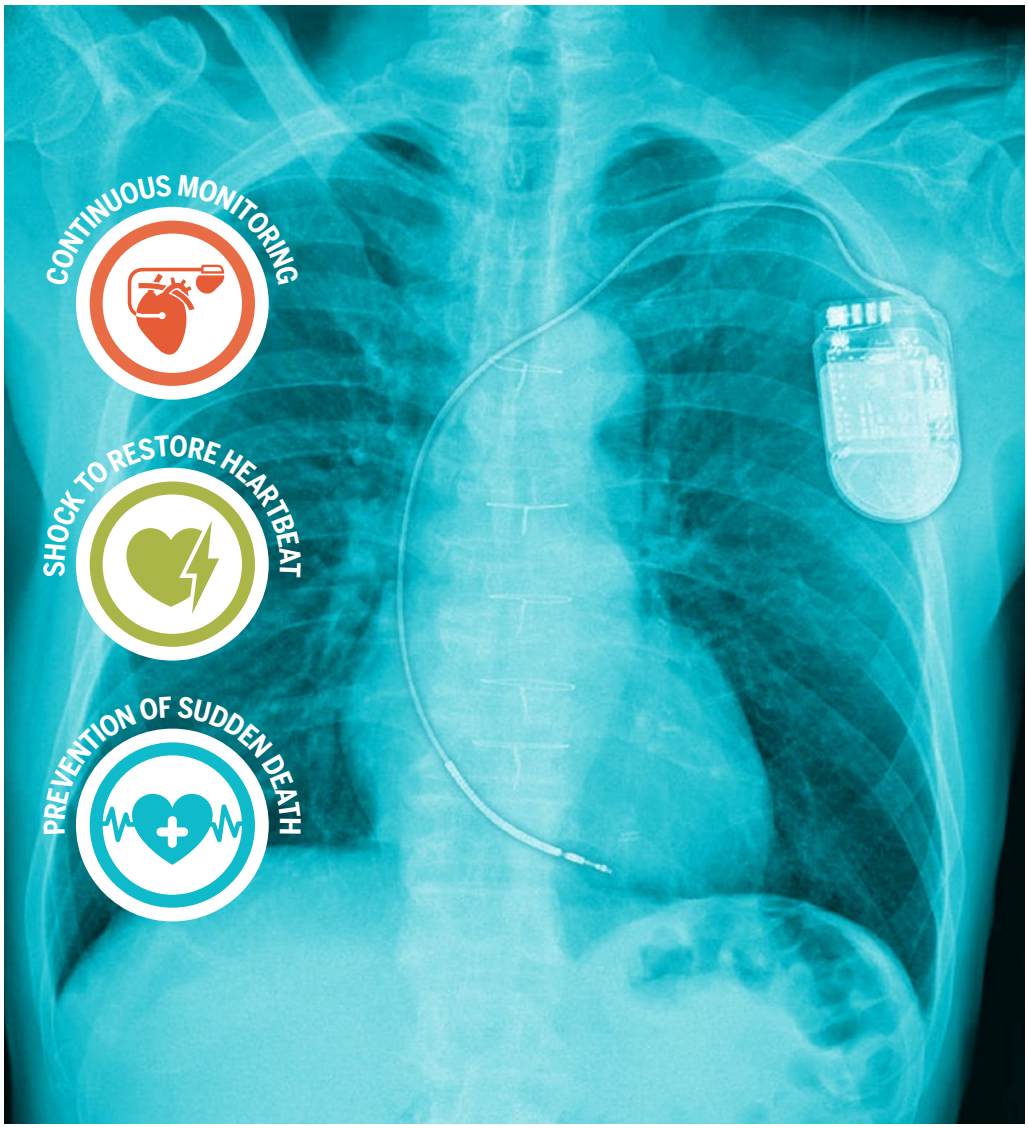
APR-SEP 2017

ISSUE 28 MICA (P) 083/07/2016

# MURMURS®

A publication of National Heart Centre Singapore

## IMPLANTABLE CARDIOVERTER DEFIBRILLATOR (ICD): UTILISATION RATE IN ASIA




BRINGING TECHNOLOGY TO HEALTHCARE

IN SEARCH OF THE SECRET TO HAVING A HEALTHIER HEART

HIGH BLOOD PRESSURE, THE SILENT KILLER

National Heart Centre Singapore
SingHealth

PATIENTS. AT THE HEART OF ALL WE DO.®

## ICD – YOUR BEST INSURANCE AGAINST CARDIAC ARREST

ICD is a device that is placed in the chest with connecting wires to the heart to monitor and correct episodes of rapid heartbeat. It can give your heart electric pulses or shocks to get your heart rhythm back to normal. If you have been found to be at recurring risk of heart rhythm problems such as ventricular tachycardia or ventricular fibrillation (when the heartbeat is both fast and irregular), an ICD may be your best insurance against cardiac arrest. Recent studies have confirmed the usefulness of the ICD in addition to optimal medical therapy. The ICD protects these patients at risk from premature deaths due to life-threatening erratic heart rhythm.

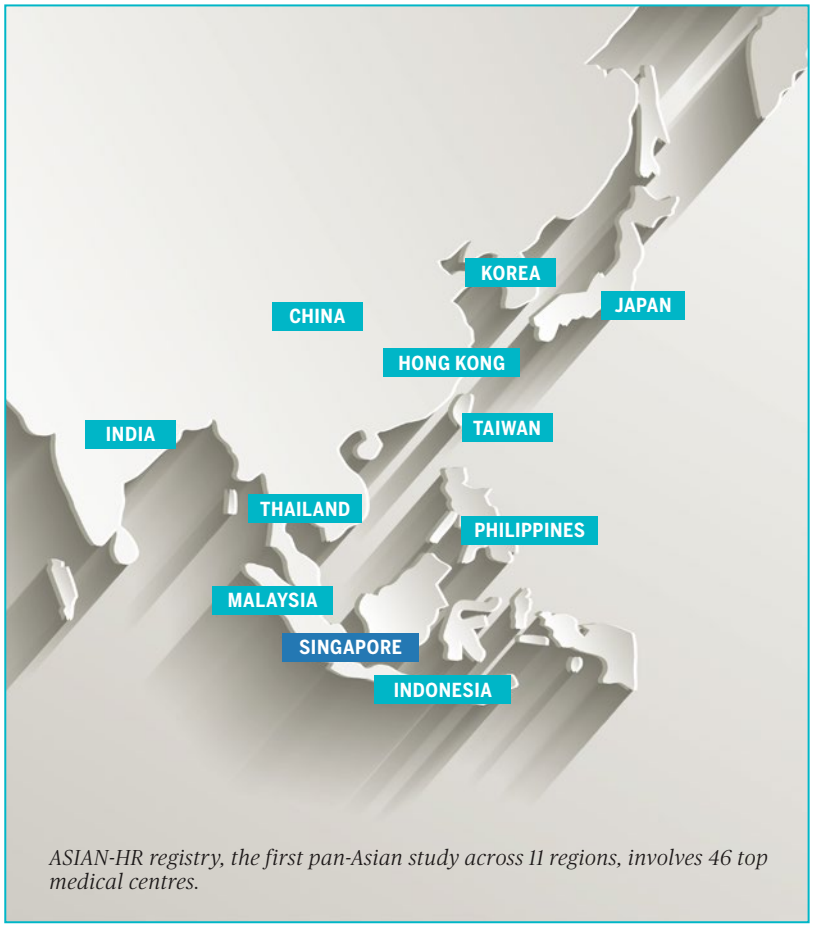
## HEART FAILURE IN ASIA – WHAT DO WE KNOW NOW?

