

TAKE ME HOME!

PULSE

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SPECIAL COVID-19 EDITION

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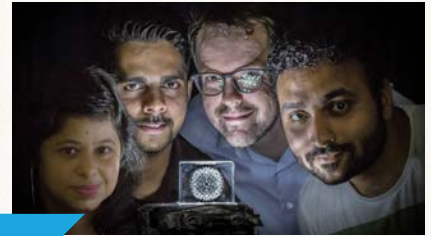
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ERRATUM NOTICE:

In our last issue on page 34, the name of the award was wrongly printed as Quality Improvement Patient Experience Award. It should be the "Quality Improvement Project (QIP) Award". We apologise for the error.

DIRECTOR'S MESSAGE



Dear readers,

The Covid-19 pandemic brought unspeakable pain and suffering to patients, families, and the world. What first began as a medical issue quickly evolved into a social issue affecting everyday lives as movement restrictions were implemented and social gatherings banned almost worldwide. It was sombre to witness trade and businesses slow to a near halt and once bustling streets empty overnight.

Yet it is also a humbling experience that humanity has been brought to its feet by an invisible enemy, and to witness the world literally shut down and change forever.

As part of the larger nationwide healthcare team battling this pandemic, National University Heart Centre, Singapore (NUHCS) kicked into high gear to contain the outbreak with two priorities at the top of our list – to provide continued care for our cardiovascular patients and to protect the health and wellbeing of our staff during this outbreak.

When Singapore raised its Disease Outbreak Response System Condition (DORSCON) status to “Orange” on 7 February 2020, NUHCS immediately set in motion emergency risk management protocols, establishing revised workflows and infrastructure layout to prevent cross infection as well as to be prepared for contingencies in managing the ongoing pandemic.

Time was of the essence – segregated medical teams were set up to ensure round-the-clock continuity of care and to prepare for future possible events such as the infection of one of our staff. We needed to re-learn many things, adapt to instantaneous changes happening every hour, and respond to ongoing situations erupting every second.

Amidst this stressful situation, I am in awe of the resilience of our staff. Grappling with the limited supply of healthcare workers, each and everyone stepped up to take on additional roles and shifts and were willing to

be deployed where they were needed, including intensive care units (ICU) to care for Covid-19 patients and to volunteer in swab teams required in emergency rooms as well as off-site facilities.

Ranks and work scopes were cast aside as every trained staff pitched in to help and responded to the call of duty.

Despite the uncertainties and risks we face in the course of our work, our unity kept our morale high owing to the fact that we work alongside zealous colleagues and friends – all equally committed to seeing the sick walk out of our hospital as healthy individuals.

In times like these, we are stirred to rise to our highest potentialities – to be the hope and comfort for the sick and suffering.

Tan Huay Cheem

Prof. Tan Huay Cheem

*Director and Senior Consultant,
Department of Cardiology, NUHCS*

IMPACT OF COVID-19 ON PATIENTS

What We Know About Covid-19

PATIENTS AT HIGHER RISK OF CORONAVIRUS

Has chronic disease



Aged above 60 years



Has coronary heart disease



HOW CORONAVIRUS

ATTACKS OUR HEART



Virus directly damages myocardial cells, leading to myocarditis



Mortality rate of patients with heart disease increases to 10.5% (from 0.9%)



The virus can induce systemic inflammatory reactions, leading to unstable coronary atherosclerotic plaques and triggering myocardial infarction

WHY CARDIAC PATIENTS ARE AT

A HIGHER RISK OF COVID-19



More likely to develop more complications and lead to severe conditions



Higher mortality rates



Tend to have multiple comorbidities due to age



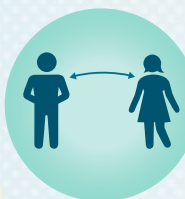
25% of reported Covid-19 deaths have coronary heart disease



3/8 Covid-19 deaths in Singapore have heart disease

HOW TO PROTECT YOURSELF AGAINST COVID-19

Advice from Prof. Tan Huay Cheem, Director and Senior Consultant, Department of Cardiology, NUHCS



Practice safe distancing.



Exercise good personal hygiene with frequent hand washing.



Continue with your prescribed medication. When in doubt, check with your doctors.



Build your own immunity with a healthy diet, regular exercise and sleeping well.



Wear protective masks whenever you are out of your homes.

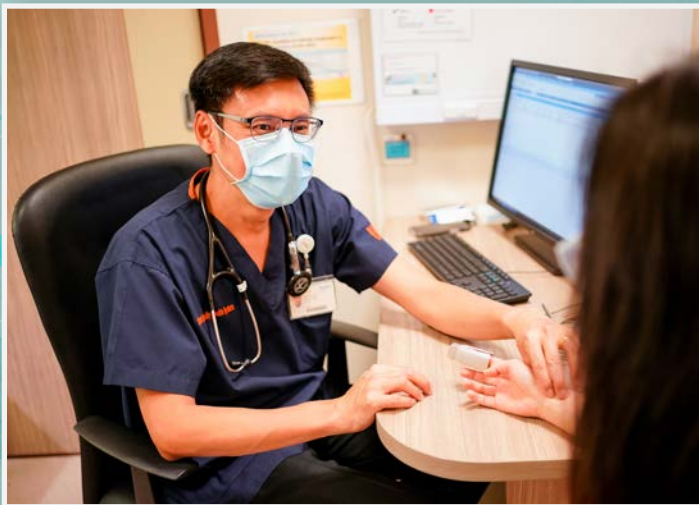


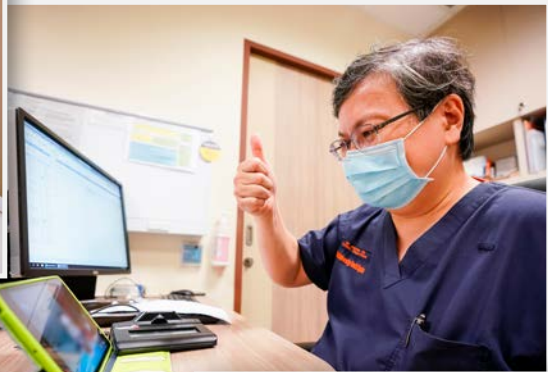
Get your influenza vaccination if you are above 65 years. It will not protect you against Covid-19 but will protect you from seasonal flu which may weaken your immunity.

A LOOK BEHIND THE SCENES

Snapshots of National University Heart Centre, Singapore (NUHCS) during the pandemic

Faced with a pandemic, NUHCS responded quickly to manage the expected influx of critical patients. This meant implementing emergency risk management protocols to prevent infection outbreak within the centre and prioritising medical supplies and facilities for the most urgent procedures. Take a look behind the scenes at NUHCS.





BATTLING A PANDEMIC

Opinion piece by Prof. Tan on his view of the impact of Covid-19

Battling a highly infectious unknown virus which could potentially escalate quickly into death, brought about changes on many fronts at every level throughout the National University Heart Centre, Singapore (NUHCS).

Change in Patient Care Management

Research showed that the coronavirus has a direct toxic effect on the heart causing myocarditis and heart muscle injury, potentially exacerbating existing heart conditions, weakening the heart and even provoking a heart attack through systemic inflammation.

To manage our current patients as well as Covid-19 patients, the critical first step was to develop clear treatment pathways and algorithms for treating cardiac patients, especially those with acute emergencies such as acute myocardial infarction (AMI), with or without concurrent Covid-19 infection.

This meant changing clinical protocols overnight such as formalising transportation protocols, team segregation, implementing strict protocols on the use of personal protective equipment

(PPE), instituting operative strategies which minimise time of exposure, stepping up measures for acute resuscitation such as airway intubation and formulating plans for right siting of patients for post-operative care after acute stenting procedures.

To conserve our resources for the most critical patients, we had to redesign our rehabilitation programme to minimise hospital visits while ensuring our patients progress with their recovery. Such challenges that came up at every turn were met with innovative approaches by our team. In this case, wearables and mobile applications provided a solution.

NUHCS's role within Singapore's healthcare network

As the only centre in the National University Health System (NUHS) cluster that provides round-the-clock emergency angioplasty service for patients with heart attacks, NUHCS's Cardiac, Thoracic and Vascular Surgery Surgeon (CTVS) Extracorporeal Membrane Oxygenation (ECMO) team is a critical resource and has since been called upon to treat two patients at National University Hospital (NUH), as of April 2020.



Fortunately, the Western STEMI network had been established earlier and played a crucial role in this pandemic battle as suggested by Italy's and Spain's experience where the centralisation and streamlining of active STEMI care to a few centres potentially minimised crossover infections amongst patients and healthcare workers while freeing up trained intensive care unit (ICU) staff to support in other areas.

As part of the larger nationwide healthcare team, everyone in NUHCS, including our allied health and support staff, stepped up to volunteer where they can and took on extra workload in this public health crisis. Our doctors maintained a fortnightly roster at the National Centre for Infectious Diseases (NCID) and multiple teams from NUHCS volunteered at off-site testing and care facilities for Covid-19 patients.



Connecting with the global medical community

More than ever, medical and scientific experts around the world need to come together to share their findings to develop patient treatment strategies. However, many meetings and conferences were cancelled due to travel bans and lockdowns to support physical distancing measures and curb the spread of the virus.

Yet there was an unprecedented rapid flow of information with new findings or complications related to cardiac care disseminated in real-time across the globe, in the race to uncover more about the virus and to find the cure. A tremendous surge in related research originated from China, followed by Singapore, Europe and the United States.

