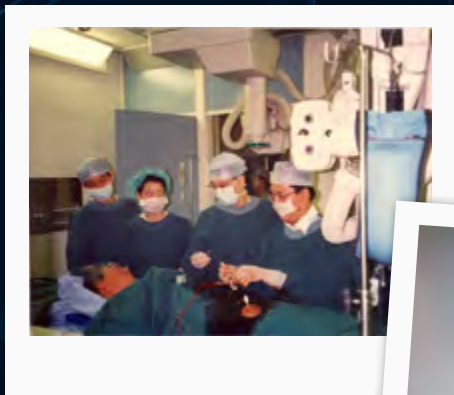
Over the years, NUHCS has been progressively updating its cardiac invasive cath labs (ICL) to meet current and future healthcare challenges. Today, they are equipped with many advanced coronary intervention technologies, such as intravascular ultrasound and optical coherence imaging for intravascular imaging which is used to assess the severity of coronary artery disease by providing a tomographical image of the coronary arteries.

Diagnostic physiologic modalities such as fractional flow reserve, thermodilution for coronary flow reserve (CFR), and the index for microvascular resistance (IMR) allow cardiologists to assess coronary artery function more precisely.

In addition, the cath labs are equipped with the latest calcium modifying therapies such as orbital atherectomy and intravascular lithotripsy. These are used to tackle issues with heavily calcified coronary lesions which pose technical difficulty during angioplasty and can translate to adverse outcome of stent restenosis and thrombosis.

Implanting mechanical circulatory support systems such as non-surgical heart pumps in patients with more complex and high-risk coronary artery diseases can be carried out in these cath labs.

In addition, the electrophysiologist (EP) team which utilises the same facility performs tertiary complex arrhythmia ablations and device implantation using advanced procedures such as cryoablation and His bundle pacing (HBP)<sup>1</sup> for conduction system pacing in the labs.



Cath Lab in 1990



New Cath Lab in 2021



In January this year, NUHCS upgraded all three cath labs with modern biplane imaging systems. These advanced medical imaging technologies use two rotating cameras to take simultaneous images, forming a 3D portrait of the body area with highly detailed images of blood vessels, soft tissue and blood flow in real-time.

Furthermore, the cath labs are connected to a hybrid operating theatre equipped with an angiographic imaging capability, enabling the entire facility to support a wide range of endovascular, catheter-based interventional therapies in the field of coronary, peripheral, congenital and structural interventions, as well as electrophysiological studies, radiofrequency ablation, and pacemaker device implantation.

These new upgrades mark yet another milestone in the expansion of the cath lab facility and services at NUHCS, ensuring the allocated space remains highly efficient to serve the current annual load of about 1,700 cases of percutaneous coronary intervention and 660 cases of EP ablation and device implantation procedures.

**<sup>1</sup>His bundle pacing (HBP)** – A therapy with the intent of overcoming sites of atrioventricular (AV) conduction disease and delay, affecting a large area of the heart.

ARTICLE BY

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



Prof Tan is a Professor of Medicine, Yong Loo Lin School of Medicine, NUS 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.

# Ladies First

*Throwing a spotlight on women's heart health*

Commemorating International Women's Day in March 2021, the National University Heart Centre, Singapore's (NUHCS) Women's Heart Health Programme launched a public education campaign focusing on women's heart health issues.

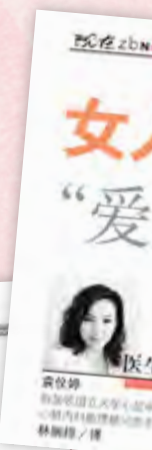
The message was clear – women need to put themselves first and prioritise their heart health as well.

In a commentary published in *The Straits Times* and *Lianhe Zaobao*, Dr Wang Yi Ting Lauren, Associate Consultant, Department of Cardiology, NUHCS wrote about the cardiovascular risks at every life stage of a woman, and the preventative steps that can be taken. In her article, she emphasised the need to keep the heart in tip-top condition as crucial to the process of aging gracefully.

NUHCS also released an inspirational video across its online platforms, honouring the "Wonder Women" in the healthcare industry. These women took on the role of caring for others in their profession, continuously delivering high standards of patient care, whilst caring for others in their personal lives.



Scan the code to watch the inspirational video:





"The doctors who can cure a broken heart"

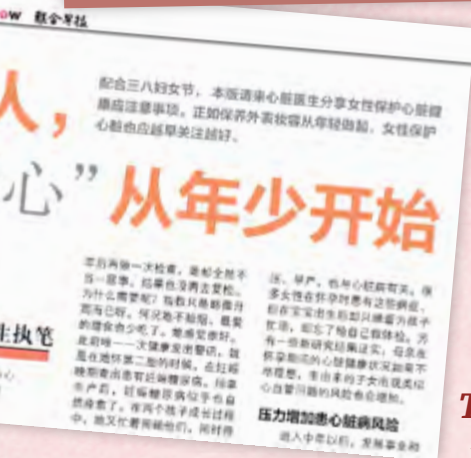
Wearing multiple hats and managing expectations in both their personal and professional lives, these nurses, cardiac technicians and doctors from NUHCS share their greatest pride at work in caring for patients with cardiac conditions. At the same time, they made the call for all women to protect their hearts.

In collaboration with *Something Private* podcast, Asst Prof Low Ting Ting, Consultant, Department of Cardiology, NUHCS joined Dr Wang and the producer to discuss women's heart health in a 40-minute podcast show, "Ladies, let's have a Heart-to-Heart about your Heart". The show was broadcast on Spotify, YouTube, Instagram, and Facebook. Asst Prof Low and Dr Wang described the warning signs of heart diseases, discussed the consequences of self-neglect, and called for the need to raise awareness of heart disease in women.

Watch the podcast here:



Working with digital publisher, *Our Grandfather Story*, a comic strip was conceptualised to depict the symptoms of a heart attack in women. These are often subtle and ignored, further increasing the risk for women. Published and shared across multiple media platforms, the comic communicated the need for women to prioritise the health of their hearts.



**To the busy everyday women – self-care is not a luxury, it is a necessity. Be heart smart and treat your heart right.**

Asst Prof Low Ting Ting, Consultant, Department of Cardiology, NUHCS

ARTICLE BY

Asst Prof Low Ting Ting  
Consultant, Department of Cardiology, NUHCS



Asst Prof Low Ting Ting is currently the clinical director of the Women's Heart Health Programme, which provides gender-tailored cardiac care and subspecialty management in pregnancy and heart disease, female phenotype coronary syndromes and heart failure conditions with a predilection for women. She is active in leading clinical trials and multi-centre registry work as well as research in advancing therapies for rarer conditions. She is also passionate about mentoring and leads the undergraduate cardiology programme in the National University of Singapore (NUS).

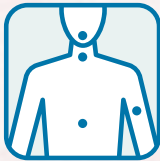
Read our Women's Heart Health brochure:



# WHAT Women

## HOW TO RECOGNISE A HEART ATTACK IN MEN & WOMEN

### SYMPTOMS IN BOTH MEN & WOMEN:



Shortness of Breath



Jaw, Neck, or Back Pain



Chest Pain (not always for women)



Cold Sweat



Nausea or Vomiting

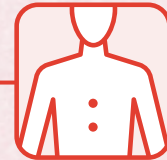
### SYMPTOMS IN WOMEN:



Dizziness



Extreme Fatigue



Lower Chest or Upper Abdomen Pain



Indigestion

Oestrogen may play a strong role in protecting women from heart disease which could explain why women are at higher risk of a heart attack after menopause. Women are MORE likely to ignore the symptoms of a heart attack or delay seeking treatment. As a result, they are LESS likely than men to receive timely treatment.

# NEED TO Know

## 10 VITAL STATISTICS ABOUT WOMEN'S HEART HEALTH

<b>1</b> in 3 women die of cardiovascular disease every year	Only <b>6</b> out of 10 women know that shortness of breath is the more common warning sign of a heart attack
Women are <b>2</b> times at risk of death within 30 days after a heart attack	<b>7</b> out of 10 women correctly identified chest pain as a heart attack symptom
<b>3</b> out of 10 women know that heart attack symptoms in women are different than in men	Only <b>8</b> % of women surveyed talked about cardiovascular-related topics with their doctor in the past 12 months
<b>4</b> 45 lives were claimed by breast cancer while cardiovascular disease claimed 2,689 women lives in 2019	Women are <b>3.9</b> times at risk of a heart attack from stress
Women are <b>5</b> 5% less likely than men to participate in cardiac rehabilitation, even after a heart attack	<b>10</b> years after a heart attack, women are 2.1 times more likely to die compared to men

### TAKE CHARGE AND REDUCE YOUR RISKS OF HEART DISEASE

Here are some things you can do to aid in the prevention of heart disease!



Healthy Diet



Avoid Alcohol



Lose Weight



Check Blood Sugar



Sleep Well



Stop Smoking



Exercise



Check Blood Pressure

# DETECTING A LESSER KNOWN DISEASE

## *Cardiac scintigraphy<sup>1</sup> for the diagnosis of transthyretin amyloid cardiomyopathy<sup>2</sup>*

Amyloidosis is a protein mis-folding disorder, occurring when native blood proteins aggregate abnormally into insoluble fibrils (amyloid) and deposit into various end-organs. The heart can be affected in some forms of amyloidosis, one of them being transthyretin (TTR) amyloidosis.

TTR is a transporter protein produced by the liver. In the presence of genetic mutation or with age, TTR can mis-fold into insoluble amyloid fibrils and deposit in the heart.

Transthyretin amyloid cardiomyopathy (ATTR-CM) patients typically present with heart failure and low blood pressure. An echocardiogram will reveal marked left ventricular wall thickening.

ATTR-CM was previously thought to be a rare cause of heart failure amongst elderly men. However, recent studies have shown that ATTR-CM is likely underdiagnosed due to a lack of awareness about the disease.

In the past, the only way to diagnose ATTR-CM was through endomyocardial biopsy, which is an invasive procedure done

for the purpose of removing small samples of heart muscle tissue for microscopic examination.

In collaboration with the Department of Diagnostic Imaging, National University Hospital, National University Heart Centre, Singapore (NUHCS) recently started the technetium pyrophosphate scintigraphy<sup>3</sup> service for the diagnosis of ATTR-CM.

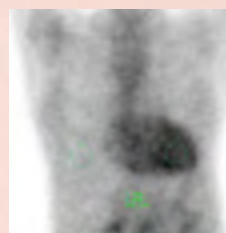
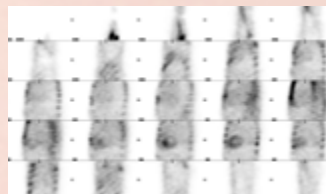
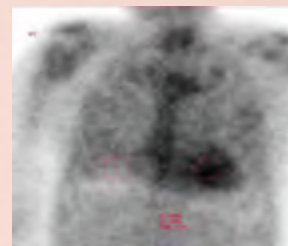
This nuclear scan modality has been shown to be as reliable as an endomyocardial biopsy for the diagnosis of ATTR-CM in the right clinical context, and allows patients to be diagnosed without going through an invasive procedure.