Professor Lam and her co-investigators analysed 5,276 patients with heart failure and reduced ejection fraction (HFrEF, also known as systolic HF) in the Asian Sudden Cardiac Death in Heart Failure (ASIAN-HF) registry whom they have followed up on since 2012, when the registry was set up. Ejection fraction (EF) refers to the percentage of blood that is ejected out of the ventricles with each contraction, and a low EF means that there is weakness of contraction or "pump failure". The ASIAN-HF registry is the first pan-Asian study across 11 regions on the impact of ICDs on mortality in Asian patients with heart failure and reduced ejection fraction.

# ICD: UTILISATION RATE IN ASIA

Singapore ranked third in Implantable Cardioverter Defibrillator (ICD) eligibility, however its ICD utilisation is below the Asian average, ranking fifth after Japan, Hong Kong, China and Thailand.

A prospective multinational data study on Asian heart failure patients conducted by Professor Carolyn Lam, Senior Consultant, Department of Cardiology, National Heart Centre Singapore, who is also the Principal Investigator of the study, revealed findings that there is a low utilisation of ICD in Asia despite its significant life-saving capability.




*ASIAN-HR registry, the first pan-Asian study across 11 regions, involves 46 top medical centres.*

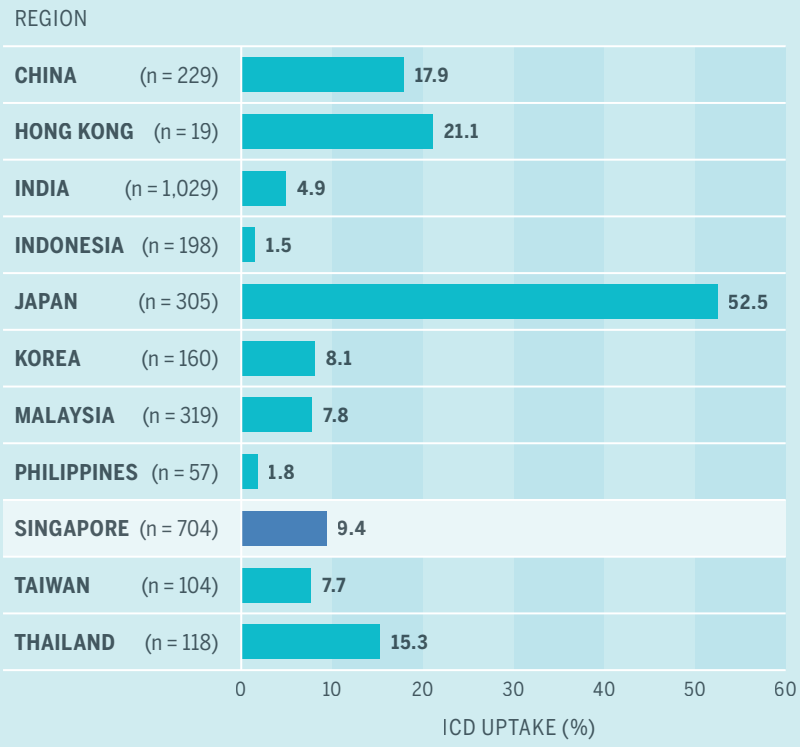
Despite being younger than their Western counterparts, comorbidities were highly prevalent among Asian patients (two-thirds of patients had two or more comorbidities), with Southeast Asian heart failure patients, in particular, having the highest risk profile in Asia. In addition, the utilisation of ICDs in Asia was very low, with disparity across geographic regions and socioeconomic status.

**"Over a median follow-up of 417 days, the study showed that ICD implantation reduced risks of all-cause mortality and sudden cardiac deaths," said Professor Lam.**

Professor Lam continued, "Even though ICDs are known to be life-saving devices in patients with HFrEF, utilisation and determinants of ICD insertion in Asia remain poorly defined. In Singapore, almost two-thirds (704 patients, 66.0%) out of a total of 1,066 patients were eligible for an ICD implantation for primary prevention of sudden cardiac death, yet only 66 (9.4%) of them received an ICD. This is despite that Singapore has one of the highest ICD eligibility rates in Asia, after India (71.7%) and Indonesia (67.7%). The average ICD eligibility rate across Asia is 61.4%."

Singapore's ICD utilisation rate falls below the Asian average of 12.0%, and it is far lower than that of Japan, which has the highest ICD utilisation among the Asian countries studied of 52.5%. Some possible reasons for the low ICD utilisation rate in Singapore and across Asia (except Japan), according to Professor Lam, could be socio-cultural factors (such as the unwillingness to have an unnatural object in their body) and lack of knowledge on the advantages of ICD. Among the ICD recipients in Asia, the study also showed that they were likely to be older, have tertiary education and reside in a high income region.

## ICD UPTAKE (%) BY REGIONS




## TOWARDS BETTER HEALTHCARE OUTCOMES

**In summary, this is the first prospective multinational data on ICD utilisation among patients with HFrEF across Asia. While a myriad of complex factors influenced the low and heterogeneous ICD utilisation within Asia, better patient education and targeted healthcare reforms present opportunities for optimum public health intervention to improve the outcomes of heart failure patients.**

## ALL YOU NEED TO KNOW ABOUT AN ICD

An implanted device which monitors the heart rhythm continuously.

When an abnormal heart rhythm is detected, the ICD will deliver an electric shock to restore a normal heartbeat.