NUHCS has been active in sharing our experience with our international colleagues in China and the Asia-Pacific region through webinars with active and robust discussions on how to manage cardiac patients with Covid-19 infection.

Medical professionals all over the world connected virtually to discuss crucial observations and continue their knowledge exchange to keep up with the evolving pandemic. While we

“Such challenges that came up at every turn were met with innovative approaches by our team.”

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

are busy saving lives, we must be prepared and equip ourselves so that we are better able to anticipate the longer term consequences of the pandemic.

What comes next?

One of the most glaring observations shared was the significant reduction in the number of heart attack patients (about 40-70%) who sought treatment in hospitals across the USA, Europe and other Asian countries. This was attributed to people's fear of contracting the virus if they stepped into hospitals. Unfortunately, this results in further complications and increased death rates in patients, which could potentially trigger a post-Covid-19 public health crisis.

Another concern brought up was that in many countries, especially in Asia, the emer-

gency cardiac care team may be exposed to AMI patients who concomitantly have Covid-19, thereby having to self-quarantine and shut down the entire essential service.

This will take all of us

Reiterated by many, this pandemic is an unprecedented issue and has changed our lives. To date, we are still battling with the pandemic with gaps in our understanding of the virus. This is a battle involving all of us and we will need to work together to win this.

Having witnessed the strength and support of my colleagues over the past few months, it is with optimism and hope that I am confident we can look back on this day and share stories of triumph.

This is an opinion piece by Prof. Tan Huay Cheem, Director and Senior Consultant, Department of Cardiology, NUHCS sharing his reflection on the impact of the global pandemic on NUHCS written in May 2020.

ARTICLE BY

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



Prof. Tan is a professor of medicine at Yong Loo Lin School of Medicine, National University of Singapore and possesses 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.

INEVITABLE CHANGES WITH COVID-19

*Opinion piece by A/Prof. Yeo
on his thoughts about the
Covid-19 pandemic*

Singapore diagnosed its first confirmed case of Covid-19 on 23 January 2020 in a Chinese national who travelled here from Wuhan. Very soon after, changes unfold almost on a weekly basis...

A rapid increase in confirmed cases was reported as testing and contact tracing teams went into full swing to ring fence the source and curtail the spread of infection.

About two weeks later, Singapore raised its Disease Outbreak Response System Condition (DORSCON) level to Orange, the second highest level. This sparked widespread panic with panic buying and hoarding of essentials such as rice, instant noodles and toilet paper amongst other things.

ARTICLE BY

A/Prof. Yeo Tiong Cheng
*Deputy Director and
Senior Consultant,
Department of
Cardiology, NUHCS*



A/Prof. Yeo is the outgoing Head of the Department of Cardiology, NUHCS. His concurrent appointments are Senior Consultant, Department of Cardiology, NUHCS and A/Prof. at Yong Loo Lin School of Medicine, National University of Singapore. He is also a fellow of the American College of Cardiology and a specialist registered with the Academy of Medicine, Singapore.

Inevitably, life for healthcare workers also changed – compulsory protocols were rolled out in hospitals and clinics. These include temperature taking for all staff twice daily, cancellation of non essential elective surgeries to prioritise facilities and supplies for urgent cases, the required donning of appropriate personal protective equipment (PPE) and segregation of clinical teams to ensure that our core teams can continue to function and operate when the situation escalates.

Amongst the medical and scientific communities, there is a quiet sense of urgency as experts race to learn more about this infection and develop tools to protect our patients as well as the healthy communities.

“*Amongst the medical and scientific communities, there is a quiet sense of urgency as experts race to learn more about this infection and develop tools to protect our patients as well as the healthy communities.*”

A/Prof. Yeo Tiong Cheng,
Deputy Director and Senior Consultant,
Department of Cardiology, NUHCS

Here, we too are bracing ourselves for the possible impact when the virus hits us like a storm. Medical supplies are quickly checked and re-checked to ensure that we have enough when we need them in an emergency.

Our teams are working double time to care for our patients and spending as much time as possible to soak up new information from our counterparts around the world. We try to gather as much new clinical knowledge about SARS-CoV-2 as possible because knowledge is the only ammunition that we have against this unknown virus.

While numbers are still low in Singapore, we need to be mindful that Singapore is an urbanised country in a highly globalised world. Our open economy and the high density of city dwellers make us highly vulnerable to imported infections.

I expect more changes to come, especially since our ability to stop this infection is not only dependent on Singapore's efforts. Equally important is how successful our neighbouring countries and the rest of the world are in overcoming this virus.

There is truth in the adage – change is the only constant.

Some things, however, remained the same – I drank a lot of green bean soup during the severe acute respiratory syndrome (SARS) outbreak in 2003 because my mother-in-law said that "it has anti-SARS properties". I am still drinking green bean soup now...

This opinion piece was written in early March 2020 before the first two Covid-19 deaths were reported on 27 March 2020 and stricter movement control measures such as the circuit breakers and closure of non-essential services were implemented in efforts to reduce community spread in Singapore. At press time, the pandemic situation continues to evolve with no vaccine available yet.

TIME IS OF ESSENCE

Managing life-threatening emergencies in a pandemic

ST¹ segment elevation myocardial infarction (STEMI) is a more severe form of heart attack where the coronary artery is blocked off by a blood clot for a prolonged period of time affecting a large area of the heart. Virtually, the heart muscle being supplied by the affected artery starts to die, leading to a life-threatening emergency.

For STEMI patients, time is of essence – their condition must be diagnosed and treated promptly. Compounded with the Covid-19 pandemic, cardiac centres worldwide now face the risk management of virus infection in healthcare facilities in addition to managing the sudden surge in demand for large capacities of material and human resources in an already finite circumstance.

In addition, one of the catheterization labs (cath lab)² at the National University Heart Centre, Singapore (NUHCS) was undergoing renovations but this was halted due to the nationwide isolation of migrant workers. When faced with a sudden influx of emergency cases and all cath labs were occupied, rooms at the Department of Diagnostic Imaging (DDI) were transformed for time-sensitive procedures to be carried out.



Cardiac and emergency teams working together during PCI



Additional protective gowns to be worn during procedures such as N95 respirators and eye-shields over sanitary clothing.



DDI rooms become reserved backup cath labs

Other hospital staff like security and nurses don protective gear to help transport critical patients to and from procedure and recuperation rooms



“For STEMI patients, time is of essence – their condition must be diagnosed and treated promptly.”

Dr. Gavin Ng Yeow Peng, Consultant, Department of Cardiology, NUHCS



To avoid the risk of cross contamination, critical procedures were redistributed across the Western STEMI network and medical teams were confined to one site. This saw all emergency angioplasty³ services and STEMI cases requiring definitive treatment being routed to NUHCS which freed up limited facilities at Ng Teng Fong General Hospital (NTFGH) for Covid-19 patients.

The possible asymptomatic⁴ nature of Covid-19 also meant the necessary implementation of maximum protection procedures to prevent widespread contamination of the surrounding environment.

Because cath labs are built with normal or positive ventilation systems⁵, a terminal clean following each procedure is required. Donning protective gear and performing primary percutaneous coronary intervention (PCI)⁶ while in full protective gear can also lead to longer treatment times.

In spite of the extra precautionary measures, the collaboration across the Western STEMI Network saw an average median door-to-balloon time⁷ of 43 minutes in the months of February and March, similar to 2019, while managing a total caseload of 107 STEMI patients.

While the situation remains dynamic and may escalate, NUHCS is closely studying global healthcare recommendations

and continuously making adjustments to ensure optimal healthcare delivery and uncompromised critical patient care in a pandemic.

¹**ST** – ST is seen on an ECG reading. It is a resting period of the heart during its conduction.

²**cath labs** – A special hospital room (different from a surgery room) where a specially trained cardiac team performs minimally invasive tests and procedures where the patient is usually awake.

³**angioplasty** – Procedure which restores blood flow through arteries.

⁴**asymptomatic** – Refers to a patient's condition where there is no symptom.

⁵**positive ventilation systems** – An air ventilation system which controls condensation to create a supply of fresh, filtered air and reduce surface condensation, mould growth and dust in a room.

⁶**percutaneous coronary intervention (PCI)** – A non-surgical procedure to treat the narrowing of the coronary arteries, often done through balloon angioplasty.

⁷**median door-to-balloon time** – Calculated from the patient's arrival at the hospital to PCI in patients with ST elevation or left bundle branch block (LBBB) on ECG performed closest to hospital arrival time.

ARTICLE BY

Dr. Gavin Ng Yeow Peng
Consultant, Department of Cardiology, NUHCS



Dr Gavin Ng is a cardiology consultant at NUHCS with special interest in coronary artery disease and acute coronary syndrome. He is active in undergraduate and postgraduate medical education as a core faculty member of the Cardiology Senior Residency Program and a clinical lecturer at Yong Loo Lin School of Medicine, National University of Singapore.

A/Prof. Low Fatt Hoe Adrian
Clinical Director, Angiography Centre, Senior Consultant, Department of Cardiology, NUHCS



A/Prof. Adrian Low is also the current Programme Director of Acute Coronary Syndrome Programme in NUHCS. As a Senior Consultant, his focus remains clinical where he has expanded the radial vascular access program at NUHCS and advocates for radial and small access vascular interventions. He is a keen researcher and is also an advocate of functional evaluation of coronary artery disease and the use of pressure wire guided interventions to reduce unnecessary procedures.