About 20 patients have undergone the scan since its introduction in November 2020, helping doctors to diagnose and treat them accordingly for ATTR-CM.

<sup>1</sup>scintigraphy – Procedure where a small amount of radioactive chemical is injected into the vein to produce scans of the body's internal structures used to diagnose, stage and monitor disease such as cancer

<sup>2</sup>cardiomyopathy – A condition caused by abnormalities in the heart muscles, resulting in dysfunctional heart pumping

<sup>3</sup>technetium pyrophosphate scintigraphy – A radiotracer scan used to differentiate transthyretin from light-chain amyloidosis, in patients with cardiac amyloidosis



*“We envision that the availability of this service will allow early diagnosis and prompt treatment of ATTR-CM patients in the future.”*

*Asst Prof Lin Weiqin, Clinical Director, Heart Failure Programme and Consultant, Department of Cardiology, NUHCS*

#### ARTICLE BY

**Asst Prof Lin Weiqin**  
Clinical Director, Heart Failure Programme and Consultant, Department of Cardiology, NUHCS



Asst Prof Lin is trained in the management of acute heart failure with temporary mechanical circulatory support, as well as caring for advanced heart failure patients with implanted durable left ventricular assist devices (LVADs) or heart transplantation. Besides heart failure, his other subspecialty interests include cardiomyopathies and echocardiography.



# FIRST OF MANY

*First Uniportal Non-Intubated Video Assisted Thoracic Surgery (UNIVATS) performed in Singapore*

The thoracic surgery and anaesthesia teams at the National University Hospital (NUH) successfully introduced UNIVATS for the treatment of a patient with a rare nerve tumour called Schwannoma on 21 January 2021. This marks the first UNIVATS procedure performed here in Singapore.

UNIVATS is a new procedure combining Uniportal Video Assisted Thoracic Surgery (UVATS) with Non-Intubated Video Assisted Thoracic Surgery (NIVATS). UVATS is performed through a single port thoracoscopic<sup>1</sup> surgery via a small 1-inch incision on the patient's chest. NIVATS is a more natural way of administering anaesthesia during surgery, as there is no need for an endotracheal<sup>2</sup> tube to go deep into the airway, and milder forms of anaesthetic medications are being used.

By combining both UVATS and NIVATS, UNIVATS can be performed with even smaller incisions, allowing patients to benefit from less physiological stress, airway trauma, thereby reducing the risk of respiratory infection, resulting in faster recovery from anaesthesia, overall recovery time, and a shorter hospital stay.

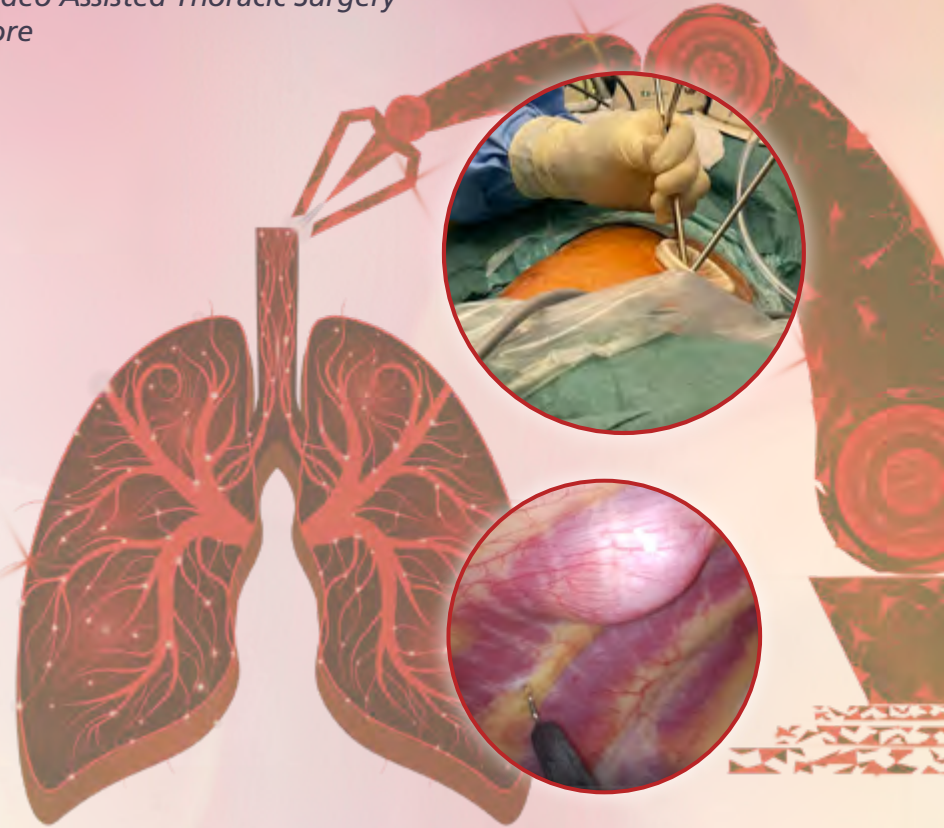
In particular, the first patient, who had a successful UNIVATS procedure to resect a rare nerve tumour in the chest stayed in the hospital for 23 hours in a day surgery ward, which is a substantial improvement

compared to the usual 2 to 3 days. After the operation, the patient's chest discomfort from the nerve tumor is relieved, and the patient expressed high levels of satisfaction with the surgery, the anaesthetic technique, as well as the overall experience.

UNIVATS is currently the most advanced minimally invasive thoracic surgery procedure in the field, which combines the expertise from the surgical and anaesthetic teams to achieve the best outcomes for thoracic surgery patients.

<sup>1</sup>thoracoscopic – A minimally invasive procedure in the chest that is performed using an endoscopic camera

<sup>2</sup>endotracheal – Inside the trachea



#### ARTICLE BY

A/Prof John Tam Kit Chung  
Head and Senior Consultant,  
Division of Thoracic Surgery,  
Department of Cardiac  
Thoracic and Vascular Surgery  
(CTVS), NUHCS



A/Prof John Tam is the founding Head of Thoracic Surgery at the NUHCS. He is a thoracic surgeon specialising in performing minimally invasive single-port keyhole surgery using advanced techniques in Uniportal Video-Assisted Thoracoscopic Surgery (UVATS). His research has been published across many high-impact medical and scientific journals. He also serves as a member on the Singapore Residency Advisory Committee for Cardio-Thoracic Surgery. He has won many awards in recognition for his service to patients and his contribution to the field of academic surgery.

Dr Deborah Khoo Xian Li  
Consultant, Department of  
Anaesthesia, NUH



Dr Deborah Khoo is a Consultant at the Department of Anaesthesia, National University Hospital with research interests in the field of difficult airway management and training, medical education and methodology, as well as the use of anti-fibrinolytics in spine operations.

# THE NEXT FRONTIER OF THORACIC SURGERY



*Adoption of advanced robotic surgical system pushes thoracic surgery possibilities with better patient outcomes*

The division of thoracic surgery in the National University Heart Centre, Singapore (NUHCS) has always been at the forefront of minimally invasive thoracic surgery in Asia, adopting the latest surgical technologies to achieve better patient outcomes in a safe and reliable way.

Employing video-assisted thoracoscopic surgery, the division led by A/Prof John Tam, together with Dr Harish Mithiran Muthiah and Asst Prof Ooi Oon Cheong, have performed more than 3,000 thoracic surgeries to date.

Recently, the division invested resources in robotic-assisted surgery where significant advancements have been made. With the intuitive da Vinci Robotic system, surgeons control the robotic arms from a console situated within the operating room. The robotic arms are inserted through tiny surgical incisions, acting as an extension of the surgeon's arms, mirroring every hand movement. This enables delicate and complex operations to be carried out with high precision and safety.

The division's coherent move to adopt the advanced robotic system has been proven to augment thoracic surgical procedures and accelerate the capabilities of thoracic surgery for lung and mediastinal<sup>1</sup> surgery.

The first robotic thoracic surgery performed for a mediastinal tumor was carried out by Dr Mithiran, with the guidance of a robotic proctor Dr Aneez D.B Ahmed, Director and Senior Consultant at the International Centre for Thoracic Surgery, in March 2021 at the National University Hospital (NUH). The surgery was a success with the patient discharged the following day.

Equipped with this technology, NUHCS' thoracic surgery division is able to offer a comprehensive suite of minimally invasive thoracic surgery options for both lung and mediastinal diseases with better precision and better outcomes.

<sup>1</sup>mediastinal – Refers to conditions that affect the mediastinum, the space in the chest, surrounded by the breastbone, spine and the lungs.



#### ARTICLE BY

Dr Harish Mithiran Muthiah  
Consultant, Division  
of Thoracic Surgery,  
Department of Cardiac,  
Thoracic and Vascular  
Surgery (CTVS), NUHCS



Dr Mithiran trained at NUH in cardiothoracic surgery. He completed his advance surgical training in 2014 where he was awarded the Fellowship of the Royal College of Surgeons of Edinburgh. He has a special interest in minimally invasive thoracic surgery which include Video-Assisted Thoracic Surgery (VATS) and Robotic Assisted Thoracic Surgery (RATS) for lung and chest diseases. He also currently serves as the Asst Programme Director for the Cardiothoracic Surgery Residency Programme.

# EXPANSION OF THORACIC SURGERY AT NG TENG FONG GENERAL HOSPITAL

*NUHCS works with NTFGH as OneNUHS*

“

*We share the common vision of providing high quality services to our patients, and to realise the vision of OneNUHS for thoracic surgery services across our cluster.*

*A/Prof John Tam Kit Chung, Head and Senior Consultant, Division of Thoracic Surgery, Department of CTVS, NUHCS*

Following its opening in 2015, Ng Teng Fong General Hospital (NTFGH) has been receiving an increasing number of patients requiring thoracic surgery, leading to a subsequent need to scale up the provision of thoracic surgery services.

For that reason, the surgery and operations team led by A/Prof Theodoros Kofidis and A/Prof John Tam Kit Chung from the Department of Cardiac Thoracic and Vascular Surgery (CTVS) at the National University Heart (NUHCS) collaborated with the team from NTFGH headed by Adj A/Prof Noel Stanley Tay to detail the provision of urgent and outpatient thoracic services at NTFGH. Weighing in these discussions, from NTFGH, were Prof Philip Lau, Head of Surgery, and Asst Prof Soon Yuen, Head of Upper Gastrointestinal Surgery Divi-

sion. The deliberation included a walking tour of NTFGH facilities to review the patient flow process.

To avoid a long waiting time for thoracic surgeries at NTFGH, the thoracic surgical team from NUHCS will perform urgent and emergent thoracic surgeries at NTFGH. The hospital's surgical team will provide in-house support to facilitate intraoperative assistance and post-operative care management. Patients can now also receive after surgery care through the outpatient thoracic surgery services in NTFGH.