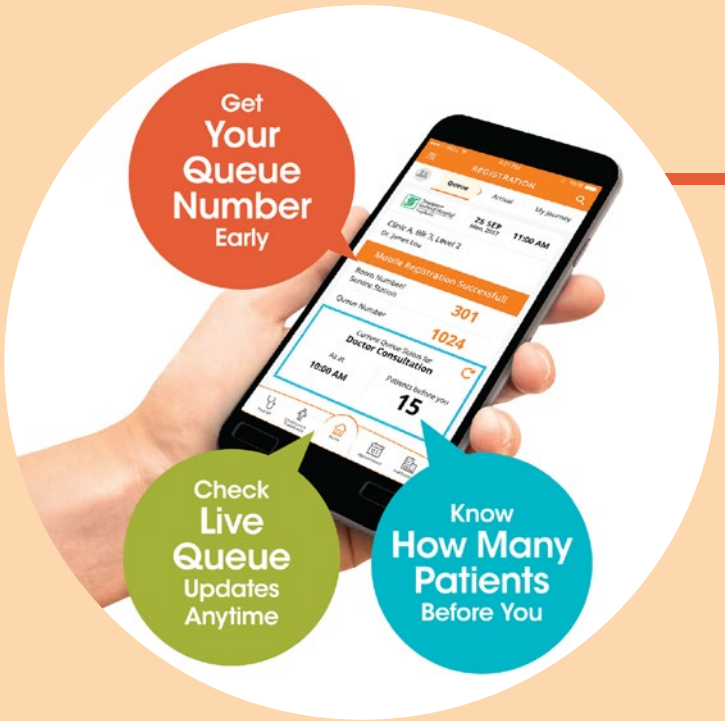
An established therapy for the prevention of sudden cardiac deaths.

### WHO NEEDS ICD?

- If you have potentially life threatening heart rhythms such as ventricular tachycardia or fibrillation
- If you have a high risk of sudden cardiac death

# BRINGING TECHNOLOGY TO HEALTHCARE

Many would agree that technology is the driving force behind improvements in healthcare, and looking at the rate of change and evolving trends, there is a need to keep up and innovate to find new ways to improve patient care and practise medicine.




## QUEUE, FROM THE CONVENIENCE OF YOUR MOBILE PHONE

**In 2016, almost 4.11 million Singaporeans have a smartphone and on average, each user spends 12 hours a day on their phones.**

**Such staggering figures only serve to push one towards adopting and adapting to the rapidly changing technological landscape. Healthcare is no different and it was evident in a SingHealth survey in 2015 where 75% indicated that they want a mobile registration service.**

The Health Buddy mobile application (app) was piloted at National Heart Centre Singapore (NHCS) and Singapore General Hospital (SGH) since last October, and SingHealth has been working hard to improve the value of the services offered via the app to our patients. In particular, waiting time at outpatient clinics has been better managed with the introduction of mobile registration.

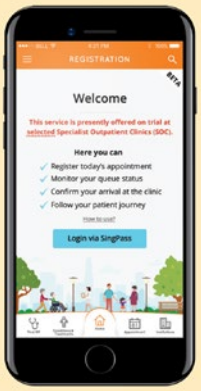
**The service was officially launched in NHCS clinics in June this year. Patients can now log in to their Health Buddy app, register for consultations and proceed to have their breakfast in leisure, while having peace of mind that they will still be able to arrive at the clinic before their queue numbers are called – all thanks to the real-time updates on queue status available via the mobile app.**

On the day of their appointment, patients will receive a SMS reminding them to register remotely. Upon login to the app, a queue number will be issued. Patients can manage their time better while receiving real-time updates on the number of patients before their turn.

## REGISTER YOUR APPOINTMENT IN 5 EASY STEPS ON HEALTH BUDDY MOBILE APP

HealthBuddy

### STEP 1




Go to Health Buddy app and click "Register Today's Appointment". Login via SingPass.

### STEP 2


Choose your appointment of the day and click "Register".

### STEP 3

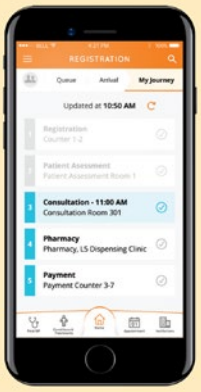

Receive your queue number and monitor the queue status 'live'.

### STEP 4


Don't Forget!

**Confirm your arrival at the clinic.** Scan your NRIC or Appointment Card at the clinic's Self Registration Kiosk.

### STEP 5




Track your appointment journey.

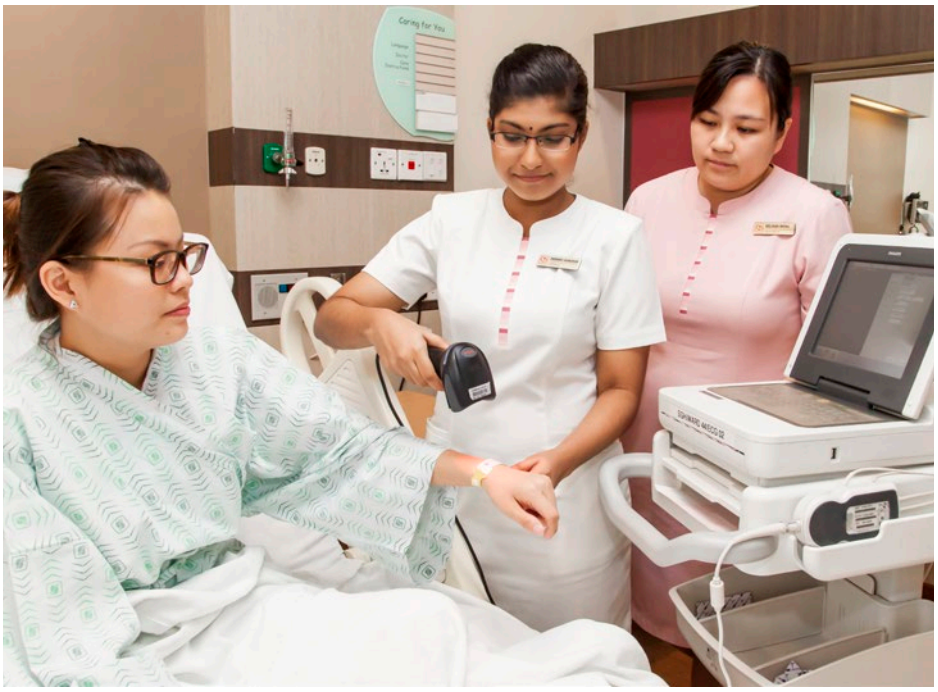
**DOWNLOAD THE HEALTH BUDDY APP ON:**

SingHealth | Download on the App Store | GET IT ON Google Play | HealthBuddy

## AUTOMATE FOR PATIENT'S SAFETY

Technology has been integral in the innovation of healthcare facilities. While state-of-the-art medical equipment and devices help us to provide optimal care to our patients, many processes are still done manually – the need to integrate and converge information across different platforms remains a challenge.