TO FIT LIKE A GLOVE

Specialised nurses deployed to provide support at the National Centre for Infectious Diseases (NCID)

In Singapore's healthcare response to the Covid-19 situation, nurses from Singapore General Hospital (SGH) and National University Hospital (NUH) were deployed to the National Centre for Infectious Diseases (NCID) as part of the first national augmented team.

Three specially trained extracorporeal membrane oxygenation (ECMO) senior staff nurses (SSN) from the Cardiothoracic Intensive Care Unit (CTICU), National University Heart Centre, Singapore (NUHCS), Ms. Ter Ying Ying, Ms. Ei Phyu Sin and Ms. Hong Yaping were part of this team who joined NCID on 23 March 2020.

"For me, it was an exciting challenge but inevitably I had some apprehension about working in a new workplace and fitting in with the team," shared Ms. Ei Phyu Sin.

While hospital operations are centred on patient safety, there were slight differences in hospital

protocols. The newly deployed team had to be retrained on putting on powered air-purifying respirator (PAPR) and personal protective equipment (PPE) in order to standardise the practice across NCID.

To orientate the newly deployed nurses with NCID's operations, the Director of Nursing (DON), Assistant Director of Nursing (ADON) and administration staff of Tan Tock Seng Hospital (TTSH) greeted and welcomed the deployed nurses on their first day.

The deployed nurses went through a two-week induction programme which included on-the-job training to familiarise the nurses with the clinic space and workflow to prepare them for emergencies and allow them to respond quickly when needed whilst ensuring that the hospital's protocols were adhered to.

What became apparent was the medical personnel's commitment to patient care despite hav-

ing trained from different departments and hospitals. Everyone understood the urgency of the crisis and banded together to focus on the task at hand, tapping on their experience and contributing wherever they can to ensure patients received at NCID had the best care possible in the situation.

"I am grateful for the opportunity to contribute during this Covid-19 crisis," says Ms. Hong Yaping. "Although it was stressful and challenging, everyone pitched in and worked together which made the job on hand even more gratifying."

ARTICLE BY

Pauline Oh
Senior Nurse Manager,
CTICU, NUHCS

Ms. Oh embarked on her nursing career with NUH in 1992 before progressing to join the specialised care team at NUHCS as a critical care trained nurse in CTICU. Presently as a Senior Nurse Manager, she oversees a team of highly trained nurses in CTICU, managing post cardiac surgical patients and those requiring ECMO. She also oversees ECMO training and competencies for the nurses in CTICU and the paediatric intensive care unit as well as for the respiratory therapists.



Ms. TerYing Ying, SSN II, CTICU, NUHCS is an ECMO-trained nurse and is an active member in the CTICU Unit Practice Council (UPC). She has worked in CTICU for the last seven years where she works with intensivists and the surgical team to provide immediate post-operative care for patients.

She was also one of the nurses deployed to NCID in March 2020. Here, Ms. Ter spoke with us candidly about her deployment in a pandemic...

ARTICLE BY

NUHCS Pulse Editorial



Having worked in the intensive care unit meant we were uniquely trained and prepared for such a scenario. For that reason, I consider it a privilege for being able to play a role in this pandemic.

Ms Ter Ying Ying, SSN II, CTICU, NUHCS

Q: *How does caring for Covid-19 patients differ from your usual work scope?*

There are different things to look out for. Covid-19 patients often have more complex medical comorbidities and issues compared to our usual post-operative patients. There are also tighter infection control measures that we need to follow.

Q: *Could you describe your deployment experience?*

It was an opportunity for me to pick up other skills, such as the respiratory management of patients, which I could bring back to NUHCS. I reviewed my own approach in caring for patients and realised how simple gestures such as moving the patient's bed closer to glass doors help patients and their families connect whilst being in intensive care. This makes a significant difference for both the patients and their families.

Q: *How do you feel being a frontline healthcare worker during this pandemic?*

The health and care of my elderly parents were the first issues that came to mind. I had to be sure my work would not be putting them at risk. Once that was settled, I have always been confident in our healthcare system about implementing the appropriate measures.

As a trained professional, the care of our patients remain our top priority. Our team quickly updated ourselves with the latest guidelines and adjusted to the new protocols to ensure a safe environment for our patients and ourselves. It is an honour to be able to play a role in this pandemic.

Q: *Are there any challenges that you have faced during your course of work?*

Having to quickly adapt to a new workplace as well as learn the different approaches to patient management has been challenging. Thankfully, I have the support and guidance of my new colleagues during my deployment.

Q: *What is one takeaway that you have gained from this experience?*

The most important takeaway for me will be the friendship with my new colleagues. It has been a true honour to work together in this fight!

A PANDEMIC TRANSFORMS CARDIAC REHABILITATION

Delivering cardiac rehabilitation remotely

“Please don’t postpone my heart rehab programme,” a patient recently diagnosed with coronary artery disease pleaded in an email, shortly after Singapore announced the first few cases of Covid-19 transmission within the local community.

Since then, change has been the only constant.

Amongst the flurry of changes, hospitals and medical facilities too are moving to respond to the pandemic. This meant that elective appointments and procedures including cardiac rehabilitation need to be relegated to free up resources for emergency patients that are expected to increase significantly in a pandemic.

While most people worry about their exposure to SARS-CoV-2, many who are sick and in the midst of their treatment are rightfully worried about missing their medical follow-up. As such, this pandemic has created an impetus for all cardiology care

teams to explore and identify solutions that can be rapidly implemented to prevent patients’ deterioration in health.

Present day technology has allowed National University Heart Centre, Singapore (NUHCS) to provide cardiac rehabilitation to patients with relative ease and quick implementation. Being able to do so was especially reassuring as patients with cardiovascular diseases had shown to have poorer outcomes with Covid-19.

The team at NUHCS looked at a combination of options including wearable trackers, phone apps, mobile chat groups, video conferencing and social media to reach patients in a lockdown, overcoming even the barriers faced during traditional cardiac rehabilitation. The team’s findings and recommendations have since been compiled and recently published in the *European Journal of Preventive Cardiology*.

Cardiac rehabilitation is not just home-based exercises. It is evidence-based and helps cardiology care teams monitor the progress of our patients’ health

Dr. Wang Yi Ting Lauren, Associate Consultant, Department of Cardiology, NUHCS

The technological approaches implemented during this pandemic is a leap forward in cardiac rehabilitation and should be further developed to transform and increase patient engagement, and promote cardiovascular prevention in a sustainable way.

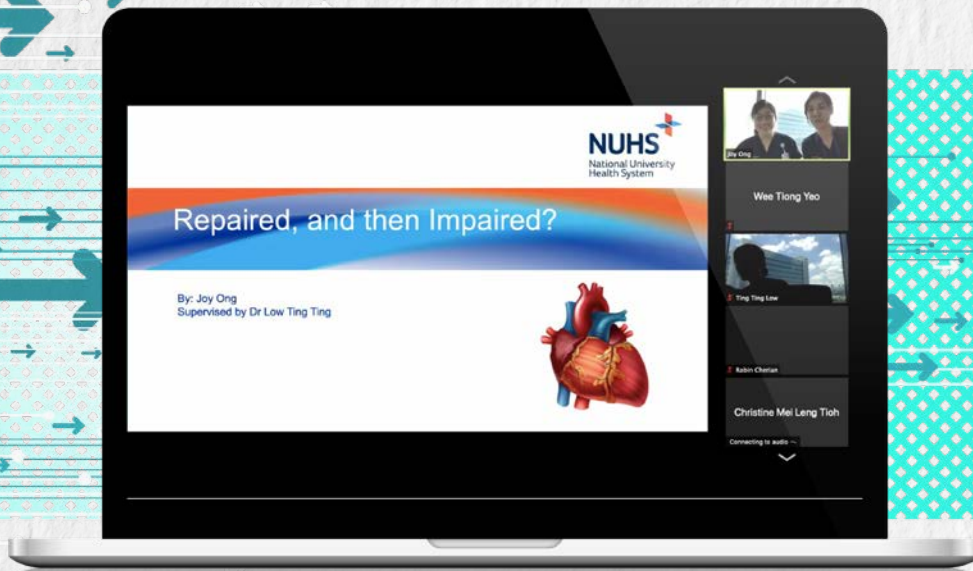
Cardiac rehabilitation is a multi-disciplinary, innovative yet structured and evidence-based programme to help patients stay on track in improving and monitoring their cardiovascular health. This is especially so in a long-drawn pandemic, where this virus infection can result in the destabilisation of pre-existing cardiac conditions.

ARTICLE BY

Dr. Wang Yi Ting Lauren
Associate Consultant,
Department of Cardiology,
NUHCS



Dr. Wang is a practising clinician in cardiology and internal medicine at NUHCS and Alexandra Hospital, Singapore. Dr Wang is also active in preventive medicine for chronic diseases and women’s heart health issues.



LEARNING CONTINUES EVEN IN A PANDEMIC

An opportunity to reshape medical education

With no vaccine in sight, public health measures including physical distancing are critical in slowing the transmission and spread of Covid-19. This inadvertently presented an opportunity to try new ways of working when the usual cannot happen.

For the first time, the National University Heart Centre, Singapore (NUHCS) team conducted Continued Medical Education (CME) sessions in the virtual space through Zoom's video conferencing platform to avoid unnecessary human contact.