By increasing the thoracic surgery capacity at NTFGH, residents in the Western region of Singapore will be better served and can expect a more efficient system under the OneNUHS cluster.

#### ARTICLE BY

A/Prof John Tam Kit Chung  
Head and Senior Consultant,  
Division of Thoracic Surgery,  
Department of CTVS, NUHCS



A/Prof John Tam is the founding Head of Thoracic Surgery at the NUHCS. He is a thoracic surgeon specialising in performing minimally invasive single-port keyhole surgery using advanced techniques in Uniportal Video-Assisted Thoracoscopic Surgery (UVATS). His research has been published across many high-impact medical and scientific journals. He also serves as a member on the Singapore Residency Advisory Committee for Cardio-Thoracic Surgery. He has won many awards in recognition for his service to patients and his contribution to the field of academic surgery.

Dr Harish Mithiran Muthiah  
Consultant, Division  
of Thoracic Surgery,  
Department of CTVS, NUHCS



Dr Mithiran trained at National University Hospital (NUH) in cardiothoracic surgery. He completed his advance surgical training in 2014 where he was awarded the Fellowship of the Royal College of Surgeons of Edinburgh. He has a special interest in minimally invasive thoracic surgery which include Video-Assisted Thoracic Surgery (VATS) and Robotic Assisted Thoracic Surgery (RATS) for lung and chest diseases. He also currently serves as the Asst Programme Director for the Cardiothoracic Surgery Residency Programme.

# SAFER, QUICKER DISCHARGE AFTER HEART SURGERY

*Evidence-based protocols to optimise patient care*

National University Heart Centre, Singapore (NUHCS) recently implemented the Enhanced Recovery After Surgery (ERAS®) protocol for cardiac surgery – one of the most resource-intensive and complex surgeries.

In 2019, the ERAS® protocol for cardiac surgery was published by the ERAS Cardiac Society following a multi-disciplinary systematic review of the current literature. This protocol has adopted many principles from abdominal surgery protocols, and also incorporated recommendations that reflect the unique nature of cardiac surgery.

Implementation of the protocol requires establishing a multi-disciplinary collabora-

tive team involving surgeons, anaesthesiologists, intensivists, haematologists, endocrinologists, nephrologists, nurses, physiotherapists, dietitians, counsellors, perfusionists and case managers to develop a comprehensive perioperative programme, guided by the protocols from the ERAS® Cardiac Society, as well as published studies with further recommendations from hospitals in the United States of America, Germany and China.

NUHCS will be closely reviewing pre- and post-protocol implementation with a series of preoperative, intraoperative and postoperative interventions (involving medical subspecialties and allied health support) to optimise overall patient outcomes.

## ARTICLE BY

**Dr Chang Guohao**  
Consultant, Department of Cardiac Thoracic and Vascular Surgery (CTVS), NUHCS



Dr Chang is an accredited specialist in cardiothoracic surgery by Singapore's Ministry of Health and was awarded the College of Surgeons Gold Medal in Cardiothoracic Surgery. He is currently a Consultant in the Department of CTVS at NUHCS with interests in all aspects of adult cardiac surgery including extracorporeal life support.

**A/Prof Ti Lian Kah**  
Director of Cardiac Anaesthesia & Senior Consultant, Department of Anaesthesia, National University Hospital (NUH)



A/Prof Ti is a tenured associate professor with the Yong Loo Lin School of Medicine, National University of Singapore. He did his cardiac anaesthesia fellowship at Duke University in the United States of America (USA), and is accredited for perioperative transesophageal echocardiography by the National Board of Echocardiography, USA. His research interest is on outcomes after surgery and has published over 80 papers, including on complications such as acute kidney injury, atrial fibrillation and poor neurological outcomes.



ARTICLE BY  
NUHCS Pulse Editorial

# DELVING DEEPER INTO CARDIOLOGY

*Dr Kent Anthony Tan shares his experience of the interventional cardiology fellowship at NUHCS*

In September 2018, Dr Kent Anthony Tan from the Philippines was accepted into the Interventional Cardiology Fellowship Programme at the National University Heart Centre, Singapore (NUHCS) after completing seven years of his residency programme at the Philippines Heart Centre.

He spent one year training in various contemporary atherectomy modalities<sup>1</sup> and the second year delving deeper into cardiovascular structural intervention.

“Good judgement comes from experience, and experience comes from bad judgment,” shared Prof Tan Huay Cheem, Senior Consultant, Department of Cardiology, who was then the Director of NUHCS. Dr Tan has since made it his own maxim in becoming a better doctor.

He was actively engaged on various levels in procedural and clinical work — treating patients with pulmonary hypertension (PH)<sup>2</sup>, adult congenital heart diseases and valve disorders, whilst being trained in various approaches to heart diseases and valve pathologies.

“One of the highlights for me was being part of a live transmission working on an orbital atherectomy<sup>3</sup> case alongside A/Prof Adrian Low at

the 2019 AICT-Asia PCR meeting,” shared Dr Tan. “Some of my mentors from back home were in attendance, so it was a proud moment for me when they commended my progress.”

Reminiscing his night duty calls, he recollected being stretched and challenged to meet the standards expected at NUHCS when dealing with the acute heart failure cases that came rushing through the hospital’s emergency doors. The team’s razor sharp focus and vigilance for possible complexities was inspiring for Dr Tan.

“The hardest part of the programme was turning in my hospital pass,” said Dr Tan. “It was an act of finality, marking the end of my time at NUHCS and having to say goodbye. As all good things must come to an end, I am eagerly looking forward to the next step in my career, where I can apply my learnings from NUHCS.”

<sup>1</sup>atherectomy modalities – Methods of treatment to remove plaque build-up in diseased arteries, limiting the flow of oxygen-rich blood to organs and other parts of the body.

<sup>2</sup>PH – A type of high blood pressure affecting the lung arteries and the right side of the heart.

<sup>3</sup>orbital atherectomy – A new methodology for treating arterial disease within the major and branch arteries of the leg.



## NUHCS Fellowship / Clinical Attachment

NUHCS offers a Fellowship / Clinical Attachment Programme to foreign doctors to gain firsthand experience in the Singapore healthcare industry, develop and strengthen the regional referral network, whilst acquiring specific clinical skills under the mentorship of leading medical professionals at NUHCS. To find out more about the eligibility criteria and application process, please email the programme coordinator at [fellowship\\_application@nuhs.edu.sg](mailto:fellowship_application@nuhs.edu.sg).

## AICT-Asia PCR meeting

Formed in 2019, AICT-Asia PCR is built by local practitioners with the support of centres of excellence in the Asia Pacific region and Europe, to focus on the diverse needs of patients in the interventional landscape. As a global educational meeting in the Asia Pacific region, the platform allows knowledge exchange between peers and the opportunity for healthcare 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.

# COVID-19, THE VACCINE, AND OUR HEART

## *Getting the facts straight*

While Covid-19 initially affects the airways and lungs, mounting evidence has shown that the heart muscle and the cardiovascular system are also affected, and can be severely damaged as a result of the viral infection.

Scientists found that the SARS-CoV-2 coronavirus can cause high levels of inflammation in the body including the heart muscles (myocarditis) or cause damage to the blood vessels, compromising the cardiovascular system. In severe cases, this could lead to a heart attack (acute myocardial infarction), heart failure, abnormal heart rhythm (arrhythmias), shock, and cardiac arrest.

As heart patients tend to be older (over the age of 65 years) and usually suffer from multiple comorbidities such as diabetes mellitus, hypertension, high cholesterol and kidney diseases, further contracting the Covid-19 infection makes them more likely to develop severe complications.

This explains why Covid-19 patients with underlying heart conditions are six times more likely to be hospitalised and 12 times more likely to die, compared with those without any heart condition.

However, it is also important to note that many patients with mild Covid-19 infection, including those with heart conditions, have managed to recover fully. Nonetheless, researchers are still compiling data to better understand the long-term impact of the coronavirus on the heart and the overall health of those who recover.

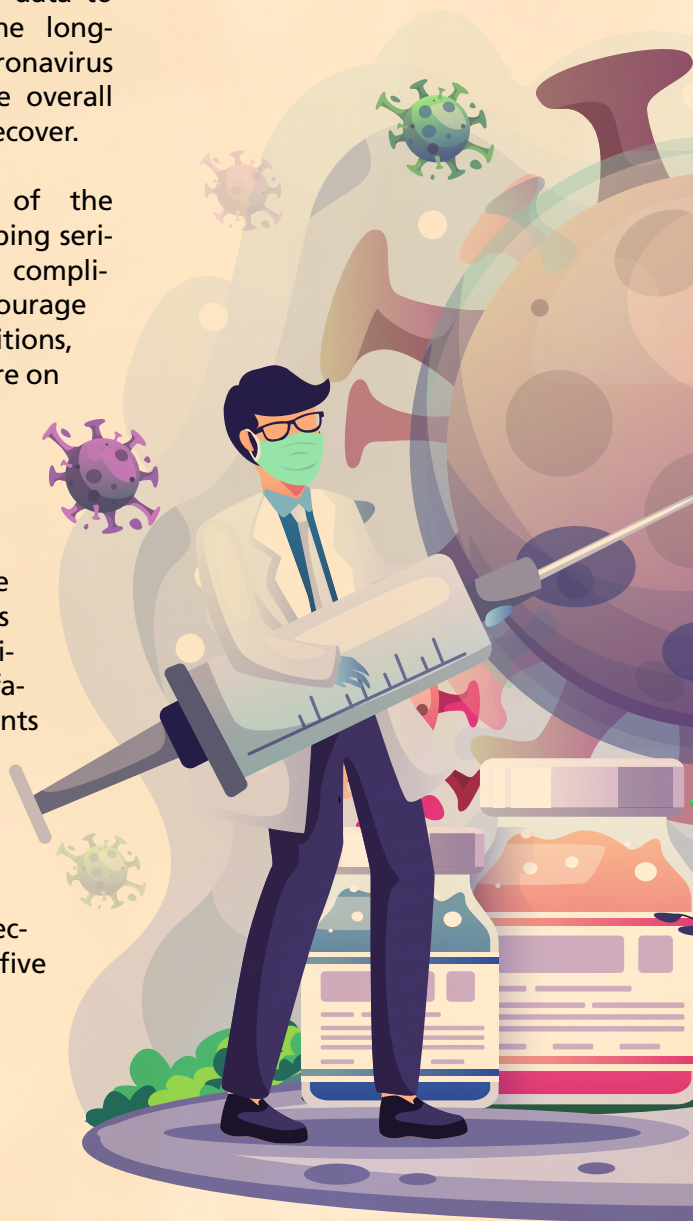
As a consequence of the higher risks of developing serious life-threatening complications, experts encourage those with heart conditions, including those who are on blood thinners such as antiplatelets (aspirin or clopidogrel), to protect themselves from the Covid-19 virus by taking the vaccination as soon as possible. Those on anticoagulants (e.g. warfarin or newer agents such as rivaroxaban, apixaban, or dabigatran) are further advised to apply compression over the site of injection for an additional five minutes.