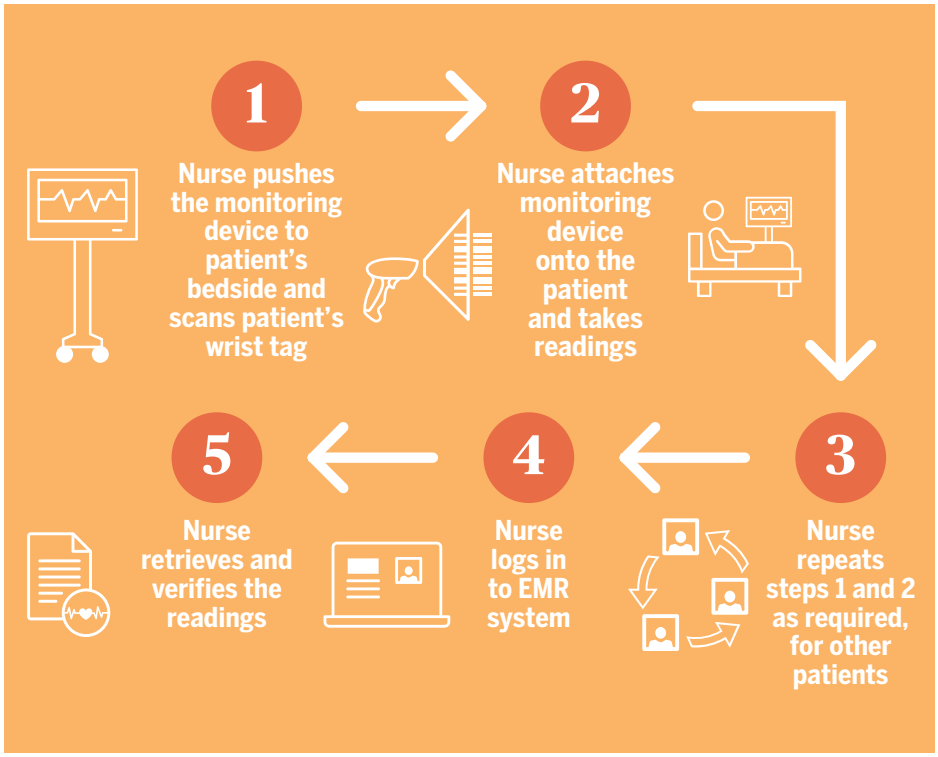
For one, patients' vital signs are often taken with various medical devices. With the Electronic Medical Records (EMR) in place, nurses are required to manually record and input readings into the EMR. Such manual processes call for time and effort as well as open up opportunities for human errors.



**One might ask if there is a way to let these devices talk to one another.**

**The Integrated Health Information Systems (IHiS) team and staff from various SingHealth institutions came together to tackle this very question, and the Medical Device Integration (MDI) solution was born.**

Using a software-based vendor-neutral solution, nurses now scan the barcode on the patient's wristband and perform a validation check against the patient's name and identification number, and the corresponding readings before confirming the data entry into the system. These steps built into the MDI solution ensure completeness and accuracy of the vital sign readings before they are interfaced with the correct patient's records in the EMR.




The communication between the numerous medical devices and the EMR is made possible through a middleware using HL7 messages (an IT programme used to transfer electronic data between different healthcare systems).

Since its implementation, the benefits have been significant, at both the operational and patient's safety fronts.

With full automation, manual processes for vital sign charting have been done away with, allowing for timely and accurate data capturing in the EMR, enhancing the care team's diagnosis and treatment.

The time saved in data transcription has also enabled nurses to spend more time on patient care.

Equally important, the validation checks built into the system have served to improve patient's safety by ensuring that the right reading has been tagged to the right patient, and that the right entry has been transmitted to the EMR of which all data subsequently flow to the various medical devices in use.

**This quality improvement initiative of the MDI won the PS21 ExCEL Awards in 2015 for the Most Innovative Project/Policy (Merit Award).**

# IN SEARCH OF THE SECRET TO HAVING A HEALTHIER HEART

While there have been many studies done on cardiac ageing, there is a need to focus on how it affects the Asian population. A team of researchers is now trying to gain insights in this area.

It should come as no surprise that age is a major risk factor for cardiovascular disease. But how exactly does our cardiovascular system change as we grow older? How can we slow down these changes so that we can preserve cardiac structure and function in the elderly for as long as possible to ensure that they continue to live a reasonably good quality of life as they age?

Studies have shown that cardiac function is central to one's functional capacity and cognitive ability. An elderly person who has poor cardiac function is also more likely to experience deteriorating health with the risk of loss of mobility and independence. Against the backdrop of a rapidly ageing population and a dramatic increase in life expectancy, plans are underway for a research study to be conducted to understand how ageing affects one's heart functions.

While there have been many studies done on cardiac ageing, there is a need to focus on how it affects the Asian population; and to define and understand what it means to age healthily in Asia. Currently, no study has been carried out to understand how Asians age from midlife to old age. Gaining insight in this area will not only enable us to come up with new treatments to preserve heart function but also to move one step closer to being able to better predict the development of heart disease in healthy individuals and intervene before heart disease affects them.

**This study on cardiac ageing will leverage on the data collected from a population-based cohort of more than 63,000 adults.**

These participants were carefully selected when they were in their midlife ages of 45 years and above; and their biological blood samples were collected and kept.

Using this group of healthy individuals as a baseline cohort, the research team aims to define the key cardiac processes that occur with ageing through performing detailed heart imaging tests as well as comparative investigative studies of the blood samples collected then and now.

Dr Angela Koh, Consultant, Department of Cardiology, National Heart Centre Singapore and Principal Researcher, explains,

**"We are hopeful that the results of this study will shed new light on the workings of the human heart and how it ages. Having a comprehensive understanding of cardiac ageing – in terms of structure and function – at midlife is the first and critical step we need to take before we can make significant impact upstream on the heart health of our population. For example, targeted preventive therapies and clinical interventions can be devised to retard the ageing process for middle-aged adults. At the same time, our findings can go towards shaping the formulation of healthcare policies that promote healthy ageing in Singapore, the region and globally."**

To realise the far-reaching impact of this study, the team hopes to use the biological samples of 700 volunteers which have been collected, to perform detailed heart imaging and investigative studies of their biological samples.

*Source: Tomorrow's Medicine. Reproduced with permission.*

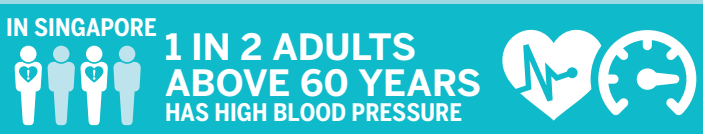
# HIGH BLOOD PRESSURE, THE SILENT KILLER

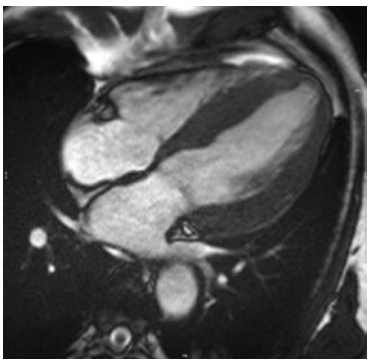
*By Asst Prof Calvin Chin*
*Consultant, Department of Cardiology, National Heart Centre Singapore*

Cardiovascular disease accounts for approximately 17 million deaths worldwide a year, of which 9.4 million are caused by complications arising from high blood pressure.