The platform was intuitive and user-friendly – course presentation was done easily where presenter can mark out notes and communicate with participants in real time through video chat or text messaging functions built into the platform. After each

session, a report is generated which captured the attendance of participants, making it easy for course administrators to track and record the CME progress of each participant.

Conducting CME virtually certainly has its benefits – it is more convenient for participants to join in the sessions and reduces redundancy in organising repeat sessions for those who are unable to attend in-person sessions.

Live video conferencing has allowed our dispersed medical professionals in different hospitals, specialty centres, medical centres, clinics as well as academic institutions located island wide to come together, albeit virtually, be connected and aligned on the latest medical updates and progress.

In fact, this platform can be further expanded to include more participants from all over the world as long as they have a stable internet connection and a working device.

p.s. Mobile phones work too. Just imagine the possibilities!

ARTICLE BY

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



Asst. Prof. Yeo is one of few electrophysiologists with experience in adult congenital heart disease arrhythmia management following his fellowship at the Royal Brompton Hospital in the UK, and is a certified Electrophysiology specialist by the European Heart Rhythm Association (EHRA). He is active in undergraduate and postgraduate medical education as Assistant Professor at the Yong Loo Lin School of Medicine, National University of Singapore and Programme Director of the Cardiology Senior Residency Programme.

CONQUER THE FEAR

Supporting Covid-19 patients in critical care

The closure of state borders and strict movement controls in response to the Covid-19 pandemic hampered the ease and speed of information exchange, crucial in gathering evidence to develop public health interventions.

With haste, the medical and scientific communities turned to the virtual space to exchange and gather critical knowledge and information in managing the Covid-19 pandemic, relying on video conferencing software and even social media platforms.

Sharing Singapore's Experience Globally

On 20 March 2020, the Extracorporeal Life Support Organisation (ELSO) held the first of a webinar series to exchange global experiences in managing Covid-19 patients on extracorporeal membrane oxygenation (ECMO) and to address concerns such as the preparations required to cope with the surge in demand whilst addressing limited healthcare capacities.

For his part, Asst. Prof. Ramanathan K.R., Senior Consultant, Department of Cardiac, Thoracic and Vascular Surgery (CTVS), National University Heart Centre, Singapore (NUHCS) outlined key considerations on infection control measures during ECMO such as the ideal personal protective equipment (PPE) to be used, the feasibility of remote monitoring and control during ECMO runs as well as the necessary inter-hospital and/or intra-hospital transport of Covid-19 ECMO patients.

“Understandably, the sudden situation has caused a bottleneck shortage in medical supplies and hence, hospitals will need to evaluate their available resources and formulate their own guidelines which will differ across medical centres,” said Asst. Prof. Ramanathan weighing in during the question and answer session.

Without conclusive evidence on how the virus spreads, he further recommended medical centres to undertake precautionary

measures when sending investigations such as double bagging and transporting specimen in a special box to the laboratories by hand.

On Singapore's Preparedness

“It is a real privilege to contribute and be a part of Singapore's healthcare set up that is the cynosure of the world's eyes for its preparedness, ability to tackle and train and come out with solutions,” remarked Asst. Prof. Ramanathan.

Being part of Singapore's Ministry of Health (MOH) National ECMO Services Advisory Workgroup, Asst. Prof. Ramanathan contributes to the nation's pandemic response and management such as streamlining ECMO criteria to manage hospitals' limited capacities.

Furthermore, an article highlighting the importance of ECMO preparedness and pandemic action plan during outbreaks of emerging infectious diseases has since been published in the March 2020 edition of *The*

“*Everyone around me is contributing in his or her own way in this unified battle against an unknown disease.*”

Asst. Prof. Ramanathan K.R.,
Senior Consultant, CTVS, NUHCS



Preparing to support COVID-19 patients on ECMO
hosted by
The Extracorporeal Life Support Organization



EXTRACORPOREAL LIFE SUPPORT ORGANISATION (ELSO)

ELSO is an international non-profit consortium of health care institutions dedicated to the development and evaluation of novel therapies for support of failing organ systems. To facilitate knowledge sharing, ELSO has set up a free dedicated online resource for medical centres managing Covid-19 patients with updates on the latest scientific data, clinical management guidelines and to facilitate discussions on managing ECMO in Covid-19 patients.

Lancet Respiratory Medicine titled “Planning and provision of ECMO services for severe ARDS¹ during the Covid-19 pandemic and other outbreaks of emerging infectious diseases”.

When fighting against an unknown virus, Asst. Prof. Ramanathan described some moments of helplessness where the medical team could do nothing but hope for the patient to overcome the disease on his own.

He recounted an experience when one of the Covid-19 patients had to be put on ECMO and cared for in the Medical Intensive Care Unit (MICU) at NUH.

It was especially heart-wrenching when the medical team had to inform the patient’s family that their only breadwinner was fighting for his life. Worse, they could not share much about the patient’s prognosis since the global data on outcomes of ECMO in Covid-19 patients were limited then.

Nonetheless, the specially trained ECMO and MICU team worked tirelessly day and night, tracking his progress and nursed him back to health, until the patient was finally explanted and eventually discharged from the hospital. This was after many days in intensive care.

It was a tear-jerking moment for the patient and his family. His recovery came as a much needed morale booster for the medical teams and motivated everyone to persevere and overcome the daily challenges they were facing with another Covid-19 ECMO patient who had been in intensive care for more than 70 days.

Sharing advice with other healthcare colleagues working in this pandemic, Asst. Prof. Ramanathan said, “Be safe. There are no emergencies in an outbreak. Make sure you take care of yourself. Never let the fear of the disease conquer you. I am sure we will overcome this phase.”

¹ARDS – Refers to acute respiratory distress syndrome which is a life-threatening lung injury which causes the lungs to be filled with liquid and prevents oxygen from reaching the blood, eventually causing organ failure if not treated.

ARTICLE BY

Asst. Prof. Ramanathan K.R.
Senior Consultant, CTVS,
NUHCS



Asst. Prof. Ramanathan is an adult cardiac intensivist instrumental in educating medical students and professionals in intensive care medicine and extracorporeal life support through his leadership positions within ELSO in US, Bond University in Australia and Singapore’s National University Hospital and Yong Loo Lin School of Medicine, National University of Singapore. He currently sits in the National ECMO Services Advisory Workgroup under Singapore’s MOH and remains committed to research programmes involving post-operative care and extracorporeal support.

FROM THE SCENE OF THE DORMS

Volunteers share their experiences working at foreign workers' dormitories

When dormitories were identified as outbreak clusters during the Covid-19 pandemic in Singapore, more help was required to support the largescale testing and monitoring of the health of hundreds of migrant workers who lived in these dormitories.

The largest dormitory in Singapore, Sungei Tengah Lodge which has 10 blocks and could house up to 25,000 residents had one of the heaviest burden of Covid-19 infections.

National University Heart Centre, Singapore (NUHCS) assembled a mobile medical team despatched to the dormitory to provide the medical support required. Beyond nurses and doctors at the frontline, there were many other members who made up the team.

Echocardiography technicians who perform ultrasound scans of the heart, diagnostic laboratory technicians who perform stress testing, laboratory technicians

usually performing vascular scans, cardiovascular research studies co-ordinators as well as the essential services daily operations staff from NUHCS were amongst the many who voluntarily raised their hands to be part of this team.

This required their willingness to perform duties outside of their job descriptions, having to change their work routines and don an uncomfortable attire to swelter in the mid-day sun continuously for days until the situation is stabilised.

ARTICLE BY

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



Dr. Koo is presently an Associate Consultant at NUHCS having completed his cardiology training in 2018 and concurrently obtained his Master of Clinical Investigation. His research interests are focused on coronary artery disease and examines the effects of sleep-disordered breathing on cardiovascular disease. Presently, he is also investigating the effects of cancer and cancer treatment on the cardiovascular system.

Ms. Audrey Leong, Clinical Research Coordinator, NUHCS



Ms. Cristine Araral, Medical Technologist, NUHCS



Mr. Alvin Tay, Asst. Director, Operations and Administration, NUHCS



It's incredibly commendable that a number of our colleagues stood up to help out during this pandemic when most people are fearful of the virus.

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

Ms. Maridel de Castro, Principal Medical Technologist at NUHCS, was one of the volunteers who headed to the dormitories to support routine testing efforts on the ground as part of public health efforts to contain the outbreak.

She usually works in the cardiac catheterization laboratory where she assists doctors in ballooning and stenting of the blood vessels as part of various diagnostic tests required by cardiologists in the diagnosis and treatment of patients.

Here, she shares candidly about her volunteer experience...

ARTICLE BY

NUHCS Pulse Editorial



Ms. Maridel de Castro,
Principal Medical
Technologist, NUHCS

Ms. Maricris Navarro,
Senior Medical
Technologist, NUHCS



1. *Why did you choose to volunteer at the dormitories?*

This is the best time to show our unity as a nation. There was an urgent need for skilled medical staff to head out and help so naturally I volunteered as I am familiar with the required procedures.

2. *Could you describe your job at the dormitories?*

I helped with isolation rounding and manning the medical post. I also supported in administrative duties such as assisting doctors in registering patients, checking their documentation, screening, taking vital signs and triaging patients for fever and any acute respiratory infection symptoms. After which, the data is being recorded in a master list.

3. *How has the experience been like for you?*

It was challenging because we are working in a makeshift environment that is different from the comfortable set-up you have in a hospital. Wearing a full gear of personal protective equipment (PPE) also makes it uncomfortable after a few hours in our humidity.