### ARTICLE BY

Prof Tan Huay Cheem  
Senior Consultant,  
Department of Cardiology,  
National University Heart  
Centre, Singapore (NUHCS)



Prof Tan is a Professor of Medicine, Yong Loo Lin School of Medicine, NUS 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.



# WHY VACCINATE?



Lowers your risk of severe complications from Covid-19



Prevents the virus from spreading to another person



Protects you and your loved ones



Creates a protective web if many people in a community are vaccinated



Allows business and other social activities to resume

# VACCINE: MYTHS & FACTS



## MYTH

*The vaccines were developed too fast to be trusted for their efficacy.*



## FACT

The science is very clear on the efficacy of the vaccine. It was developed much quicker than usual because there are many eligible patients for testing in a pandemic, instead of having to wait for patients to enroll in the tests. Additionally, the phases of vaccine testing were carried out concomitantly during this pandemic which shortens the time. Finally, there has been a total commitment by manufacturers for rapid vaccine development and co-operation by the governing bodies to speed up review and accreditation processes.



## MYTH

*The new mRNA technology of vaccines may potentially transform recipients from humans into "hybrids" through alteration of the cell's DNA structure.*



## FACT

The mRNA vaccine is made up of a gene, which codes for a viral protein, wrapped up in a fat droplet, and administered intramuscularly. The mRNA gene makes the cell produce the viral protein to stimulate our body's immune response to the virus but does not alter the host cell's DNA structure. This is the very basis of the science behind cells and cellular function. A genetic modification would involve the deliberate insertion of foreign DNA into the nucleus of a human cell which is not how a vaccine works.



# IN PURSUIT OF ANSWERS TO THE HEART

*Researchers at the Cardiovascular Research Institute look at broad spectrum of issues to improve disease burden in Singapore*

ARTICLE BY  
NUHCS Pulse Editorial



"In the 1980s, 80 to 90 percent of the people who had heart failure were likely to die in the next few weeks. Now, about half of these people will be able to live for another five to six years," reflected Prof Arthur Mark Richards, Deputy Director, National University Heart Centre, Singapore (NUHCS) on the changes he has seen over the years in his career.

Even so, he added, such odds leave plenty of room for improvement and many challenges for clinicians and scientists to answer.

Describing the field as a specialty with many unanswered questions, Prof Richards is intent on finding these answers at the Cardiovascular Research Institute (CVRI) – the research arm of NUHCS, where he has led as Director since its inception in 2009.

Hailing from New Zealand, Prof Richards has built CVRI from ground up with a handful of researchers to a centre with about 100 dedicated staff working in an advanced research centre equipped with specialised lab equip-

ment including wet lab facilities, research animal breeding colonies, high-definition digital imaging equipment, and high throughput platforms to run and perform a wide array of proteomic, metabolomic and nucleic acid assays and analysis.

At any one time, CVRI tackles around 50 different projects relating to cardiovascular issues, from looking at a particular molecule in a cell in a lab to running clinical trials of novel approaches to the treatment of heart failure.

"One thing that stood out to me was the great deal of heart and arterial diseases here, but research funding for cardiovascular research was disproportionately small compared to that going to other biomedical domains," Prof Richards said in observation when he was part of the Cardiovascular Disease Taskforce to develop research roadmaps for Singapore.

Singapore has a high rate of diabetes which is the key background contributing factor to heart diseases in people here. The combination of diabetes with risk factors such as high



blood pressure appears to be far more toxic to the heart in Singapore than in western countries.

"We don't really understand the problem," he let on. "Rather than focus solely on the heart organ, we need to think about the things that injure it – such as diabetes, blood pressure, hypertension, all of which are very prevalent here."

In the race for answers, he said, "One of the next steps for me, is to encourage cardiovascular research. We could have another five or six senior research investigators who could bring CVRI to a critical mass, where it can really keep its momentum, have lots of cross-pollination of ideas with each other, share facilities and generate more synergy."

nation of ideas with each other, share facilities and generate more synergy."

CVRI has been paying attention to heart failure, focusing on a broad spectrum from pure prevention to complete

rebuilding and regenerating the heart.

"It's very ambitious but kind of aspirational. It is the foundational mission for our work, and directs the advances we have made," he said.

Some of the work that have come out of CVRI include the design and development of a new heart replacement valve made from natural materials; the re-engineering of a protein from a bacterium to encapsulate another protein for targeted purposes, and identifying new biomarkers that can predict heart failure after a heart attack.

CVRI performs clinical trials in collaboration with other institutes in Singapore and in other countries on related studies such as looking into the association of poor sleep and coronary heart disease to address a patient's survival rate.

Having been here for over a decade, Prof Richards acknowledged that Singapore has some unique strengths conducive for medical research such as the high education and good work ethics of the talent pool.

"People here typically really want to do a good job and take things to the next level."

He further commented on the research support structure in Singapore which he thought was "far-sighted". The government provides grants to support junior clinician scientists to pursue research whilst they continue with clinical work. Grants are also made avail-

able to encourage institutes in Singapore to collaborate, which not only avoids duplication of resources but combines institutional strengths and has fostered communication and closer working ties between the different institutes.

"I don't think this has happened in other countries," said Prof Richards.

Looking ahead, he is hopeful that CVRI will expand to tackle the multitude of cardiovascular issues confounding experts. He also sees the institute progressing further into the research which they have made headway.

He chimed, "We have a whole atlas of biomarkers now that we would like to explore from our previous work. We want to see if they do actually work for prognostic or diagnostic uses in the clinic and whether they point to entirely new treatments. There is a lot going on!"

“

***When you get on the trail of asking questions and finding answers, and making discoveries, you tend to stay on the path.***

Prof Arthur Mark Richards, Deputy Director, NUHCS and Director, CVRI

# THE ACCIDENTAL CAREER

*Perfusion Week highlights critical role of perfusionists*

The first week of May is dedicated as Perfusion Week to bring about awareness of the perfusionist's role in cardiovascular surgery and extracorporeal membrane oxygenation (ECMO).

Many cardiovascular surgeries need the heart to be still in order to be operated on. This is where perfusionists step in. They are specially trained to operate, maintain and record the output of the heart-lung machine, designed to maintain the circulation of blood and oxygen through the body.

Outside the operating theatres (OT), perfusionists also provide cardiac and respiratory support with the ECMO machines, which are smaller heart-lung machines designed for long-term life support.

Working as a perfusionist within the Department of Cardiac, Thoracic and Vascular Surgery (CTVS) at the National University Heart Centre, Singapore (NUHCS), Ms Clara Anne Lim shares more about the profession.



Ms Clara Anne Lim  
Perfusionist,  
Department of CTVS,  
NUHCS



**What got you interested in the job of a perfusionist?**

**Clara:** It was a recruiter from whom I first heard about the job of a perfusionist. I had to google it as it was my first time hearing about this job! However, the job piqued my interest as it was related to my studies – cardiac technology and biomedical sciences. I decided to take up the challenge as the human heart has always fascinated me.

On the day of my interview, I remember a senior perfusionist sprung a surprise tour to the OT where I would need to work in, and observed my response to being present during open heart surgeries. I certainly did not expect that. Luckily, I did not faint or I would have been rejected.

**What do you like best about being a perfusionist?**

I love the challenges I face in this fast-paced job. It requires quick thinking on your feet, and is also demanding as we are required to support the various number of surgeries going on.

It is a very rewarding job, when I play a part in helping someone survive surgery that will help him or her lead a better quality of life.

**What are the most challenging aspects of the job?**

There are some days which can be more physically and mentally challenging than others.

We are rostered to be on call 24 hours to respond to medical emergencies. When these situations occur, it could mean long hours as



emergency procedures can be very complicated.

There was one difficult night call during the Covid-19 Circuit Breaker in 2020. A patient had a heart attack and went into cardiogenic shock. He was also a suspected Covid-19 case which required the procedure to be done in isolation, and for us to don on full personal protection equipment (PPE).

This meant that we could not leave the OT even for a toilet break, as the PPE made it a hassle. Since it was an emergency, the entire team was basically stuck in the room the entire night as there was no backup team!

In general, I find paediatric cases more stressful and demanding, especially when they are fragile newborns. They are much smaller in size, requiring our circuits

and machinery to be smaller which also meant that we need to be very precise in managing these cases. In addition, congenital cardiac surgeries on paediatrics tend to be more complex as they could have different anatomies and physiologies compared to adults.

#### **What are some common misconceptions about perfusionists?**

Like me at the start of my career, many people have not heard about perfusionists. They think the job is related to perfumes, when it is actually about the body's circulatory system.

Another misconception is that people liken our job to a technician operating a machine. However, our responsibility goes beyond that. We take over the oxygenation and perfusion of

the patient once they are on bypass, constantly monitoring and responding to haemodynamic, brain function, and blood gas changes, making clinical decisions on patient management during the surgery.

#### **Any tips for aspiring perfusionists?**

Understand the anatomy and physiology of the entire human body, and not just the heart. We perfuse the entire body which has a critical impact on the functions of other organs, including the brain and kidneys.

#### **ARTICLE BY**

Mr Goh Si Guim  
Senior Principal  
Perfusionist, Department  
of CTVS, NUHCS



Mr Goh joined a team of three perfusionists at the National University Hospital (NUH) to help support the Department of CTVS in 1993. With the expansion and growth of cardiovascular surgical procedures at NUH, the Perfusion Service team has likewise grown in parallel to a team of 12, to date. He was previously trained to become a qualified perfusionist at the Singapore General Hospital and holds a Bachelor's in Biological Sciences.



# NEVER WALK ALONE

*The role of patient support groups*

ARTICLE BY

NUHCS Pulse Editorial

The passion to provide care and support for heart patients post treatment was the motivation behind setting up the Caring Hearts Support Group (CHSG) – a voluntary initiative by patients from the National University Heart Centre, Singapore (NUHCS), which was established in the third quarter of 2017.

As a patient support group, CHSG is truly the face of NUHCS, embodying the Centre’s core and purpose to provide treatment and care for heart patients. Often, treatment of cardiovascular diseases could mean a lifelong condition or a long rehabilitation period. In this, CHSG becomes a key avenue for patients to better understand and manage their condition, whilst providing emotional support and encouragement for patients and their families on the long road to recovery.

Ms Magdalene Chia, the programme co-ordinator of CHSG, who is also a patient of NUHCS and a volunteer member of CHSG, reflects on the past three years since the formation of the group.

Together with other members, she leads CHSG by organising meaningful activities to engage its members.

Asst Prof Yeo Tee Joo, Consultant, Department of Cardiology, NUHCS, who is focused on improving NUHCS’s cardiac rehabilitation experience for patients, acts as an adviser to CHSG and steers the direction and growth of the group.