In Singapore, one in every two adults more than 60 years old has high blood pressure, and hypertension-related cardiovascular complications account for close to 4% of total deaths (ranked 6th) in 2015.

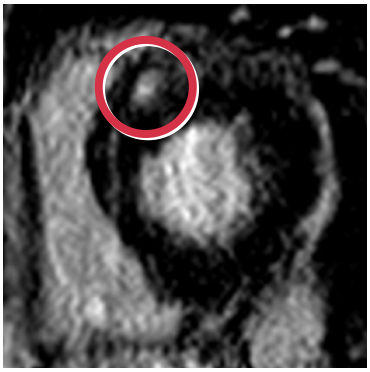
High blood pressure occurs when systolic blood pressure is persistently over 140 mmHg and diastolic blood pressure is over 90 mmHg. Whilst normal levels of blood pressure are important to maintain overall health, persistently high blood pressures are detrimental. The heart muscle thickens in the presence of increased stress from hypertension. Initially, this process is adaptive to maintain heart function. Over time, the increased stress leads to a failing heart and other complications. This transition from adaptation to decompensation is mediated by the scarring of the heart muscles due to the increased stress *(refer to images on the right)*.



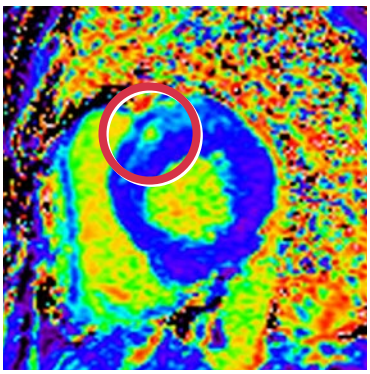



*An individual with hypertension and evidence of thickening of the heart muscles.*

## SPECIAL TECHNIQUES IN CARDIOVASCULAR MAGNETIC RESONANCE IMAGING



*Detected areas of scarring in the heart muscles (circled in red).*



In addition to the adverse effects on the heart, excessive high blood pressure can also lead to complications in the eye (which causes blindness), kidneys (which causes kidney failure requiring dialysis in advanced stage) and brains (which causes stroke). Hypertension can cause non-specific symptoms such as headaches, dizziness, chest pain and palpitations. When heart failure is present, patients would typically notice increasing breathlessness that worsens on exertion, swelling in the legs and the inability to lie flat during sleep.

**However, it is critical to be aware that most hypertensive patients do not have symptoms and this is why high blood pressure is notoriously termed the "silent killer".**

Because of its lack of associated symptoms, many hypertensive patients are frequently diagnosed from community health screening programmes or in a clinic when they see a doctor for an unrelated medical condition. If hypertension is detected early, it is possible to minimise the risk of developing hypertension-related complications. Hypertension is commonly present with other medical conditions such as diabetes, obesity and obstructive sleep apnea. Lifestyle management such as moderation in salt intake, smoking cessation and weight loss may improve one's blood pressure. If that fails, patients may require one or more medications to keep their blood pressure under control.

It is interesting to note that individuals may have different responses to hypertension. For instance, some hypertensive patients may develop heart failure while others remain well despite similar blood pressure levels or duration of disease. These heterogeneous responses to hypertension is an area which requires active research. The National Heart Centre Singapore is currently conducting a hypertension programme to identify vulnerable patients so that more aggressive treatment and monitoring may be instituted before complications develop. Individuals with hypertension who are interested to participate in the study can email ***remodel@nhcs.com.sg***.

# CONTACT US

National Heart Centre Singapore
SingHealth

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Overseas Referrals Tel **(65) 6844 9000**

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Fax **(65) 6222 9258**
Email **central.appt@nhcs.com.sg**

**GENERAL ENQUIRIES**
Tel **(65) 6704 8000**
Fax **(65) 6844 9030**
Email **nhcs@nhcs.com.sg**

## NON-INVASIVE CARDIAC IMAGING, ECHOCARDIOGRAPHY AND NUCLEAR CARDIOLOGY

NHCS has a comprehensive range of investigations to detect cardiovascular problems including the latest gamma camera technology for heart scans which reduces scanning time by 75%, and a 320-slice cardiac computed tomography (CT) scan machine which reduces radiation exposure in patients undergoing heart scans by 90%. NHCS also runs the Cardiomyopathy Clinic for patients with abnormal heart muscle.

## OUR SPECIALISTS

| | |
|---|---|
| Prof Terrance Chua Siang Jin | *Medical Director and Senior Consultant* |
| Assoc Prof Ding Zee Pin | *Senior Consultant and Advisor, Echocardiography* |
| Assoc Prof Ewe See Hooi | *Senior Consultant and Director, Echocardiography* |
| Assoc Prof Tan Ru San | *Senior Consultant and Co-Director, Cardiac Magnetic Resonance Imaging* |
| Assoc Prof Tan Swee Yaw | *Senior Consultant and Director, Cardiac Rehabilitation Unit* |
| Asst Prof Felix Keng Yung Jih | *Senior Consultant and Director, Nuclear Cardiac Imaging* |
| Asst Prof Tan Ju Le | *Senior Consultant and Director, Adult Congenital Heart Disease* |
| Assoc Prof Sahlen Anders Olof | *Senior Consultant* |
| Asst Prof Kurugulasigamoney Gunasegaran | *Senior Consultant* |
| Asst Prof Lee Chung Yin | *Senior Consultant* |
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| Asst Prof Lim Choon Pin | *Consultant* |
| Asst Prof Lim Tiong Keng | *Consultant* |
| Asst Prof See Chai Keat | *Consultant* |
| Dr Jeffrey Lau Man Chu | *Consultant* |
| Dr Lohendran Baskaran | *Consultant* |
| Dr Louis Teo Loon Yee | *Consultant* |
| Dr Nadira Binte Hamid | *Consultant* |
| Dr Go Yun Yun | *Consultant* |
| Dr Ruan Wen | *Associate Consultant* |

FOR THE FULL LIST OF NHCS SERVICES AND SPECIALISTS, PLEASE VISIT **www.nhcs.com.sg.**

# RESEARCH PUBLICATIONS

## MARCH – SEPTEMBER 2017

### MARCH 2017

**Invasive or non-invasive imaging for detecting high-risk coronary lesions?** *Expert Rev Cardiovasc Ther. 2017 Mar.*

**Stress cardiovascular magnetic resonance imaging: current and future perspectives.** *Expert Rev Cardiovasc Ther. 2017 Mar.*