Yet, the job has been very fulfilling as we got to interact with patients and we can see that the workers are grateful. It has been reassuring for them to know that they are not left out in our pandemic battle.

For me, I got to be part of a working team and made new friends who are equally passionate about their jobs and helping people.

4. *What are your thoughts of being a healthcare worker at the frontline during this pandemic?*

While we worry about our heightened exposure to the virus, it is also gratifying to be helpful and be part of a national effort to keep people safe. This will be an extra busy period and as tired as we are, all of us are forging on and looking forward to the rainbow after the storm.

5. *Is there anything you would like to say to the people who have been affected by this virus?*

Don't be afraid and don't give up! Stay strong and positive! Everyone has a part to play during this pandemic. By staying home and abiding the health advisories, we can reduce the number of infections.

FULL SPEED AHEAD



In a race against time to set up Tuas South Community Care Facility

Singapore has a robust system of care for Covid-19 patients that is tiered according to their healthcare needs. Patients are triaged¹ into appropriate medical facilities such as Community Care Facilities (CCFs) and Community Recovery Facilities (CRFs) to avoid overwhelming limited resources in the hospitals.

Most patients picked up by testing, present with mild or no symptoms and they usually recover with minimal intervention. These patients are generally admitted to a CCF for monitoring and review. Patients who remain well would then be transferred to a step-down CRF at a later phase of their illness for further recovery prior to discharge back to the community or dormitories.

To support these complex operations, Singapore’s healthcare workforce was tapped upon and deployed to the various facilities to provide an appropriate level

of care across the different facilities and to meet the needs of patients.

Dr. Lim Yinghao, Associate Consultant, Department of Cardiology, National University Heart Centre, Singapore (NUHCS) was tasked with setting up the Tuas South CCF in end April 2020 to cater to the needs of Covid-19 patients in the early phase of their illness. There were already more than 15,000 cases of Covid-19 patients in Singapore by then, and there was a pressing need for additional CCF beds.

Medical and non-medical personnel from diverse backgrounds were brought together to focus on this tasking. The facility had to be set-up with appropriate equipment, and processes and workflows had to be designed. Medical and non-medical volunteers working at the facility had to undergo strict training to ensure the safety of patients and themselves.

The first patient was received on 16 May 2020. Since then, the facility has received over 2,400 patients. This was only possible with the dedication of all parties in surmounting the numerous challenges and tight timeline.

¹triage – The process of prioritising patients based on their need for medical attention.

“I am grateful for the support and guidance of all colleagues and mentors, and for the opportunity to lead this endeavour.”

Dr. Lim Yinghao, Associate Consultant, Department of Cardiology, NUHCS

ARTICLE BY

Dr. Lim Yinghao
Associate Consultant,
Department of Cardiology,
NUHCS



Dr. Lim is presently an Associate Consultant at NUHCS. He is the course co-director for the Chia Boon Lock Cardiology Review Course and the Cardiology PACES Course. His interests are in the fields of pulmonary hypertension, structural heart disease as well as medical and device innovation.

WINNING GOLD

Youths researched on experimental heart surgery for showcase at fair

Three students from NUS High School of Mathematics and Science undertook a research project for their submission at the Singapore Science and Engineering Fair 2020 where budding scientists and engineers compete to showcase their passion in these fields.

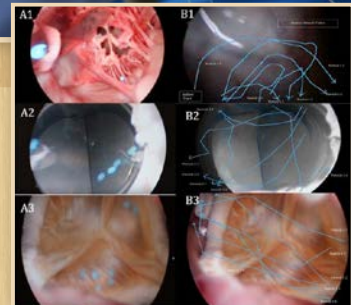
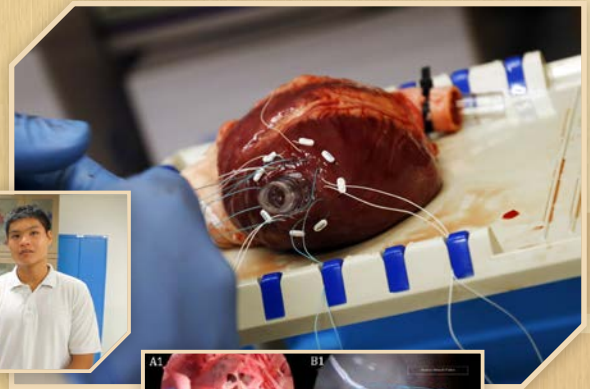
Granted the opportunity to work with the team at the National University of Singapore (NUS) Cardiac Surgery Lab, the students – Ms. Tay Qi Ying, Mr. Poon Cheng Jun and Ms. Sashew Chew, collaborated with Mr. Ong Zhi Xian, undergraduate from Yong Loo Lin School of Medicine, National University of Singapore (NUS) to discover more about mitral valves under the supervision of Dr. Md Faizus Sazzad, Research Fellow, Department of Cardiac, Thoracic and Vascular Surgery, Yong Loo Lin School of Medicine, NUS. Dr. Sazzad is a plethoric research fellow and innovator who is part of the team under A/Prof. Theodoros Kofidis, Head and Senior Consultant, Department of Cardiac, Thoracic and Vascular Surgery (CTVS), National University Heart Centre, Singapore (NUHCS).

Utilising a cardiopulmonary bypass machine¹, they flushed water with neutral buoyancy particles into the left ventricle of an explanted swine heart to simulate hemodynamic flow. With a cardioscope², the team observed the mitral apparatus and used tracking software to map out the left ventricle's flow pattern with various heart valves.

After much analysis, the students observed that prosthetic valves were more disruptive, with the mechanical valve having a more disruptive flow pattern compared to the bioprosthetic valve³. Their observations affirmed previous findings that mechanical valves have a higher risk of complication than bioprosthetic valves.

The team's research findings have been captured in their paper, "Cardioscopic Evaluation and Qualitative Estimation of Mitral Apparatus in A Quasi-Dynamic State in An Ex-Vivo Swine Heart Model", published in the *Journal of Biomedical Engineering and Research* in April 2020.

Needless to say, the team walked away with the Gold Award at the fair and, an even brighter future ahead.



(A) Cardioscopy Snapshot of Particle Movement at Respective Valves

(B) Traced Outline of Particle Trajectory at Respective Valves.

A1, B1: Native valve,

A2, B2: Medtronic Open Pivot Mechanical Valve and

A3, B3: Medtronic Mosaic Bioprosthetic Valve

¹**cardiopulmonary bypass machine** – A machine that provides a bloodless field for cardiac surgery by taking over the function of the heart and lungs by maintaining the circulation of blood and oxygen during a surgery.

²**cardioscope** – A tube-like instrument that is inserted into the heart through an incision with a tiny camera at the end which allows the operator to see the interior of the heart projected onto a screen.

³**bioprosthetic valve** – Manufactured from swine heart valves or bovine pericardium which has been harvested, cleaned and processed as a biomaterial.

ARTICLE BY

A/Prof. Theodoros Kofidis
Head and Senior Consultant,
Department of CTVS, NUHCS



A/Prof. Kofidis is recognised for his innovative surgical discoveries focused on less traumatic heart surgery. His passion in this area led to his founding of the Initiative for Research & Innovation in Surgery (IRIS). He continues to present his work at numerous international conferences as well as lead training workshops for medical teams around the world. He actively contributes to the industry through his multiple concurrent appointments held globally. He remains active in research with many published works, a number of patents, and sits on the editorial review board for a number of scientific journals.



Floral Fantasy

ANNUAL DINNER & DANCE 2020





National University Heart Centre, Singapore (NUHCS) got together on 17 January 2020 at the Regent Singapore for its eagerly awaited Annual Dinner and Dance.

With the theme of “Floral Fantasy”, more than 400 staff turned up dressed in their picture-perfect interpretation of the theme and took many pictures with the fantastical garden props in the reception area.

The evening was not short of entertainment with a slew of performances which starred talents from NUHCS as well.

Led by Advanced Practice Nurse Juvena Gan, the nurses performed an energetic song and dance number that was both captivating and humorous, while the Cardiology Senior Residents staged a

passionate rendition of pop song classics.

During the contest segment, Asst. Prof. Low Ting Ting, Consultant and Asst. Prof. Chai Ping, Head and Senior Consultant, Department of Cardiology, NUHCS won the *Best Dressed* prizes with their spontaneous catwalk performances.

It was a night to remember as everyone clearly had fun, dancing on the floor after dinner till late.

NUHCS Annual Dinner and Dance 2020 would not have been possible without the planning and support from the Operations and Administration department, in particular Ms. Christina Ng and Ms. Juliette Lim.

Cheers to another great year ahead at NUHCS!

ARTICLE BY

Asst. Prof. Devinder Singh
 Director of Cardiac Informatics and Senior Consultant, Department of Cardiology, NUHCS



Asst. Prof. Singh has keen interests in clinical cardiology, cardiac rhythm disorders (arrhythmia), cardiac pacing (including cardiac resynchronization therapy) and cardiac magnetic resonance imaging. He performs electrophysiology study and radiofrequency ablation of cardiac arrhythmias. He also implants pacemakers and defibrillators. Before joining NUHCS, he was an Associate Consultant in the cardiac department at Khoo Teck Puat Hospital.