Here, Ms Chia and Asst Prof Yeo share on the role CHSG has played and weigh in on its future role in patient care.



**Ms Magdalene Chia**  
Programme  
Co-ordinator, CHSG



**Asst Prof Yeo Tee Joo**  
Consultant, Department  
of Cardiology, NUHCS

**Pulse:** *How has CHSG impacted patients' lives?*

**Tee Joo:** CHSG provides invaluable voluntary support services, especially for new heart patients, by providing more than medical information about heart diseases. Through the sharing of personal experiences, CHSG members offer insights into prevention and cardiac rehabilitation programmes, especially crucial at professional platforms such as the Singapore Prevention & Cardiac Rehabilitation Symposium 2019, which could influence future patient care.

**Magdalene:** Patients who first join CHSG naturally feel discouraged, fearful, and emotional or have low confidence about their recovery. But, most of them become more confident, sociable, and positive as they learn more about their medication and condition. They take active responsibility leading healthier lifestyles and some have gone on to become

health advocates by supporting other heart patients or spreading awareness within our community.

remote exercises and sharing sessions.

Many of our members joined and participated in these activities, reaffirming our role and belief that the need to connect with members frequently is a step in the right direction. Interestingly, during this period when we had to find a different way to connect with our members, we also uncovered many hidden creative talents within our group, such as art and singing.

compliance to medication and healthy lifestyles as well as the effectiveness of such communal groups in preventing heart diseases.

**Magdalene:** We are very grateful to all our stakeholders who have supported our past activities and initiatives these past few years. We are currently in discussions to align and offer our volunteer services with NUHCS and NUH to work towards common outcomes within the heart patient community.

Meanwhile, we intend to continue designing our self-supported programmes and initiatives which are popular amongst our members, such as exercise activities, sharing sessions, meet-ups and educational talks.



**Pulse:** What do you hope CHSG would mean for its members?

**Magdalene:** We hope to build CHSG into a trusted platform and avenue, firstly as a 'safe haven' for patients to foster friendship and togetherness. Through this, we hope to create a positive impact on members' lives, to care and inspire one another to lead healthy lives and advocate the wider public to take on a more proactive role with their cardiovascular health.

**Pulse:** Could you share how the coronavirus year (2020) affected CHSG (and members)?

**Magdalene:** It was initially challenging to provide support without face-to-face interaction. Nonetheless, we felt it was important for continued communication as it was especially critical to offer emotional support during this period. Like many others, we continued with our outreach through online platforms. We organised virtual get-togethers, celebrated festivals and conducted

**Pulse:** Are there any upcoming plans that members look forward to?

**Tee Joo:** We see CHSG as a growing extension of our health care team of motivated patients who can offer affirmation and emotional support. This adds value to the recovery of patients beyond treatment and medication.

The National University Hospital (NUH) is putting together a health coaching course aimed at equipping individuals with more information about chronic conditions and enabling them to become health coaches. We hope to involve some members from CHSG in this course.

There is further synergy and scope to collaborate and study



### Caring Hearts Support Group (CHSG)

Heart patients who are keen to join or those who are interested to find out more about CHSG can write in to: [mchia@kucinta.com](mailto:mchia@kucinta.com)



# CHSG Milestones



**3 MARCH  
2018**

Official Launch of CHSG with unveiling of brand, logo, tagline, vision and mission



1<sup>st</sup> Annual Retreat to Malacca

**SEPTEMBER  
2018**

Marked 1<sup>st</sup> Anniversary with barbecue party

**MARCH  
2019**



**SEPTEMBER  
2019**

2<sup>nd</sup> Annual Retreat to Penang

Participated at Singapore Prevention and Cardiac Rehabilitation Heart Symposium 2019

**OCTOBER  
2019**



**APRIL  
2020**

1<sup>st</sup> virtual get-together

3<sup>rd</sup> Anniversary Celebration with a walk at Coney Island

**MARCH  
2021**



# EVERY SECOND COUNTS

*The impact of the Covid-19 pandemic on the Western STEMI Network*

In the wake of the pandemic, many countries reported an increase in mortality as hospitals reorganised time-sensitive services to cope with the strain on resources such as primary percutaneous coronary intervention (PCI)<sup>1</sup> for acute ST-segment elevation myocardial infarction (STEMI)<sup>2</sup>.

Any delay in treatment, including the time from the onset of symptoms to the time the patient arrives at a PCI-capable hospital or

to the time the device is deployed, also known as door-to-balloon time (D2Bt), can adversely affect the outcome of STEMI patients.

Global reports have suggested an intrinsic delay from diagnosis to reperfusion, especially in hospitals overwhelmed with Covid-19 patients, because of the strain on the emergency medical system and the requirement to don personal protective equipment. Paradoxically, there has also been an unexplained phenomenon of a large

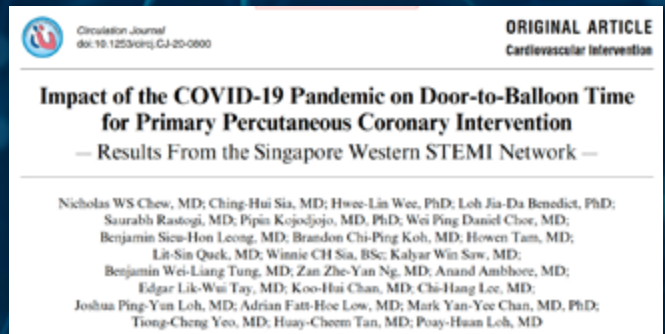
reduction in the number of STEMI patients, raising the concern that patients avoided hospitals for fear of exposure to Covid-19.

To evaluate the effect of the pandemic response on D2Bt and clinical outcomes of STEMI patients undergoing primary PCI, a retrospective study was conducted within the Singapore Western STEMI network (Network) on patients who presented directly or were transferred to National University Heart Centre, Singapore (NUHCS) for primary PCI, from October 2019 to March 2020, comparing the clinical outcomes of patients admitted before and during the Covid-19 outbreak response. In Singapore, local health authorities raised the national disease outbreak alert (also known as DORSCON Orange) on 7 February 2020.

Within the Network, a slight increase in D2Bt was observed during the outbreak response. However, there were no significant differences in the incidences of cardiogenic shock, unplanned readmissions, and in-hospital mortality.

***Credits to all involved in the Network, showing that it has withstood the trial of such challenges and emerged stronger. The selflessness shown by all of our colleagues who put themselves in the frontline to care for these patients is highly commendable.***

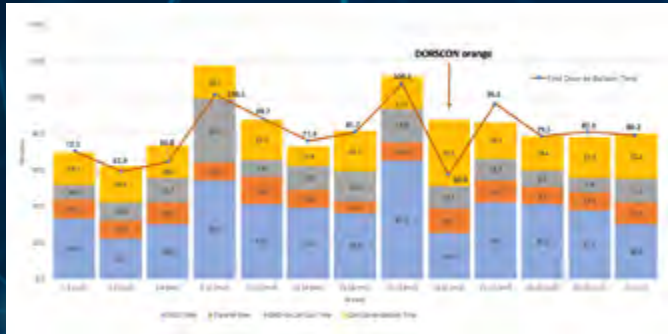
Dr Nicholas Chew, Senior Resident, Department of Cardiology, NUHCS





### Singapore's Western STEMI network

is a collaborative protocol system involving NUHCS, National University Hospital (NUH) Emergency Department, NTFGH, AH, as well as the Singapore Civil Defence Force aimed to centralise the primary PCI service delivery in NUHCS for the western region in Singapore.



Inter-hospital transfer of patients from Ng Teng Fong General Hospital (NTFGH) and Alexandra Hospital (AH) experienced no delay with the vast majority of patients treated within the internationally accepted D2Bt threshold of 120 minutes.

Of note, the efficiency of the primary PCI service was only adversely affected in the two weeks leading up to DORSCON Orange, but this was swiftly returned to the usual as medical personnel adjusted to the new protocols.

The drop in efficiency was attributed to the longer waiting time needed in the emergency departments of both the referral and recipient hospitals. Importantly, there were no in-hospital deaths among patients admitted during those two weeks.

The pandemic has strained the healthcare system and reduced the efficiency of the primary PCI service, inadvertently raising concerns of the long-term sequelae on STEMI patients which remains uncertain in the near future.

Although clinical outcomes were well within internationally accepted guidelines, there are invaluable lessons to learn from this pandemic. The study showed that a close collaboration between emergency medical services and hospitals in the early implementation of pre-hospital workflows is crucial in order to improve service efficiency. There was also a need to capitalise and mobilise resources quickly in an outbreak response.

While the pandemic has put a strain on the Network, the lessons will be reviewed, with all stakeholders at the regional level making concerted efforts to mitigate any potential service disruption in the future.

*The above is a commentary from the authors following the recent publication of their study, "Impact of the COVID-19 Pandemic on Door-to-Balloon Time for Primary Percutaneous Coronary Intervention – Results From the Singapore Western STEMI Network" in Circulation Journal 2021 Volume 85 Issue 2 Pages 139-149.*

<sup>1</sup>PCI – A non-surgical procedure to treat obstructed coronary arteries often done through balloon angioplasty or by inserting a catheter in the artery to place a stent which keeps the artery open.

<sup>2</sup>STEMI – A more severe form of heart attack where a large part of the heart muscle has died due to an obstruction in the blood flow, leading to a life-threatening emergency.

ARTICLE BY

Dr Loh Poay Huan  
Senior Consultant,  
Department of Cardiology,  
NUHCS



Dr Loh is currently the clinical lead for the Western STEMI Network and a Senior Consultant at NUHCS. Prior to joining NUHCS, he trained and worked in the field of cardiology in the United Kingdom (UK). He remains active in research with a special interest in interventional cardiology.

Dr Nicholas Chew  
Senior Resident,  
Department of Cardiology,  
NUHCS



Dr Chew is currently a cardiology senior resident, having joined the senior residency programme at NUHCS in 2020. While embarking on a new journey in his specialist training, he hopes to contribute in the areas of research and education in cardiology.



# WHAT'S ON TV?

Senior Consultants from the National University Heart Centre, Singapore – Prof Tan Huay Cheem and Asst Prof Lim Toon Wei appeared as guest medical experts in MediaCorp's Channel 8 *Body SOS* on 19 March and 23 April this year to discuss cardiovascular health issues.



# PLANTING A TREE FOR FUTURE GENERATIONS

The Department of Cardiology and the Department of Cardiac, Thoracic, and Vascular Surgery from the National University Heart Centre, Singapore donated trees as part of the NUS Yong Loo Lin School of Medicine's 115<sup>th</sup> Anniversary Plant-A-Tree programme.