**Invasive Assessment of the Coronary Microcirculation in Reperfused ST-Segment-Elevation Myocardial Infarction Patients: Where Do We Stand?** *Circ Cardiovasc Interv. 2017 Mar.*

**Age and Surgical Complexity impact on Renoprotection by Remote Ischemic Preconditioning during Adult Cardiac Surgery: A Meta analysis.** *Sci Rep. 2017 Mar.*

**Exome-wide association study reveals novel susceptibility genes to sporadic dilated cardiomyopathy** *PLoS One. 2017 Mar.*

**Antegrade Cardioplegia Decannulation Using the COR-KNOT System in Minimally Invasive Mitral Valve Surgery.** *Innovations (Phila). 2017 Mar/Apr.*

**Computational medical imaging and hemodynamics framework for functional analysis and assessment of cardiovascular structures.** *Biomed Eng Online. 2017 Mar.*

**Wenckebach pattern in right bundle branch block - benign or not.** *J Electrocardiol. 2017 Mar-Apr.*

### APRIL 2017

**Safety of optical coherence tomography in daily practice: a comparison with intravascular ultrasound.** *Eur Heart J Cardiovasc Imaging. 2017 Apr.*

**Targeting reperfusion injury in patients with ST-segment elevation myocardial infarction: trials and tribulations.** *Eur Heart J. 2017 Apr.*

**Comparison of acute expansion of bioresorbable vascular scaffolds versus metallic drug-eluting stents in different degrees of calcification: An Optical Coherence Tomography Study.** *Catheter Cardiovasc Interv. 2017 Apr.*

**Two-dimensional intraventricular flow pattern visualization using the image-based computational fluid dynamics.** *Comput Methods Biomech Biomed Engin. 2017 Apr.*

**Understanding the Epidemiology of Heart Failure to Improve Management Practices: an Asia-Pacific Perspective.** *J Card Fail. 2017 Apr.*

**Automated diagnosis of congestive heart failure using dual tree complex wavelet transform and statistical features extracted from 2s of ECG signals.** *Comput Biol Med. 2017 Apr.*

**Intraoperative Bioprosthetic Valve Dysfunction Causing Severe Mitral Regurgitation.** *Ann Thorac Surg. 2017 Apr.*

**Association Between Use of Long-Acting Nitrates and Outcomes in Heart Failure With Preserved Ejection Fraction.** *Circ Heart Fail. 2017 Apr.*

**Vericiguat in patients with worsening chronic heart failure and preserved ejection fraction: results of the SOluble guanylate Cyclase stimulatoR in heArT failurE patientS with PRESERVED EF (SOCRATES-PRESERVED) study.** *Eur Heart J. 2017 Apr.*

**Asia-Pacific consensus statement on the optimal use of high-sensitivity troponin assays in acute coronary syndromes diagnosis: focus on hs-TnI.** *Heart Asia. 2017 Apr.*

**Is there a role for ischaemic conditioning in cardiac surgery.** *F1000Res. 2017 Apr.*

**Epigenomic and transcriptomic approaches in the post-genomic era: path to novel targets for diagnosis and therapy of the ischemic heart.** *Cardiovasc Res. 2017 Jun.*

**Machine Learning of Three-dimensional Right Ventricular Motion Enables Outcome Prediction in Pulmonary Hypertension: A Cardiac MR Imaging Study.** *Radiology. 2017 May.*

### MAY 2017

**Coronary Plaque Characteristics in Hemodialysis-Dependent Patients as Assessed by Optical Coherence Tomography.** *Am J Cardiol. 2017 May.*

**Cardiac Applications of PET/MR Imaging.** *Magn Reson Imaging Clin N Am. 2017 May.*

**Novel targets and future strategies for acute cardioprotection: Position Paper of the European Society of Cardiology Working Group on Cellular Biology of the Heart.** *Cardiovasc Res. 2017 May.*

**Heart Failure in Women: Risk Across a Woman's Adult Life.** *J Card Fail. 2017 May.*

**Association Between Mid-Wall Late Gadolinium Enhancement and Sudden Cardiac Death in Patients with Dilated Cardiomyopathy and Mild and Moderate Left Ventricular Systolic Dysfunction.** *Circulation. 2017 May.*

**Reply to "Circadian variation in acute myocardial infarction size: Likely involvement of the melatonin and suprachiasmatic nuclei".** *Int J Cardiol. 2017 May.*

**Utility of Post-Mortem Genetic Testing in Cases of Sudden Arrhythmic Death Syndrome.** *J Am Coll Cardiol. 2017 May.*

**Prevalence of Healthcare-Associated Infections and Antimicrobial Use Among Adult Inpatients in Singapore Acute-Care Hospitals: Results From the First National Point Prevalence Survey.** *Clin Infect Dis. 2017 May.*

**Unified microcarrier process for human pluripotent stem cell expansion, and cardiomyocyte differentiation and purification in a 500 mL bioreactor.** *Cytotherapy Vol 19, Issue 5, Supp., May 2017.*

**Features of glycemic variations in drug naïve type 2 diabetic patients with different HbA1c values.** *Sci Rep. 2017 May.*

**Clinical Significance of Lipid-Rich Plaque Detected by Optical Coherence Tomography: A 4-Year Follow-Up Study.** *J Am Coll Cardiol. 2017 May.*

**Electronic supplementary material Identification of a Na+/K+-ATPase inhibition-independent proarrhythmic ionic mechanisms of cardiac glycosides.** *Sci Rep. 2017 May.*

**Quantifying the area-at-risk of myocardial infarction in-vivo using arterial spin labeling cardiac magnetic resonance.** *Sci Rep. 2017 May.*

**Dark blood late gadolinium enhancement: a novel technique to improve scar detection.** *Eur Heart J Cardiovasc Imaging. (2017) 18 (suppl_2).*

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**Evaluation of coronary flow conditions in complex coronary artery bifurcations stenting using computational fluid dynamics: Impact of final proximal optimization technique on different double-stent techniques.** *Cardiovasc Revasc Med. 2017 Jun.*

**A Randomized Controlled Trial of Screening, Risk Modification and Physical Therapy to Prevent Falls among the Elderly Recently Discharged from the Emergency Department to the Community: the Steps to Avoid Falls in the Elderly Study.** *Arch Phys Med Rehabil. 2017 Jun.*

**The Optimize Heart Failure Care Program: Initial lessons from global implementation.** *Int J Cardiol. 2017 Jun.*

**Combined diagnostic performance of coronary computed tomography angiography and computed tomography derived fractional flow reserve for the evaluation of myocardial ischemia: A meta-analysis.** *Int J Cardiol. 2017 Jun.*

**Utility of near-infrared spectroscopy for detection of thin-cap neoatherosclerosis.** *Eur Heart J Cardiovasc Imaging. 2017 Jun.*