Dr. Lim Yinghao
 Associate Consultant, Department of Cardiology, NUHCS



Dr. Lim is presently an Associate Consultant at NUHCS. He is the course co-director for the Chia Boon Lock Cardiology Review Course and the Cardiology PACES Course. His interests are in the fields of pulmonary hypertension, structural heart disease as well as medical and device innovation.



A HEARTY PARTY TO WARM HEARTS

Caring Hearts Support Group Annual Year End Party 2019

Caring Hearts Support Group (CHSG) closed 2019 with its annual year end party on 29 December with heartfelt home-cooked meals and merriment to warm all heart patients.

CHSG is a voluntary initiative organised by patients of the National University Heart Centre, Singapore (NUHCS) and established with the aim to support patients in their journey to remain heart healthy. Through CHSG's regular outreach and engagement, patients have found meaningful support and companionship.

Membership is free and open to any cardiovascular patient of NUHCS who have completed their basic cardiac rehabilitation at the NUHCS Heart Rehab Centre. Activities and events such as monthly

walks, educational talks, exercise sessions, networking sessions, social get-together and community engagement events are organised on a regular basis aimed at helping patients maintain a healthy heart but to also help them understand about their hearts to empower them to take charge of their health. Where applicable, activities are conducted online.

CHSG plays a pivotal role in supporting patients post treatment at NUHCS. For some patients, getting back to their normal daily lives may take longer than expected and the journey to full recovery could be difficult or depressing.

Hence, CHSG hopes to inspire and motivate patients through caring for one another.

Our annual party serves as an informal way to affirm and encourage members to continue with our inspiring work whilst bringing long-time collaborators and friends from NUHCS and Singapore Heart Foundation (SHF) together for a heart-warming year end party.

As the year closed, every smile was returned, every friendship re-affirmed, every heart touched and warmed, as members pledged to embody our motto, *"Caring Begins With Me"*.



CARING HEARTS SUPPORT GROUP (CHSG)

Interested readers who wish to join CHSG may write to mchia@kucinta.com

ARTICLE BY

Ms. Magdalene Chia
Programme Coordinator,
CHSG

Magdalene Chia is a patient of NUHCS and a Volunteer Member of CHSG. Together with CHSG members, she helps lead CHSG with meaningful activities and steer CHSG forward to bring forth positive changes to heart patient members' lives. Her passion in CHSG is to spread care and kindness to all whom the Group meets.



LEADING THE HEART HEALTH MOVEMENT

Prof. Tan outlined his goals as Singapore Heart Foundation's (SHF) fourth Chairman



Prof. Tan Huay Cheem, Director and Senior Consultant, Department of Cardiology, National University Heart Centre, Singapore (NUHCS) was appointed SHF's fourth Chairman on 31 August 2019.

SHF, previously known as the Singapore National Heart Association (SNHA), is the heart health movement in Singapore with the mission to promote heart health, prevent and reduce disability and death due to cardiovascular diseases and stroke.

Prof. Tan is no stranger to the organisation, having volunteered and served in numerous committees since 2001 and was the Honorary Secretary since 2007. Taking on the role, Prof. Tan outlined three areas which he would like to move the organisation forward.

Firstly, SHF will play an active advocacy role for cardiovas-

cular health by working with all stakeholders involved, and lending an active helping hand in shaping initiatives, designing programmes and building infrastructure to raise the overall awareness of heart health among Singaporeans.

The second goal would be to promote education and become the go-to resource for relevant heart health information. SHF will work with various organisations to provide evidence-based and scientifically proven information to the public. It will explore channels of communications ranging from traditional to social media to target audiences spanning all age groups from the young in schools to working adults and retirees. Everyone should be made aware of the risks of heart disease, recognise the symptoms and methods of prevention, learn how to respond in emergencies, as well as the current treatment options available.

The third goal focuses on manpower upskilling and training. Continual learning will be a culture within SHF to enable staff to be mission ready, capable of carrying out their roles professionally and competently. Prof. Tan hopes to make working in a social service agency (SSA) an attractive and satisfying career option for those with the right aptitude. SHF could even become the training ground for those who may subsequently move on to work in other SSAs.

As SHF celebrates its 50th anniversary this year, Prof. Tan says more can be expected of SHF in the coming years – to engage, educate and empower the public in making Singapore a heart-healthy nation. He hopes to engage NUHCS, other public and private health institutions in more collaborative initiatives as he believes that SHF can only be successful with continued support from the government and the community.

THE NEXT GENERATION IN HEART RECOVERY



Achieving hemodynamic stabilisation¹ with percutaneous ventricular assist devices²

Cardiogenic shock³ is a feared complication of myocardial infarction⁴. Despite advances in revascularisation⁵ technology, mortality rates remain high for patients who develop cardiogenic shock after myocardial infarction.

To improve outcomes for this group of patients, clinical guidelines now recommend a multi-disciplinary management approach aided by the early deployment of mechanical circulatory support (MCS) devices.

National University Heart Centre, Singapore (NUHCS) established a cardiogenic shock team comprising of cardiothoracic surgeons, cardiologists and nurses specially trained to care for such patients. The team is trained to quickly deploy either the Impella[®] catheter-based left ventricular assist device, or extracorporeal membrane oxygenation (ECMO)⁶ for patients needing MCS.

Impella[®] has been used in other parts of the world with encouraging results. The device is inserted percutaneously from the groin artery and sits in the left ventricle of the heart. It takes over the heart's job of delivering blood to the rest of the body, allowing the heart to rest and recover.

In February 2020, this device was implanted in a patient who suffered from cardiogenic shock and was cared for in the Coronary Care Unit (CCU) by NUHCS's multi-disciplinary cardiogenic shock team. Following the stable recovery of the patient's heart, the device was successfully explanted four days later.

This marked the first ever use of the Impella[®] device in Singapore in the management of cardiogenic shock, paving the way for future procedures.

¹**hemodynamic stabilisation** – The stability of blood flow in the heart and vessels to provide a steady supply of oxygen to all tissues and organs in the body.

²**percutaneous ventricular assist devices** – A mechanical pump device used in patients with poor heart pumping function to improve blood output from the heart and maintain blood pressure.

³**cardiogenic shock** – Condition when the heart suddenly cannot pump enough blood to meet the body's needs. This condition is often fatal if not promptly treated.

⁴**myocardial infarction** – Commonly known as a heart attack, this condition occurs when blood flow in one of the heart's coronary arteries is slowed or blocked, causing the formation of a blood clot and death of the heart muscle tissue.

⁵**revascularisation** – Refers to the restoration of blood flow to areas of the heart muscle affected by coronary artery disease.

⁶**ECMO** – A life support machine which replaces the function of the heart and lungs. Patients who require this machine need to be cared for in a hospital's intensive care unit.

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. His research interests are in the fields of mechanical circulatory support, acute heart failure and amyloid cardiomyopathy.

From the time I was a first-year fresh-eyed medical officer in November 1994, I experienced the warmth and camaraderie of the Cardiac Department at the National University Hospital (NUH). I was so impressed during my term there that it became my driving force to enter the field of cardiology to join their ranks as a registrar in 1999.

We had a “team tradition” at the hospital – the rostered team working on weekends always start their shift with a team breakfast before splitting up to attend to their daily tasks and duties in the wards. It only took a few minutes but this simple tradition helped us to know our colleagues better which explained the high esprit de corps with a strong sense of mission within the department.

Over the years, I have witnessed the department grow in strength, overcome challenges, including the severe acute respiratory

syndrome (SARS) outbreak in 2003, and develop into a centre of excellence, the National University Heart Centre, Singapore (NUHCS), as it is known today.

I have been fortunate to be able to learn from and be mentored by inspiring leaders such as the late Prof. Chia Boon Lock, A/Prof. Lim Yuen Teng, Prof. Tan Huay Cheem and A/Prof. Yeo Tiong Cheng. I also had the privilege to work alongside a special family of highly talented, intelligent, capable and dedicated colleagues – my fellow clinicians, nurses, pharmacists, technologists, executives and patient service associates, among others, all who contributed to my professional growth.

While it is a daunting task to take over the reins of leadership in the midst of a pandemic, I considered it my duty to step up – to serve and lead the department.

LEADING A NEW ERA

Opinion piece by Asst. Prof. Chai on his new appointment

Together, we shall prevail, emerge stronger and better so that we may continue to enhance the health of our patients, families, communities and country.

This is an opinion article penned by Asst. Prof. Chai Ping who is the recently appointed Head of Department of Cardiology, NUHCS. He took over from A/Prof. Yeo Tiong Cheng, who remains as Deputy Director, NUHCS, in charge of cluster integrated care programmes.

ARTICLE BY

Asst. Prof. Chai Ping
Head & Senior Consultant,
Department of Cardiology,
NUHCS



Asst. Prof. Chai is an accredited specialist in cardiology since 2002. Subsequently, he did his fellowship in Cardiovascular Magnetic Resonance at the Royal Brompton Hospital, in the UK from the period of 2004 to 2005. His specialty interest lies in heart failure and non-invasive cardiovascular imaging. He is heavily involved in medical and nursing education.

“Together, we shall prevail, emerge stronger and better so that we continue to enhance the health of our patients, families, communities and country.”

Asst. Prof. Chai Ping, Head & Senior Consultant,
Department of Cardiology, NUHCS



FORGING TIES ACROSS BORDERS

Governing the Singapore Chapter of the American College of Cardiology

With the understanding that healthcare crosses borders, the Singapore Chapter of the American College of Cardiology (ACC) was established in 2012, under the leadership of A/Prof. Lim Yuen Teng, to promote dialogue exchange among cardiovascular professionals around the globe and to advocate for and advance the priorities of ACC members in Singapore.