NUS Medicine 115th Anniversary

*Plant-a-Tree*



# Congratulations!



## National University Hospital (NUH) Quality Improvement Project Award

### MERIT AWARD – RAPID IMPROVEMENT EVENT

#### Coronary Artery Bypass Graft Improvement

A/Prof Theodoros Kofidis  
Ada Chan  
Asst Prof Kristine Teoh  
Asst Prof Diarmuid Paul Murphy  
Chancy Lim  
Clifford Xu De Sheng  
Dolly Khatri  
Dr Chang Guohao  
Dr Karen Koh Wei Ling  
Dr Qian Qi  
Hu Xinpei (Peggy Hu)  
Jolane Eng  
Kalaivani Ramiah @ Priya  
Khoo Shan Nee  
Lim Seok Kian  
Oh Seok Lee Pauline  
Poojari Shefali Jay  
Sally Chin

#### Value Driven Outcomes: Transcatheter Aortic Valve Implantation

A/Prof Yeo Tiong Cheng  
Christina Columna Jamon  
Dr Jeanette Ting  
Dr Koh Wei Ling Karen  
Dr Ivandito Kuntjoro  
Ho Ee Kian  
Lim Yee Chen  
Myat Myint Myint Kyaing  
Ong Azlin  
Then Ai Huong  
Vikneswary D/O Murugiah

### RECOGNITION AWARD - PROJECTS

#### Reducing the Incidence of Disconnected Home Monitoring Patients

Asst Prof Devinder Singh  
Asst Prof Lim Toon Wei  
Asst Prof Pipin Kojodjojo  
Asst Prof Seow Swee Chong  
Asst Prof Yeo Wee Tiong  
Cindy Goh  
Er Wen Shan  
Lai Lee Wah  
Too Pei Ni



## National University Health System (NUHS) FY20 Seed Grant Awards



The National University Health System (NUHS) seed grants are open to researchers from NUHS institutions. The funding supports creative research in health and biomedical sciences, ranging from discovery to implementation. The seed grants aim to nurture novel research ideas with the potential to grow and qualify for national research grants.



**Prof Roger Foo,**  
Senior Consultant,  
Department of Cardiology

**Project:** Non-steroidal anti-inflammatory drugs (NSAIDs) raise cardiovascular risk by perturbing cellular prostaglandin signaling



**Asst Prof Lin Weiqin,**  
Clinical Lead, Heart Failure and Shock Service and Consultant,  
Department of Cardiology

**Project:** Takotsubo Syndrome: Role of inflammation in pathogenesis and myocardial recovery

## Promotions

*Congratulations to our newly-promoted doctors!*

FROM APR 2021



**Dr Sia Ching Hui**  
Associate Consultant



**Dr Perryn Ng**  
Associate Consultant



**Prof Lee Chi Hang Ronald**  
Professor and Senior Consultant

## Main Clinical Educator Appreciation Award 2021



## Congratulations!

Ms Fun Yoke Chang Shermaine was awarded for her management and contribution in clinical training matters, and her dedication in imparting knowledge to the next generation of medical staff.

## PUBLICATIONS

**2020 EACTS/ELSO/STS/AATS expert consensus on post-cardiotomy extracorporeal life support in adult patients.** *Eur J Cardiothorac Surg.* 2021 Jan;59(1):12-53. Lorusso R, Whitman G, Milojevic M, Raffa G, McMullan DM, Boeken U, Haft J, Bermudez CA, Shah AS, D'Alessandro DA. EACTS/ELSO/STS/AATS Committee Reviewers: Arora RC, Freemantle N, Knosalla C, MacLaren G, Potapov EV, Schmid C, Shekar K, Silvestri S, Wahba A.

**A 78-year-old male with inferior ST-segment elevation on electrocardiogram, diabetic ketoacidosis and acute pancreatitis.** *Cardiovasc Endocrinol Metab.* 2020 Apr 17;9(4):186-188. Ho JSY, Mui B, Sia CH, Djohan AH, Mok SF, Chan MY, Ambhore A.

**A Brain-Heart Interaction: Bickerstaff's brainstem encephalitis with Takotsubo Cardiomyopathy.** *QJM* 2020 Jul [Epub ahead of print]. See FHW, Goh YH, Sia CH, Tan BYQ, Yeo LLL, Vijayan J, Ahmad A.

**A Multicenter Global Registry of Paclitaxel Drug-Coated Balloon in Dysfunctional Arteriovenous Fistulae and Grafts: 6-Month Results.** *J Vasc Interv Radiol.* 2021 Mar;32(3):360-368. Karnabatidis D, Kitrou PM, Ponce P, Chong TT, Pietura R, Pegis JD, Ko PJ, Lin CH; **Lutonix AV Global Registry Investigators.**

**A percutaneous approach to create tricuspid regurgitation in swine: a model for transcatheter tricuspid valve therapy assessment.** *J Artif Organs.* 2021 Jan [Epub ahead of print]. Yan Q, Chan ZW, Goh JXW, Hon JKF, Wong JCL, Kong WKF, Tay EL.

**A rare case of ectopic retrosternal goiter.** *Clin Case Rep.* 2021;9:1849-1852. Oh SL, Chia CLK, Ooi OC, Sonawane V, Rao AD, Singaporewalla R.

**A systematic review of brachial artery ligation as a safe and feasible option in the management of arteriovenous dialysis access infection.** *J Vasc Surg.* 2021 Feb [Epub ahead of print]. Lee KS, Choong AMTL, Ng JJ.

**Acute mesenteric ischaemia after cardiac surgery: Clinical suspicion**

**is key to survival.** *Singapore Med J.* 2020 Nov;61(11):613. Papadimas E, Kang GS.

**Alternative technique of long acting cardioplegia delivery results in less hemodilution.** *Perfusion.* 2020 Aug [Epub ahead of print]. Ong GS, Goh SG, Lim QX, Huang SCN, Jaafar NB, Lim CA, Chew KHC, Sazzad F, Kofidis T.

**An in vitro investigation into the hemodynamic effects of orifice geometry and position on left ventricular vortex formation and turbulence intensity.** *Artif Organs.* 2020 Dec;44(12):e520-e531. Tan SG, Hon JKF, Nguyen YN, Kim S, Leo HL.

**Anti-phospholipid syndrome and COVID-19 thrombosis: connecting the dots.** *Rheumatol Adv Pract.* 2021 Feb;5(1):rkaa081. Tung ML, Tan B, Cherian R, Chandra B.

**Anticoagulation After Isolated Mitral Valve Repair: A Systematic Review and Meta-Analysis of Clinical Outcomes.** *Heart Lung Circ.* 2021 Feb;30(2):247-253. Papadimas E, Tan YK, Choong AMTL, Kofidis T, Teoh KLK.

**Association between smoking status and outcomes in myocardial infarction patients undergoing percutaneous coronary intervention.** *Sci. Rep* 2021;11:6466. Sia CH, Ko J, Zheng H, Ho AFW, Foo D, Foo LL, Lim PZY, Liew BW, Chai P, Yeo TC, Tan HC, Chua T, Chan MY, Tan JWC, Bulluck H, Hausenloy DJ.

**Association of Electrocardiographic P-Wave Markers and Atrial Fibrillation in Embolic Stroke of Undetermined Source.** *Cerebrovasc Dis.* 2021;50(1):46-53. Li TYW, Yeo LLL, Ho JSY, Leow AS, Chan MY, Dalakoti M, Chan BPL, Teoh HL, Seow SC, Kojodjojo P, Sharma VK, Tan BYQ, Sia CH.

**Atrial Fibrillation and the Prognostic Performance of Biomarkers in Heart Failure.** *Clin Chem.* 2021 Jan 8;67(1):216-226. Tan ESJ, Chan SP, Liew OW, Chong JPC, Leong GKT, Yeo DPS, Ong HY, Jaufeerally F, Yap J, Sim D, Ng TP, Ling LH, Lam CSP, Richards AM.

**Automated Fastener vs Hand-tied Knots in Heart Valve Surgery: A Systematic Review and Meta-analysis.** *Ann Thorac Surg.* 2020 Dec [Epub ahead of print]. Sazzad F, Ler A, Kuzemczak M, Ng S, Choong AM, Kofidis T.

**Bridging the Gap Between Intensivists and Primary Care Clinicians in Extracorporeal Membrane Oxygenation for Respiratory Failure in Children: A Review.** *JAMA Pediatr.* 2021 Mar [Epub ahead of print]. Barbaro RP, Brodie D, MacLaren G.

**Burnout and Associated Factors Among Health Care Workers in Singapore During the COVID-19 Pandemic.** *J Am Med Dir Assoc.* 2020 Dec;21(12):1751-1758.e5. Tan BYQ, Kanneganti A, Lim LJH, Tan M, Chua YX, Tan L, Sia CH, Denning M, Goh ET, Purkayastha S, Kinross J, Sim K, Chan YH, Ooi SBS.

**Call to improve vascular surgery education in medical schools.** *British Journal of Surgery.* 2021 Mar;108(3):e123-e124. Ng JJ, Lee KS, Choong AMTL.

**Caring for Critically Ill Children With Suspected or Proven Coronavirus Disease 2019 Infection: Recommendations by the Scientific Sections' Collaborative of the European Society of Pediatric and Neonatal Intensive Care.** *Pediatr Crit Care Med.* 2021 Jan;22(1):56-67. Rimensberger PC, Kneyber MCJ, Deep A, Bansal M, Hoskote A, Javouhey E, Jourdain G, Latten L, MacLaren G, Morin L, Pons-Odena M, Ricci Z, Singh Y, Schlapbach LJ, Scholefield BR, Terheggen U, Tissières P, Tume LN, Verbruggen S, Brierley J; European Society of Pediatric and Neonatal Intensive Care (ESPNIC) Scientific Sections' Collaborative Group.

**Characteristics and outcomes of young patients with ST segment elevation myocardial infarction undergoing primary percutaneous coronary intervention: retrospective analysis in a multiethnic Asian population.** *Open Heart.* 2021 Jan;8(1):e001437. Tung BWL, Ng ZY, Kristanto W, Saw KW, Chan SP, Sia W, Chan KH, Chan MY, Kong WKF, Lee CH, Loh JP, Low AF, Poh KK, Tay EL, Tan HC, Yeo TC, Loh PH.

**Cilostazol for secondary stroke prevention: systematic review and meta-analysis.** *Stroke Vasc Neurol.* 2021 Feb [Epub ahead of print]. Tan CH, Wu AG, Sia CH, Leow AS, Chan BP, Sharma VK, Yeo LLL, Tan BYQ.

**Clinical risk stratification in COVID-19: the need for a revised approach?** *Pulm Circ.* 2021 Jan

27;11(1):2045894020988630.  
Cherian R.

**Concurrent Use of Renal Replacement Therapy during Extracorporeal Membrane Oxygenation Support: A Systematic Review and Meta-Analysis.** *J Clin Med.* 2021 Jan 11;10(2):241.  
Mitra S, Ling RR, Tan CS, Shekar K, MacLaren G, Ramanathan K.