**Long-Term Prognostic Value of Appropriate Myocardial Perfusion Imaging.** *Am J Cardiol. 2017 Jun.*

**Patient-reported outcomes in the SOluble guanylate Cyclase stimulatoR in heArT failurE patientS with PRESERVED ejection fraction (SOCRATES-PRESERVED) study.** *Eur J Heart Fail. 2017 Jun.*

**Patient-reported outcomes in the SOluble guanylate Cyclase stimulatoR in heArT failurE patientS with PRESERVED ejection fraction (SOCRATES-PRESERVED) study.** *Eur J Heart Fail. 2017 Jun.*

**Everolimus Eluting Bioresorbable Vascular Scaffold for Treatment of Complex Chronic Total Occlusions.** *EuroIntervention. 2017 Jun.*

**Epigenomic and transcriptomic approaches in the post-genomic era: path to novel targets for diagnosis and therapy of the ischemic heart.** *Cardiovasc Res. 2017 Jun.*

**Relative efficacy and safety of ticagelor vs clopidogrel as a function of time to invasive management in non-ST-segment elevation acute coronary syndrome in the PLATO trial.** *Clin Cardiol. 2017 Jun.*

**Significance of Ischemic Heart Disease in Patients With Heart Failure and Preserved, Midrange, and Reduced Ejection Fraction: A Nationwide Cohort Study.** *Circ Heart Fail. 2017 Jun.*

**Thymosin Beta-4 Is Elevated in Women With Heart Failure With Preserved Ejection Fraction.** *J Am Heart Assoc. 2017 Jun 13.*

**Remote magnetic catheter navigation versus conventional ablation in atrial fibrillation ablation: Fluoroscopy reduction.** *J Arrhythm. 2017 Jun.*

**Targeting of Extracellular RNA Reduces Edema Formation and Infarct Size and Improves Survival After Myocardial Infarction in Mice.** *J Am Heart Assoc. 2017 Jun.*

**The Zerox pilot study: use of zero fluoroscopy for electrophysiological intervention.** *EP Europace, Vol 19, Issue suppl_3, Jun 2017*

**Gender-differences in the associations between circulating creatine kinase, blood pressure, body mass and non-alcoholic fatty liver disease in asymptomatic asians.** *PLoS One. 2017 Jun.*

**Asia's First Minimal-Access Left Ventricular Assist Device Implantation.** *Ann Acad Med Singapore. 2017 Jun.*

### JULY 2017

**Prognostic Value of Combined CT Angiography and Myocardial Perfusion Imaging versus Invasive Coronary Angiography and Nuclear Stress Perfusion Imaging in the Prediction of Major Adverse Cardiovascular Events: The CORE320 Multicenter Study.** *Radiology. 2017 Jul.*

**Expanded clinical use of everolimus eluting bioresorbable vascular scaffolds for treatment of coronary artery disease.** *Catheter Cardiovasc Interv. 2017 Jul.*

**2017 HRS expert consensus statement on magnetic resonance imaging and radiation exposure in patients with cardiovascular implantable electronic devices.** *Heart Rhythm. 2017 Jul.*

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**Full left ventricular coverage is essential for the accurate quantification of the area-at-risk by T1 and T2 mapping.** *Sci Rep. 2017 Jul.*

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**Successful anticoagulation therapy for a giant left atrial thrombus following mitral valve repair.** *J Thorac Dis. 2017 Jul.*

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**Anaesthesia reflections for robotic assisted atrial septal defect repair: fusion of cardiothoracic skills. A single centre experience, 'Singapore Way'. Scandinavian Society of Anesthesiology and Intensive Care Medicine 34th Congress.** *Acta Anaesthesiol. Scand., 2017 Aug.*

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**How to stomach an epigenetic insult: the gastric cancer epigenome.** *Nat Rev Gastroenterol Hepatol. 2017 Aug.*

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**Quality of Care of the Initial Patient Cohort of the Diabetes Collaborative Registry.** *J Am Heart Assoc. 2017 Aug.*

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**Incidence and impact of dialysis modality on acute coronary syndrome and death in end stage renal failure patients.** *Eur Heart J, Aug 2017.*

**Left atrial strain by cardiac magnetic resonance feature tracking is a novel diagnostic biomarker of heart failure with preserved ejection fraction.** *Eur Heart J, Aug 2017.*

**Integrated target discovery screens identify a novel therapeutic target for cardiovascular fibrosis.** *Eur Heart J, Aug 2017.*

**T1 and T2 mapping cardiovascular magnetic resonance is not able to differentiate between infarcted and salvaged myocardium in reperfused STEMI patients** *Eur Heart J, Aug 2017.*

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### SEPTEMBER 2017

**Computed Tomography Coronary Angiography Long-term Results of Bioresorbable Vascular Scaffold in clinical practice. A BVS-Expand project.** *Eur Heart J, Aug 2017.*

**Asia's First Transapical Transcatheter Mitral Valve-in-Ring Implantation.** *Annals Academy of Medicine. Aug 2017.*

**Diagnostic Performance of T1 and T2 Mapping to Detect Intramyocardial Hemorrhage in Reperfused ST-Segment Elevation Myocardial Infarction (STEMI) Patients.** *J Magn Reson Imaging. 2017 Sep.*

**Multi-national and multi-ethnic variations in health-related quality of life in patients with chronic heart failure.** *Am Heart J. 2017 Sep.*

**Effect of Monocyte-to-Lymphocyte Ratio on Heart Failure Characteristics and Hospitalizations in a Coronary Angiography Cohort.** *Am J Cardiol. 2017 Sep.*

**Factors influencing warfarin control in Australia and Singapore.** *Thromb Res. 2017 Sep.*

**Characteristics and outcomes of medically managed patients with non-ST-segment elevation acute coronary syndromes: Insights from the multinational EPICOR Asia study.** *Int J Cardiol. 2017 Sep.*

**Targeting the myocardium in hypertensive left ventricular hypertrophy.** *Expert Rev Cardiovasc Ther. 2017 Sep.*

**Melatonin as a cardioprotective therapy following ST-segment elevation myocardial infarction: is it really promising? Reply.** *Cardiovasc Res. 2017 Sep.*

**Phenotypic and pharmacogenetic evaluation of patients with thiazide-induced hyponatremia.** *J Clin Invest. 2017 Sep.*

**Novel Index of Maladaptive Myocardial Remodeling in Hypertension.** *Circ Cardiovasc Imaging. 2017 Sep.*

**Combination Therapy to Target Reperfusion Injury After ST-Segment–Elevation Myocardial Infarction.** *Circulation. 2017 Sep.*

# HONING THE SKILLS AT THE UNIVERSITY OF CHICAGO MEDICINE

Returning recently from a one-year Clinical Cardiac Electrophysiology (EP) Health Manpower Development Programme (HMDP) Fellowship in May this year, Dr Chua Chi Ming Kelvin, Consultant, Department of Cardiology, National Heart Centre Singapore (NHCS), shares with us how life is like training at The University of Chicago Medicine, USA (UCM), one of the world's leading academic medical institutions, which also features the Arrhythmia Technology Suite, dubbed the "EP Lab of the Future".