In October 2018, Asst. Prof. Edgar Tay Lik Wui, Director of Congenital/Structural Heart Disease Programme and Senior Consultant, Department of Cardiology, National University Heart Centre, Singapore (NUHCS) was appointed as the Governor of ACC's Singapore Chapter.

The Singapore Chapter has participated in and organised several international and local programmes to forge closer ties amongst its members, including the recent ACC Asia Regional Conference in Shanghai, as well

as the jeopardy competition at the ACC meeting in New Orleans where the Singapore team brought the gold home.

During the ongoing Covid-19 pandemic, the Singapore Chapter continued its work through digital platforms.

To keep cardiologists up to date in clinical care, late breaking trials and the latest developments were delivered via web conferencing. Webinars were organised to facilitate knowledge sharing and provide Covid-19 clinical guidance for cardiovascular care teams.

Instead of halting ongoing research, the collaboration with ACC on STEMI management continued, albeit virtually.

With optimism, the Singapore Chapter has started planning ahead for the inaugural Singapore Cardiac Society and ACC Asia Conjoint Meeting in 2021

which seeks to consolidate the best scientific content from two organisations in one session.

The ACC Cardiovascular Overview and Board Review Course structured for family physician partners, allied health teams and cardiologists to learn more about the prevention, diagnosis and treatment of cardiovascular diseases will be open for registration at the same time.

ARTICLE BY

Asst. Prof. Edgar Tay Lik Wui
*Director of Congenital/
Structural Heart Disease
Programme and Senior
Consultant, Department
of Cardiology, NUHCS*



Asst. Prof. Tay leads the Transcatheter Aortic Valve Replacement/Implantation and mitralclip mitral valve repair programme at NUHCS. He is active in research with many published in peer-reviewed journals and has written book chapters on echocardiography in congenital heart disease and structural intervention. Subspecialising in the field of adult congenital heart disease, pulmonary hypertension and structural intervention, he is active in the clinic management of such patients at NUHCS and is also an Asst. Prof. at the Yong Loo Lin School of Medicine, National University of Singapore.

GAINING FIRSTHAND EXPERIENCE

Dr. Kua trained under instantaneous wave-free ratio pioneer

Dr. Kua Jieli, Consultant, Department of Cardiology, Ng Teng Fong General Hospital (NTFGH) received the Health Manpower Development Programme (HMDP) award, which gave him the opportunity to advance his skill-sets overseas from March 2019 to March 2020.

Administered by the Ministry of Health (MOH), the award provides local medical specialists the opportunity to learn from international leaders at reputable overseas centres to advance their learning and improve the standards of healthcare delivery in Singapore.

With the award, Dr. Kua pursued a one year interventional cardiology training at Hammersmith Hospital in London, UK under the supervision of Dr. Sayan Sen, Consultant Cardiologist and Honorary Senior Clinical Lecturer at Hammersmith Hospital & Imperial College London, in the UK.

As Dr. Sen is one of the pioneers of using instantaneous wave-free ratio (iFR) in the assessment of coronary physiology, Dr. Kua had the opportunity to be exposed to a variety of clinical cases using iFR to assess for coronary ischemia¹ during his training.

iFR is the latest innovative diagnostic tool used to assess the hemodynamic² significance of coronary stenosis³, which can be obtained at rest without the use of vasodilators⁴. In recent years, largescale published studies have supported the use of iFR particularly for its quicker process and low incidence of patient-related discomfort.

ARTICLE BY

Dr. Kua Jieli
*Consultant, Department of
Cardiology, NTFGH*



Dr. Kua Jieli joined NUHCS in 2013 to complete his senior residency training. Currently, he practices as a Consultant Cardiologist at NTFGH which is part of the National University Health System (NUHS) public healthcare cluster in Singapore. His specialty interests are in the field of interventional and nuclear cardiology.

Dr. Kua also had an eye-opening experience working in a hospital under UK's Imperial College Healthcare National Health Service (NHS) Trust where patients received free healthcare. Under the Imperial College Healthcare NHS Trust, about a million people in Northwest London have access to acute and specialist healthcare through its five hospitals and growing number of community services each year.

¹**coronary ischemia** – Refers to the condition for not having enough blood through the coronary arteries.

²**hemodynamic** – The dynamics or study of blood flow.

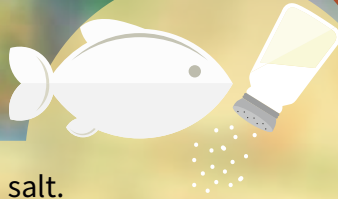
³**coronary stenosis** – Refers to the condition where arteries are narrowed or constricted limiting blood flow.

⁴**vasodilators** – Medications that dilate blood vessels.



Healthy HAWKER EATS

Is it possible to eat healthy food at the hawker stalls? Yes, you can!



Choose foods with less oil, sugar and salt.

Ask for less gravy or sauces. Limit deep fried foods to no more than twice per week. Choose lean cuts of meat / fish or ask for skin to be removed from poultry.



Eat fresh fruit for dessert.

After your meal, choose to eat your serving of fresh fruit instead of drinking it in juice.



Plain water as your main beverage of choice.

Avoid sugary and alcoholic beverages. Opt for sugar-free soft drinks or unsweetened tea.



Go for higher fibre options.

Request for brown rice instead of white rice. Ask for more vegetables to be added to your meal.

Tips on making healthier food choices at a hawker centre



ARTICLE BY

Ms. Tricia Teo
Senior Dietitian, National University Hospital (NUH)



Tricia is currently a senior dietitian who has been with the NUH Dietetics Department since 2012. She is currently the main dietitian for the Women's Heart Health Clinic and Cardiothoracic Intensive Care Unit. Her other clinical interests include Critical Care Nutrition and Paediatric Feeding.

NUH Dietetics Department



How to choose healthier dishes from hawker stalls

YONG TAU FOO STALL:

Choose non-fried items. Opt for clear soup or dry with minimal sauces.

ECONOMICAL RICE/NASI PADANG STALL:

Opt for brown rice (if available). Choose at least two vegetables dishes. Choose steamed / stir-fried / braised / grilled lean meat, fish or poultry (without skin). Avoid deep fried dishes. Avoid adding gravy or sauces.

FISH SOUP STALL:

Opt for sliced fish instead of fried fish. Request for more vegetables. Avoid adding milk in soup.

NOODLE STALL: Opt for soup noodles instead of fried noodles. For dry noodle dishes, request for less or no oil. Avoid lard and fried shallots. Limit gravy intake as much as possible.

“
**Question after question,
 I did not realise that it
 had been 90 minutes
 of non-stop talking.
 When it was finally over,
 I felt my throat was
 desperately parched.**

Asst. Prof. Andrew Choong,
 Consultant, Department of CTVS, NUHCS

The trepidation and anxiety when sitting for examinations never seems to go away, no matter how many examinations one has been through.

That rang especially true for Asst. Prof. Andrew Choong, Consultant, Department of Cardiac, Thoracic and Vascular Surgery (CTVS), National University Heart Centre, Singapore (NUHCS), as he was preparing for the last hurdle he needed to clear to earn his Doctor of Philosophy (PhD) in Medicine from the University of Warwick, UK – his *viva voce* (oral examination).

Asst. Prof. Choong's thesis was on “Unusual Arterial Access Sites for Arterial Endovascular Interventions” which he completed under the tutelage of Prof. Lee Chuen Neng, Senior Consultant, Department of CTVS, NUHCS. His work was funded by the PhD scholarship fund set up by Ms. Chan Su Shan and her family in honour of her father Prof. Chan Kong Thoe.

Having passed numerous examinations, presented at dozens of international conferences and given countless invited lectures, one would have thought that,

another oral examination would be a breeze for Asst. Prof. Choong (in fact, he was awarded the Gold Medal for the highest overall examination performance when he attained the Fellowship of the European Board of Vascular Surgery with Honours back in 2014).

Yet when placed in the hot seat, his first immediate thought was the same sense of nervousness and foreboding he had when he sat for his medical school finals 17 years ago.

Held during the height of the Covid-19 pandemic, Asst. Prof. Choong had to do his *viva voce* via video conferencing.

After almost seven years of toil, the culmination was a non-stop inquisition which lasted over an hour and a half, during which, time stood still for him.

When the questioning finally stopped, he had to log off for the panel to deliberate his result.

THE LAST HURDLE – AN INQUISITION

Asst. Prof. Choong recounted taking his *viva voce* during the pandemic



He re-joined a few minutes later, to learn he had passed.

It was only then, when the reality of the pass had sunk in, that with a desperately parched throat, did he realise he had forgotten to bring his water bottle to the examination.

ARTICLE BY

**Asst. Prof. Andrew Mark
 Tze Liang Choong**
 Consultant, Department
 of CTVS, NUHCS



Asst. Prof. Choong is a Consultant, vascular, endovascular and aortic surgeon. He is a well-published and active researcher and has been invited to deliver keynote lectures at numerous international vascular conferences. Prior to joining NUHCS, he was with King's College Hospital in the UK, having completed his specialist training in both Australia and the UK. Also a passionate medical educator, he has lectured at the London Postgraduate School of Surgery, UK, the University of Queensland and Griffith University in Australia and continues to teach at the National University Health System (NUHS) as associate program director for the Research Residency Programme as well as at Yong Loo Lin School of Medicine, National University of Singapore.