**Demographic shift in COVID-19 patients in Singapore from an aged, at-risk population to young migrant workers with reduced risk of severe disease.** *Int J Infect Dis.* 2021 Feb;103:329-335. Ngiam JN, Chew NWS, Tham SM, Beh LLD, Lim ZY, Li YWT, Cen S, Tambyah PA, Santosa A, Sia CH, Cross GB.

**ECMO for COVID-19: Updated 2021 Guidelines from the Extracorporeal Life Support Organization (ELSO).** *ASAIO J.* 2021 Feb [Epub ahead of print]. Badulak J, Antonini MV, Stead CM, Shekerdemian L, Raman L, Paden ML, Agerstrand C, Bartlett RH, Barrett N, Combes A, Lorusso R, Mueller T, Ogino MT, Peek G, Pellegrino V, Rabie AA, Salazar L, Schmidt M, Shekar K, MacLaren G, Brodie D.

**ECMO support for COVID-19: a balancing act - Authors' reply.** *Lancet.* 2021 Jan 9;397(10269):95.  
Barbaro RP, MacLaren G, Brodie D.

**Effect of Renin-Angiotensin System Inhibitors on Acute Kidney Injury Among Patients Undergoing Cardiac Surgery: A Review and Meta-Analysis.** *Semin Thorac Cardiovasc Surg.* 2020 Nov [Epub ahead of print]. Zhou H, Xie J, Zheng Z, Ooi OC, Luo H.

**Effects of Sodium/Glucose Cotransporter 2 (SGLT2) Inhibitors on Cardiovascular and Metabolic Outcomes in Patients Without Diabetes Mellitus: A Systematic Review and Meta-Analysis of Randomized-Controlled Trials.** *J Am Heart Assoc.* 2021 Feb;10(5):e019463. Teo YH, Teo YN, Syn NL, Kow CS, Yoong CSY, Tan BYQ, Yeo TC, Lee CH, Lin W, Sia CH.

**Electrocardiography findings in right ventricular apical pacing.** *Singapore Med J.* 2020 Oct;61(10):517-522. Shen X, Sia CH, Poh KK, Huang W, Ho KL.

**Endovascular versus open surgical endarterectomy for atherosclerotic**

**lesions of the common femoral artery (CFA).** *Cochrane Database of Systematic Reviews.* 2020 Feb;2:CD013545. Wee I, Tan G, Ng S, Chan ESY, Ng JJ, Samuel M, Choong AMTL.

**Extracellular vesicle drug occupancy enables real-time monitoring of targeted cancer therapy.** *Nat Nanotechnol.* 2021 Mar [Epub ahead of print]. Pan S, Zhang Y, Natalia A, Lim CZJ, Ho NRY, Chowbay B, Loh TP, Tam JKC, Shao H.

**Extracorporeal Life Support Organization (ELSO): 2020 Pediatric Respiratory ELSO Guideline.** *ASAIO J.* 2020 Sep/Oct;66(9):975-979. Maratta C, Potera RM, van Leeuwen G, Moya AC, Raman L, Annich GM. Reviewers: Brogan TV, Davidson M, MacLaren G, Peek G.

**Fever as a predictor of adverse outcomes in COVID-19.** *QJM* 2021 Feb [Epub ahead of print]. Chew NWS, Ngiam JN, Tham SM, Lim ZY, Li YWT, Cen S, Yap ES, Tambyah PA, Santosa A, Cross GB, Sia CH.

**Global impact of the first coronavirus disease 2019 (COVID-19) pandemic wave on vascular services.** *Br J Surg.* 2020 Oct;107(11):1396-1400. **Vascular and Endovascular Research Network (VERN) COVER study collaborative.**

**Gut Microbiota Dysbiosis as a Target for Improved Post-Surgical Outcomes and Improved Patient Care: A Review of Current Literature.** *Shock.* 2021 Apr 1;55(4):441-454. Dawoodbhoy FM, Patel BK, Patel K, Bhatia M, Lee CN, Moochhala SM.

**How to do it: value-driven sharp recanalization of central vein occlusion.** *ANZ J Surg.* 2020 Mar;90(3):362-363. Yoong GSW, Koh FHX, Wee BBK, Gopinathan A, Ho P.

**How to set up a minimally invasive cardiac surgery program?** *Turk Gogus Kalp Damar Cerrahisi Derg.* 2020 Oct 21;28(4):571-575. Kofidis T, Chang G.

**Impact of avoiding cardioplegic arrest on clinical outcome in patients undergoing CABG in Bangladesh: a systematic review and meta-analysis.** *Indian J Thorac Cardiovasc Surg.* 2021

Mar;37(2):153-163. Sazzad F, Ganesh G, Cheekoty P, Veerappan M, Kofidis T.

**Impact of the coronavirus disease 2019 (COVID-19) pandemic on the care of patients with acute and chronic aortic conditions.** *Eur J Cardiothorac Surg.* 2021 Jan [Epub ahead of print]. Czerny M, Gottardi R, Puiu P, Bernecker OY, Citro R, Corte AD, di Marco L, Fink M, Gosslau Y, Haldenwang PL, Heijmen RH, Hugas-Mallorqui M, Iesu S, Jacobsen O, Jassar AS, Juraszek A, Kolowenka M, Lepidi S, Marrocco-Trischitta MM, Matsuda H, Meisenbacher K, Micari A, Minatoya K, Park KH, Peterss S, Petrich M, Piffaretti G, Probst C, Reutersberg B, Rosati F, Schachner B, Schachner T, Sorokin V, Szeberin Z, Szopinski P, Di Tommaso L, Trimarchi S, Verhoeven ELG, Vogt F, Voetsch A, Walter T, Weiss G, Yuan X, Benedetto F, De Bellis A, D'Orta M, Discher P, Zierer A, Rylski B, van den Berg JC, Wyss TR, Bossone E, Schmidli J, Nienaber C, Collaborators: Accarino G, Baldascino F, Böckler D, Corazzari C, D'Alessio I, de Beaufort H, De Troia C, Dumfarth J, Galbiati D, Gorgatti F, Hagl C, Hamiko M, Huber F, Hyhlik-Duerr A, Ianelli G, Iesu I, Jung JC, Kainz FM, Katsargyris A, Koter S, Kusmierczyk M, Kolsut P, Lengyel B, Lomazzi C, Muneretto C, Nava G, Nolte T, Pacini D, Pleban E, Rychla M, Sakamoto K, Shijo T, Yokawa K, Siepe M, Sirch J, Strauch J, Sule JA, Tobler EL, Walter C, Weigang E.

**Impact of the COVID-19 Pandemic on Door-to-Balloon Time for Primary Percutaneous Coronary Intervention - Results From the Singapore Western STEMI Network.** *Circ J.* 2021 Jan 25;85(2):139-149. Chew NWS, Sia CH, Wee HL, Loh JDB, Rastogi S, Kojodjojo P, Chor WPD, Leong SHB, Koh CPB, Tam HW, Quek LS, Sia W, Saw KW, Tung WLB, Ng ZY, Ambhore A, Tay EL, Chan KH, Lee CH, Loh JP, Low AF, Chan MY, Yeo TC, Tan HC, Loh PH.

**Important covariates such as perioperative cardiac arrest or hemodynamic instability to reduce confounding.** *J Vasc Surg.* 2021 Mar;73(3):1115-1116. Ng JJ, Choong AMTL.

**Improving Outcomes for Children Requiring Extracorporeal Membrane Oxygenation Therapy Following Hematopoietic Stem Cell**

**Transplantation.** Crit Care Med. 2021 Apr 1;49(4):e381-e393. Olson TL, O'Neil ER, Kurtz KJ, MacLaren G, Anders MM.

**Inadequately low left ventricular mass in patients with significant aortic stenosis predicts favourable prognostic outcomes.** Int J Cardiovasc Imaging 2021 Jan [Epub ahead of print]. Chew NWS, Ngiam JN, Tan BYQ, Sia CH, Ruan W, Sim HW, Kong WKF, Tay EL, Yeo TC, Poh KK.

**Intravascular lithotripsy for the treatment of severe calcific neointimal hyperplasia in a bare metal stent 17 years after implantation.** Coron Artery Dis. 2021 Mar 1;32(2):172-174. Chan KH, Escano JS, Tan HC.

**Left heart bypass versus circulatory arrest for open repair of thoracoabdominal aortic pathologies.** ANZ J Surg. 2020 Dec;90(12):2434-2440. Papadimas E, Tan YK, Qian Q, Ng JJ, Kofidis T, Teoh KLK, Sorokin V, Choong AMTL.

**Left ventricular systolic dysfunction is associated with poor functional outcomes after endovascular thrombectomy.** J Neurointerv Surg. 2020 Sep [Epub ahead of print]. Tan BYQ, Leow AST, Lee TH, Gontu VK, Andersson T, Holmin S, Wong HF, Lin CM, Cheng CK, Sia CH, Ngiam N, Ng ZX, Yeo J, Chan B, Teoh HL, Seet R, Paliwal P, Gopinathan A, Yang CL, Maus V, Abdullavev N, Mpotsaris A, Bhogal P, Wong K, Makalanda HLD, Spooner O, Amlani S, Campbell D, Michael R, Quäschling U, Schob S, Maybaum J, Sharma VK, Yeo LLL.

**Longitudinal versus transverse incision for common femoral artery exposure: a systematic review and meta-analysis.** ANZ J Surg. 2021 May;91(5):822-831. Ng JJ, Tan JKH, Lee JWK, Choong AMTL.

**Man with fever, cough and atypical chest pain.** J Am Coll Emerg Physicians Open. 2020 Apr;1(3):306-308. Koo CY, Chan PF, Ong HA, Kojodjojo P.

**Massive pulmonary embolism in a patient with nephrotic syndrome and single lung.** J Thromb Thrombolysis. 2021 Jan [Epub ahead of print]. Hong KS, Chook S, Leow L, Lim SL, Ramanathan K, Kofidis T, Kang GS.

**Measurement of the Luminal Diameter of Peripheral Arterial Vasculature in Yorkshire Landrace Swine by Using Ultrasonography and Angiography.** J Am Assoc Lab Anim Sci. 2020 Jun 12;59(4):438-444. Zuo K, Koh LB, Charles CJ, Yim EKF, Lim J, Li RR, Leo HL, Cui F, Ho P.

**Noninvasive Oxygen Strategies to Manage Confirmed COVID-19 Patients in Indian Intensive Care Units: A Survey.** Indian J Crit Care Med. 2020 Oct;24(10):926-931. Subramaniam A, Haji JY, Kumar P, Ramanathan K, Rajamani A.

**Obesity in COVID-19: A Systematic Review and Meta-analysis.** Ann Acad Med Singap. 2020 Dec;49(12):996-1008. Ho JSY, Fernando DI, Chan MY, Sia CH.

**Obstructive sleep apnea during rapid eye movement sleep in patients after percutaneous coronary intervention: a multicenter study.** Sleep Breath. 2021 Mar;25(1):125-133. Augung AT, Kristanto W, Tan MJ, Koo CY, Xu PQ, Chin CW, Roldan G, Thant AT, Chan SP, Chua AP, Barbe F, Kojodjojo P, Lee CH.