*Dr Kelvin Chua (far right), with Dr Roderick Tung (back row, third from the left), along with the entire Electrophysiology team at The University of Chicago Medicine's newly minted Arrhythmia Technology Suite.*

## WHAT WAS THE TRAINING LIKE AT UCM?

I completed a one-year fellowship in Cardiac Electrophysiology at UCM, under the mentorship of Dr Roderick Tung. This one year had been intense and filled with endless learning opportunities. A typical day for me would mean waking up around 4.30am, trying to catch the 5am train, reaching the hospital by 6am, reviewing the post- and pre-procedural patients, preparing for daily conferences at 7am, and starting procedures at 8.30am. There were only two of us – my co-fellow and me during the fellowship year – we had to be on the pager every alternate week. Hence, we had to juggle the inpatient consultation service, procedural cases and clinics, and this often meant leaving the hospital as late as 8pm, clocking in a more-than-12-hour day. Being on call also meant travelling back to the hospital after office hours whenever patients required electrophysiology consultations or device interrogations. Indeed, life was tough but exciting during that period.

## HOW HAS THE OVERSEAS EXPERIENCE HELPED YOU?

As my mentor is renowned for performing complex arrhythmia ablation procedures, we were often referred patients who had prior failed ablations. A large proportion of these patients had complex ventricular arrhythmias requiring a combined endocardial and epicardial approach in order to achieve success. In addition, some of these patients had arrhythmias that were haemodynamically poorly tolerated. Through strong collaboration with our interventional cardiology colleagues who inserted percutaneous left ventricular assist devices such as the Impella device, we were able to support these patients while they were having their arrhythmias, allowing us to investigate the mechanisms of these arrhythmias to optimise targets for ablation. We also collaborated extensively with our cardiothoracic team and established a robotic hybrid ablation procedure where we could tackle atrial fibrillation from the epicardium surgically and the endocardium using electrophysiology catheters. Our team was also the first to describe the ablation of ventricular ectopics from the left ventricular summit region through the assistance of the Da Vinci robotic system. This is a region where ventricular ectopics are notoriously difficult to reach endocardially using electrophysiology catheters yet we were able to adopt a minimally invasive surgical approach to tackle this issue. All these experiences have honed my clinical and technical skills considerably to approach the treatment of complex arrhythmias.

## WHAT WOULD BE THE MOST CHALLENGING SITUATION YOU HAVE ENCOUNTERED AND HOW DID YOU OVERCOME IT?

The most challenging part of my fellowship was having to shuttle back and forth from the hospital after office hours, which was physically draining. The hospital was not situated in a central location that is easily accessible and thus commuting even with driving often took at least 30 to 40 minutes. There was once I was called back to deactivate a device for a patient going for a heart transplant. It was the day after the Presidential Election – the whole city was filled with protestors and many areas were cordoned off with road blocks. I took a wrong turn and ended up on a street full of protestors who stopped my car, laid on the road in front of my car to stop me from moving, and questioned my election vote. I had to show them my badge and yelled that I had a medical emergency to attend to before they would let me pass. It was quite an experience!

The most memorable part of my training was performing live cases during Heart Rhythm Scientific Sessions, which was one of our Electrophysiology (EP) Society's biggest meetings. I was tasked as the main operator for one of the cases, working with UCM's renowned robotic surgeon, Dr Husam Balkhy. It was indeed a great honour to be showcasing our expertise to the entire EP community there.

*Dr Roderick Tung (middle), Dr Kelvin Chua and co-fellow Dr Andrew Beaser (both at the back row) letting their hair down with fellow EP Society comrades at a party.*

# JOIN US!

## ART FOR HEARTS EXHIBITION

Art has the power to heal, connect and transform people and their environment.

For the second year running, the National Heart Centre Singapore (NHCS) building is transformed into a gallery space. Showcasing exclusive art pieces such as paintings and sculptures, some of these amazing works come from NHCS' patients. The touch of colour adds vibrancy to the clinic areas and walkways, and injects an air of positivity to the surroundings.

*Art for Hearts* aims to help soothe the patients' minds and cultivate a healing, uplifting environment for both patients and healthcare staff.

DATE:
**Until 30 Nov 2017**

VENUE:
**NHCS Levels 2, 4 & 5**
**5 Hospital Drive**
**Singapore 169609**

**FREE ADMISSION.** For more information, please contact **Ms Veronica Khoo** at **6704 2384** / **development@nhcs.com.sg**.

# APPOINTMENTS AND PROMOTIONS

**ASST PROF TAN TEING EE**
Head and Senior Consultant, Department of Cardiothoracic Surgery
*Subspecialty interest: Cardiac Surgery (Adult), Heart/Lung Transplant, Mechanical Heart Assist Device, Robotic Surgery*

**ASST PROF LIM SEE LIM**
Deputy Head and Senior Consultant, Department of Cardiothoracic Surgery
*Subspecialty interest: Cardiac Surgery (Adult)*

**DR CHIN CHEE YANG**
Consultant, Department of Cardiology
*Subspecialty interest: Interventional Cardiology*

**DR LAU MAN CHUN JEFFREY**
Consultant, Department of Cardiology
*Subspecialty interest: Echocardiography*

**DR LIM CHUN YIH PAUL**
Consultant, Department of Cardiology
*Subspecialty interest: Electrophysiology, Pacing*

**DR LOHENDRAN BASKARAN**
Consultant, Department of Cardiology
*Subspecialty interest: Nuclear Cardiology*

**DR TEO LOON YEE (LOUIS)**
Consultant, Department of Cardiology
*Subspecialty interest: Heart Failure, Echocardiography*

**DR HO JIEN SZE**
Associate Consultant, Department of Cardiology

**DR FOO JIE SHENG**
Associate Consultant, Department of Cardiology

**DR LOH XINGYUAN JULIAN KENRICK**
Associate Consultant, Department of Cardiology

**DR MOHAMMED RIZWAN AMANULLAH**
Associate Consultant, Department of Cardiology

**DR NG CHOON TA**
Associate Consultant, Department of Cardiology

**DR YAP JIUNN LIANG JONATHAN**
Associate Consultant, Department of Cardiology

## APPOINTMENT WITH DUKE-NUS MEDICAL SCHOOL

**ASSOC PROF SAHLEN ANDERS OLOF**
Adjunct Associate Professor, Department of Cardiology

**ADVISORS**
Prof Terrance Chua
Prof Koh Tian Hai

**MEDICAL EDITOR**
Asst Prof Victor Chao

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