THE IRON-MAN SUIT FOR PROTEINS

Drum Lab creates first man-made shells to protect delicate proteins

The Drum Lab at the Cardiovascular Research Institute (CVRI) has re-engineered an iron storing protein found in *Archaeoglobus fulgidus* (an unusual bacterium¹ found in hot springs) to construct the first nanoparticulate² thermostable ExoShell³ (tES).

This first man-made encapsulating technology has proven to improve the yield of functional in vitro folding by approximately 100-fold and protects the proteins within from external damage.

Like a cocoon, the novel and highly stable nanoshell wraps around an unfolded substrate⁴, protecting the foreign-held proteins from a wide range of stressors, including extreme heat and harsh chemicals, and further allows researchers to successfully guide the complex folding process of the proteins into their functional active form.

Currently, this folding process is exceedingly complex and often

fails where misfolded proteins can result in a lack of functionality and sometimes lead to diseases such as Alzheimer's Disease.

With tES, targeted cancer treatment could be more deterministic with the facilitation and transport of proteins to a specific site. As a proof-of-concept, the research team has successfully demonstrated eradication of tumor in a xenograft breast tumor mouse model using tES-mediated enzyme prodrug therapy.

With their findings recently published in the scientific journal *Nature Communications*, the team continues to expand their original findings to include a panel of 12 difficult to produce biologicals, including p53, a protein of critical need in cancer research.

With further research, the team hopes to develop tES into a universal platform for the delivery of a wide variety of therapeutics via oral administration with a high degree of target specificity.



THE DRUM LAB

The Drum lab is a translational lab that engages in chemical synthesis to clinical trial, working under lead researcher Asst. Prof. Chester Drum, Senior Consultant, Department of Cardiology, National University Heart Centre, Singapore (NUHCS).

¹**bacterium** – A single-celled microorganism that typically lives in organic matter, reproduces by binary fission and usually lacks a nuclear membrane.

²**nanoparticulate** – An ultrafine microscopic particle that is between 1 and 100 nanometres in diameter.

³**ExoShell** – An outer covering that is usually hard acting as a shield to cover and protect something within.

⁴**substrate** – The chemical species being observed in a chemical reaction, which reacts with a reagent to generate a product.

ARTICLE BY

Asst. Prof. Chester Drum
Senior Consultant,
Department of Cardiology,
National University Heart
Centre, Singapore (NUHCS)



Asst. Prof. Drum is a senior consultant cardiologist at NUHCS. With more than 20 years of clinical experience in managed care, private, public and academic healthcare settings, he holds multiple patents and continues to be active in research especially in the biochemistry field focusing on innovations for unmet clinical needs.

Dr. Annanya Shetty
Research Fellow, The
Drum Lab, Cardiovascular
Research Institute (CVRI)



Dr. Shetty works as a Research Fellow in The Drum Lab where she is driving product development and commercialisation of the lab's novel protein folding and delivery platform. She is a biomedical scientist holding a Masters in Biochemistry from the University of Madras and a PhD in Medicine from the National University of Singapore (NUS) with over seven years of research experience in drug discovery and development.

Asst. Prof. William Kong Kok-Fai
*Senior Consultant
Department of
Cardiology*

FROM JANUARY 2020:



Dr. Loh Poay Huan
*Senior Consultant
Department of
Cardiology*



Dr. Gavin Ng Yeow Peng
*Consultant
Department of
Cardiology*



Asst. Prof. Chester Lee Drum
*Senior Consultant
Department of
Cardiology*



Congratulations

TO OUR NEWLY PROMOTED DOCTORS!

FROM APRIL 2020:



Dr. Jeanette Ting Hsin Yeen
*Consultant
Department of
Cardiology*



Dr. Jai Ajitchandra Sule
*Associate Consultant
Department of
Cardiac, Thoracic
and Vascular
Surgery*



Dr. Wang Yi Ting Lauren
*Associate Consultant
Department of
Cardiology*



Dr. Eugene Tan Siang Joo
*Associate Consultant
Department of
Cardiology*



QUALITY IMPROVEMENT PROJECT (QIP) AWARDS

CARDIAC RECOGNITION AWARD

The National University Heart Centre, Singapore's Cardiac Medical Team below received the recognition award for their performance achievement in Acute Myocardial Infarction (AMI) Improvement RIE (SAS) from October 2017 to September 2018.

A/Prof. James Yip

A/Prof. Yeo Tiong Cheng

Dr. Devinder Singh

Dr. Lim Yoke Ching

Dr. Khaing Thet

Asnah Binte Ikhsan

Chia Lay Hoon

Chua Yi Ling

E Navasri

Fu Yongxin

Khoo Shan Nee

Tan Chai Eng

NURSING RECOGNITION AWARD

The nursing team managing care for patients in Ward 63 and Ward 64 received the recognition award for the processing seamless discharge of patients before 11.30am during the period of 17 December 2018 to 31 October 2019.

Dr. Karen Koh Wei Ling

Bartolome Rizafel Crisostomo

Candy Chee Su Ting

Chua Yi Ling

E Navasri

Fu Yongxin

Michelle Sally Anak Atong

Nurshafiyah Binte Hanafi

Nuryasmin Arina Binte Muhammad

Saiful Nurazzam Chua

Song Hui Sang

Sotelo Catherine Zarate

Tan Chai Eng

Vikneswary D/O Murugiah

Yovelle Low

Zhang Lihong

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ABSTRACTS

17th Asia Pacific Medical Education Conference (APMEC) 2020, Singapore, 8-12 January 2020

Development and Evaluation of an Introductory Online Radiology Session for Master of Nursing Students
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Case Report: A Case of Concomitant MAZE Procedure and Closure of Left Atrial Appendage through the Atrial Septal Defect in Minimally Invasive Tricuspid Valve Replacement
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Left Atrial Volume Index is Associated With Atrial Fibrillation and Recurrent Stroke in Embolic Stroke of Undetermined Source (ESUS)
Ho JS, Sia CH, Boi Y, Foo AS, Dalakoti M, Chan MY, Ngiam NJ, Chan BP, Teoh HL, Sharma VK, Kojodjojo P, Seow SC, Yeo LL, Tan BY.

Left Ventricular Systolic Dysfunction is Associated With Poor Functional Outcomes and Mortality After Endovascular Thrombectomy for Acute Ischemic Stroke

Tan BY, Leow AST, Sia CH, Sunny S, Ng ZX, Yeo JYP, Chia MLJ, Wong LY, Widjaja L, Gopinathan A, Yang CL, Chan BPL, Teoh HL, Seet RCS, Paliwal PR, Sharma VK, Yeo LLL.

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A Novel Echocardiographic Index Demonstrating Reduced Relative Valve Load in Patients with Paradoxical Low-Flow Compared to Normal-Flow Severe Aortic Stenosis with Preserved Left Ventricular Ejection Fraction
Ngiam N, Chew N, Sia CH, Sim HW, Tan BYQ, Kong WKF, Teo TC, Poh KK.

A Novel Echocardiographic Index of Relative Valve Load Predicts Clinical Outcomes in Patients with Medically Managed Aortic Stenosis
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Characterizing the Prevalence and Echocardiographic Profile of Patients with Paradoxical Low-Gradient Mitral Stenosis
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Ethnic Differences in Computed Tomography Aortic Valve Calcium Quantification in Patients with Aortic Stenosis
Exequiel Guzzetti, Jin Kyung Oh, Mylene Shen, Marc Dweck, Poh KK, Amr E Abbas, Rami Mando, Greg S Pressman, Daniel Brito, Lionel Lloyd Tastet, Tania Pawade, Mariano Falconi, Diego Perez de Arenaza, Kong WKF, Tay EL, Philippe Pibarot, Jae-Kwan Song, Marie Annick Clavel.

Inadequately Low Left Ventricular Mass in Patients with Aortic Valve Stenosis: Improved Left Ventricular Contractility and Clinical Outcomes?
Chew N, Ngiam N, Tan BYQ, Sia CH, Sim HW, Kong WKF, Tay EL, Yeo TC, Poh KK.

Natural History Of Symptoms And Stress Echo Findings In Patients With Moderate Or Severe Ischemia And No Obstructive CAD (INOCA): The NHLBI-funded CIAO Ancillary Study To The ISCHEMIA Trial
Harmony R Reynolds, Michael Picard, James Min, John Spertus, Yi Li, Jesus Peteiro, Jose Lopez-Sendon, Roxy Senior, Mohammad El-Hajjar, Jelena Celutkiene, Michael Shapiro, Patricia Pellikka, Khaled Alkafih, Khaled Abdul-Nour, Michel Khouri, Leonid Bershtein, Mark de Belder, Poh KK, Jerome Fleg, David Maron, Judith Hochman.

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Unscramble the letters to form words that relate to this issue of *Pulse*.
Flip to our special section if you need some hints!

1

E A
N R
I W B

6

I D
N P
M A E
C

2

S I
M T E

4

R O X
L P R T A
E C A R
O E

7

Y A M
A T T C S
O P I M

3

S I Y
L T A
A G O N P

5

U E T
R O K
B A

Answers:
1. WEBINAR, 2. STEM, 3. ANGIOPLASTY, 4. EXTRACORPOREAL,
5. OUTBREAK, 6. PANDEMIC, 7. ASYMPTOMATIC