**Optimal vortex formation time index in mitral valve stenosis.** Int J Cardiovasc Imaging 2021 Jan [Epub ahead of print]. Ambhore A, Ngiam NJ, Chew NWS, Pramotedham T, Loh JP, Kang GS, Poh KK.

**Organization of extracorporeal membrane oxygenation services for COVID-19.** Asian Cardiovasc Thorac Ann. 2021 Mar;29(3):165-169. Leow L, Papadimas E, Subbian SK, MacLaren G, Ramanathan K.

**Organization of thoracic surgical services during the COVID pandemic.** Surgeon. 2021 Feb;19(1):e1-e8. Leow L, Ramanathan K, Kofidis T, Tam JKC, Mithiran H.

**Outcomes of left ventricular thrombosis in post-acute myocardial infarction patients stratified by antithrombotic strategies: A meta-analysis with meta-regression.** Int J Cardiol. 2021 Apr 15;329:36-45. Low CJ, Leow AS, Syn NL, Tan BYQ, Yeo LLL, Tay EL, Yeo TC, Chan MY, Loh JP, Sia CH.

**Outcomes of Pediatric Extracorporeal Cardiopulmonary Resuscitation: A Systematic Review and Meta-Analysis.** Crit Care Med.

2021 Apr;49(4):682-692. Farhat A, Ling RR, Jenks CL, Poon WH, Yang IX, Li X, Liu Y, Darnell-Bowens C, Ramanathan K, Thiagarajan RR, Raman L.

**Outcomes of Vascular and Endovascular Interventions Performed During the Coronavirus Disease 2019 (COVID-19) Pandemic.** Ann Surg. 2021 Apr 1;273(4):630-635. Benson RA, Nandhra S, The Vascular and Endovascular Research Network (VERN) COVID-19 Vascular Service (COVER) Tier 2 Study.

**Pediatric intensive care preparedness and ECMO availability in children with COVID-19: An international survey.** Perfusion. 2020 Dec [Epub ahead of print]. Cho HJ, Ogino MT, Jeong IS, Paden ML, Antonini VM, Marwali EM, Fraser JF, MacLaren G, Belohlavek J, Di Nardo M.

**Personal protective equipment preparedness in Asia-Pacific intensive care units during the coronavirus disease 2019 pandemic: A multinational survey.** Aust Crit Care. 2021 Mar 1;34(2):135-141. Rajamani A, Subramaniam A, Shekar K, Alcancia CM, Ramanathan K, On Behalf of the SPARTAN Collaborative - Small Projects, Audits, Research Trials – Australia/New Zealand.

**Positive Bubble Study in Severe COVID-19 Indicates the Development of Anatomical Intrapulmonary Shunts in Response to Microvascular Occlusion.** Am J Respir Crit Care Med. 2021 Jan 15;203(2):263-265. Cherian R, Chandra B, Tung ML, Vuylsteke A.

**Predicting Clinical Outcomes in Acute Ischemic Stroke Patients Undergoing Endovascular Thrombectomy with Machine Learning: A Systematic Review and Meta-analysis.** Clin Neuroradiol. 2021 Jan [Epub ahead of print]. Teo YH, Lim ICZY, Tseng FS, Teo YN, Kow CS, Ng ZHC, Chan KKN, Sia CH, Leow AST, Yeung W, Kong WY, Chan BPL, Sharma VK, Yeo LLL, Tan BYQ.

**Predicting mortality, thrombus recurrence and persistence in patients with post-acute myocardial infarction left ventricular thrombus.** J Thromb Thrombolysis. 2021 Jan [Epub ahead of print]. Yeung W, Sia CH,

Pollard T, Leow AS, Tan BYQ, Kaur R, Yeo TC, Tay EL, Yeo LLL, Chan MY, Loh JP.

**Prone Positioning of Patients during Venovenous Extracorporeal Membrane Oxygenation.** Ann Am Thorac Soc. 2021 Mar;18(3):421-423. Shekar K, Ramanathan K, Brodie D.

**Re: "Do we need another modality for truncal vein ablation?" - What about microwave as an endothermal device?** Phlebology. 2021 Jun;36(5):414-415. Tang TY, Yap CQ, Soon SXY, Wong JCL.

**Real-time flow impedance evaluation method for ultra-fast early detection of aneurysmal diseases.** Biomed Signal Process Control. 2021 Feb;64:102256. Wong YR, Ong CW, Toh AL, Lim E, Ho P, Leo HL.

**Rescue extracorporeal membrane oxygenation for massive anterior mediastinal masses.** J Artif Organs. 2021 Apr [Epub ahead of print]. Leow L, Sampath HK, Yong KJ, Kofidis T, Tam JKC, MacLaren G, Teo L, Mithiran H, Ramanathan K.

**Results from a meta-analysis comparing bovine carotid artery grafts with polytetrafluoroethylene grafts must be interpreted with caution due to methodological flaws.** J Vasc Access. 2020 Jul [Epub ahead of print]. Ng JJ, Choong AMTL.

**Role of extracorporeal membrane oxygenation in children with sepsis: a systematic review and meta-analysis.** Crit Care. 2020 Dec 7;24(1):684. Ramanathan K, Yeo N, Alexander P, Raman L, Barbaro R, Tan CS, Schlapbach LJ, MacLaren G.

**Role of the pharmacist during the COVID-19 pandemic: a time to rethink strategies.** Singapore Med J. 2020 Jun [Epub ahead of print]. Poh AL, Lin W.

**Sleep apnea and diabetes mellitus are independently associated with cardiovascular events and hospitalization for heart failure after coronary artery bypass grafting.** Sci Rep. 2020 Dec 10;10(1):21664. Aung AT, Koo CY, Tam WW, Chen Z, Kristanto W, Sim HW, Kojodjojo P, Kofidis T, Lee CH.

**ST-segment elevation myocardial infarction hospitalisations remain unchanged during COVID-19.**

Singapore Med J 2020 Nov [Epub ahead of print]. Koo CY, Chan SP, Tung WLB, Pok KK, Tan HC, Loh PH.

**Stress Hyperglycaemia is Associated with Poor Functional Outcomes in Patients with Acute Ischaemic Stroke after Intravenous Thrombolysis.** QJM. 2020 Aug [Epub ahead of print]. Ngiam NJH, Cheong CWS, Leow AST, Wei YT, Thet JKX, Lee IYS, Sia CH, Tan BYQ, Khoo CM, Sharma VK, Yeo LLL.

**Subclinical Cardiomyopathy in Miyoshi Myopathy Detected by Late Gadolinium Enhancement Cardiac Magnetic Resonance Imaging.** Int Heart J. 2021;62(1):186-192. Tan SML, Ong CC, Tan KB, Chin HL, Paliwal PR, Ng KWP, Lin W.

**Surgery beyond coronavirus disease 2019.** ANZ J Surg. 2020 Oct;90(10):1865-1866. Leow L, Ng CSH, Mithiran H.

**Takotsubo syndrome and rheumatic diseases-a critical systematic review.** Rheumatology(Oxford). 2021 Jan 5;60(1):11-22. Lin W, Tay SH, Mak A.

**Targeted Myocardial Restoration with Injectable Hydrogels – In Search of The Holy Grail in Regenerating Damaged Heart Tissue.** Biomedicines. 2021 May;9(6):595. Sazzad F, Kuzemczak M, Loh E, Wu W, Kofidis T.

**The allergic myocardial infarction dilemma: is it the anaphylaxis or the epinephrine?** J Thromb Thrombolysis. 2021 Feb [Epub ahead of print]. Tan PZ, Chew NWS, Tay SH, Chang P.

**The Emerging Role of Drug-Induced Sleep Endoscopy in the Management of Obstructive Sleep Apnea.** Clin Exp Otorhinolaryngol. 2020 Oct [Epub ahead of print]. Cheong CS, Loke W, Thong MKT, Toh ST, Lee CH.

**The impact of chronic kidney disease on long-term outcomes following semi-urgent and elective percutaneous coronary intervention.** Coron Artery Dis. 2020 Nov [Epub ahead of print]. Soh RY, Sia CH, Lau RH, Ho PY, Ng YMT, Ho JS, Kaur H, Sim HW, Yeo TC, Tan HC, Chan MY, Loh JP.

**The incidence of pulmonary thromboembolism in COVID-19**

**patients admitted to the intensive care unit: a meta-analysis and meta-regression of observational studies.** J Intensive Care. 2021 Feb 22;9(1):20. Ng JJ, Liang ZC, Choong AMTL.

**The pull-through technique is not necessary in most cases of fistula salvage or maintenance.** J Vasc Access. 2020 Jun [Epub ahead of print]. Ng JJ, Loh SEK, Choong AMTL.

**The Utility of CHA(2)DS(2)-VASc Scores as a Risk Assessment Tool in Low-Risk In-Hospital Patients With Coronavirus Disease 2019 Infection.** Am J Cardiol. 2021 Feb 15;141:160-162. Chew NWS, Ngiam JN, Sia CH.

**Thoracic aorta stent grafts design in terms of biomechanical investigations into flexibility.** Math Biosci Eng. 2020 Dec 22;18(1):800-816. Liu Z, Wu L, Yang J, Cui F, Ho P, Wang L, Dong J, Chen G.

**Unusual presentation of Aspergillus aortitis after aortic valve surgery with massive hemoptysis.** JTCVS Techniques. 2021 April;6:63-65. Leow L, Qian Q, Chew KL, Sorokin V.

**Use of del Nido Cardioplegia for Adult Heart Surgery: How Long Is Not Too Long?** J Extra Corpor Technol. 2020 Dec;52(4):272-278. Goh SG, Goh WHC, Lim CA, Huang SCN, Ler AAL, Lim QX, Jaafar NB, Lim C, Sazzad F, Kofidis T.

**Venoarterial Extracorporeal Membrane Oxygenation for Postcardiotomy Shock-Analysis of the Extracorporeal Life Support Organization Registry.** Crit Care Med. 2021 Feb [Epub ahead of print]. Kowalewski M, Zieliński K, Brodie D, MacLaren G, Whitman G, Raffa GM, Boeken U, Shekar K, Chen YS, Bermudez C, D'Alessandro D, Hou X, Haft J, Belohlavek J, Dziembowska I, Suwalski P, Alexander P, Barbaro RP, Gaudino M, Di Mauro M, Maessen J, Lorusso R.

**What's new in ECMO for COVID-19?** Intensive Care Med. 2021 Jan;47(1):107-109. MacLaren G, Combes A, Brodie D.

**Zone 1 Aortic Arch Hybrid Endovascular Repair with Extra-anatomical Bypass: A Meta-analysis.** Ann Vasc Surg. 2021 Apr;72:601-609. Bayfield NG, Samuel M, Bayfield AE, Choong AMTL.

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