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NOT JUST A FANCY FITNESS TRACKER WEARABLE SENSORS HELP PREDICT HEART PROBLEMS



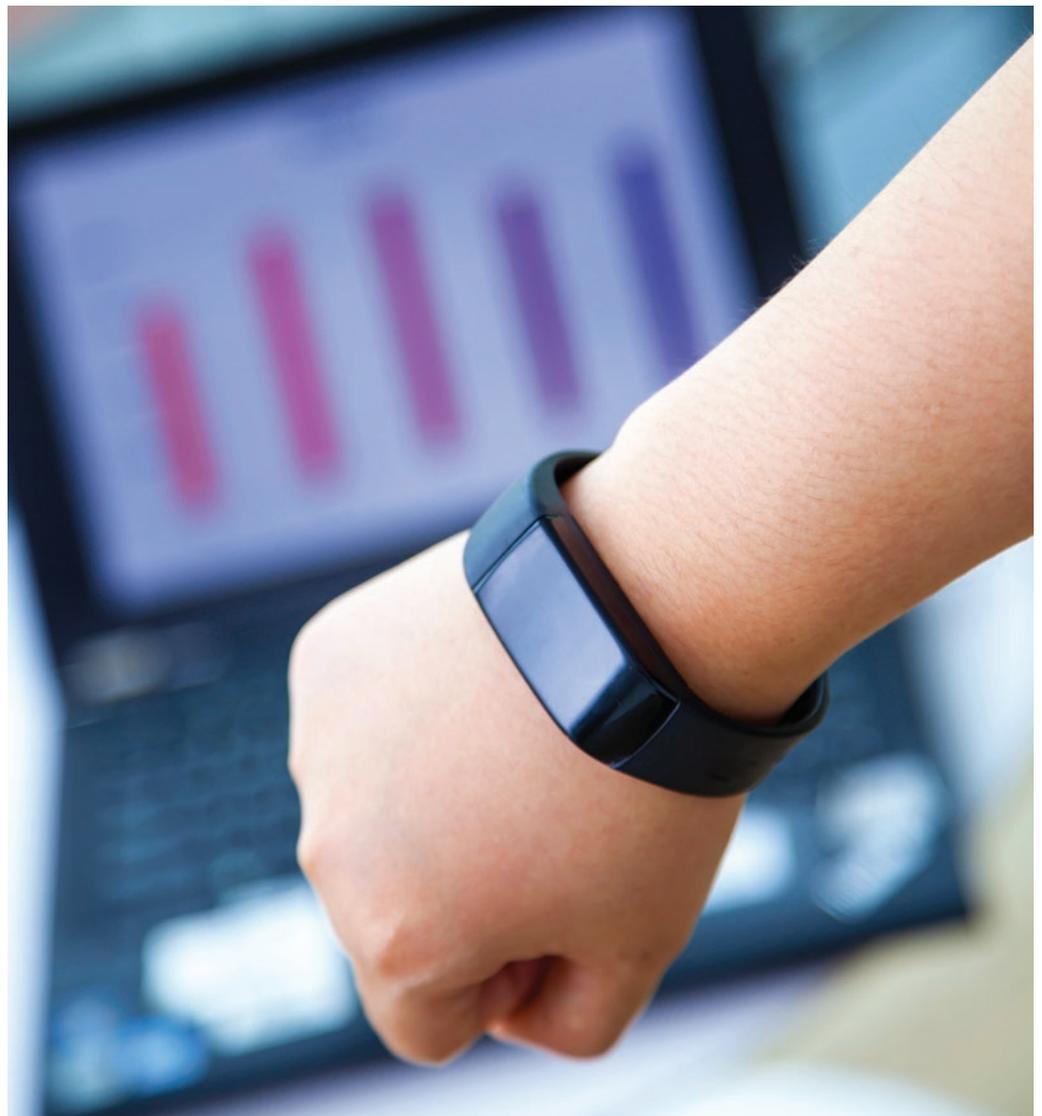
BREATH OF HOPE –
LUNG TRANSPLANTATION



NEW INDEX DETECTS RISK
OF HEART FAILURE IN
HYPERTENSIVE PATIENTS



BRINGING CARDIOLOGY
SPECIALTY CLOSER
TO HOMES



NOT JUST A FANCY FITNESS TRACKER – WEARABLE SENSORS HELP PREDICT HEART PROBLEMS

Research team from the SingHealth Duke-NUS Institute of Precision Medicine (PRISM) and National Heart Centre Singapore (NHCS) found that wearable sensors are not just useful for personal fitness tracking, but can also enhance biomedical research and may help predict cardiovascular and metabolic diseases.

With a more health-conscious population, coupled with advancements in medical and digital technologies – it is no wonder that wearable sensors such as fitness trackers and smartwatches are becoming common. Some even consider them as trending ‘fashionables’. Most often used for tracking physical activities, some wearable sensors can even track calories burnt, sleeping patterns and heart rate, thus keeping tabs on one’s general health and wellness.

APART FROM FITNESS TRACKING, HOW ELSE CAN THE DATA FROM THESE WEARABLE SENSORS BE USED?

233 volunteers were subjected to a series of clinical tests, and activity trackers were used to monitor their activities and heart rates. Results showed that apart from wearable sensors being able to identify groups of volunteers with distinct behavioural characteristics, data collected on heart rate (at rest) were notably found to be associated with risks of cardiovascular and metabolic diseases. Resting heart rate was evaluated against risk markers such as high body mass index (BMI), high waist circumference, and high total cholesterol, among others, and proved to be a better performer at predicting one’s risk of developing a cardiovascular and metabolic disease as compared to activity data.



Notably, it was also found that wearable activity data could be used to identify active individuals at increased risk of having enlarged hearts, a condition also known as “athlete’s heart”.

This was commonly thought to only affect competitive athletes whereby the heart enlarges to cope with the increased demand for oxygen intake during exercise. The activity data from wearables may help us to identify individuals who are more likely to have this condition due to exercise, as such patients have a higher chance of being misdiagnosed as having underlying heart disease in the clinic.



Volunteers were issued a wearable activity tracker (Fitbit HR Charge) to be worn over a course of five days for the study.



The study also showed that activity data from wearable sensors can predict circulating levels of lipids known as ceramides, which have been associated with obesity, diabetes and heart disease. Physically active volunteers have been

found to have lower levels of circulating ceramides as compared to their sedentary counterparts.

Drawing such a correlation is only possible if the researchers studying the interaction between lifestyle and lipid metabolism have relied on comprehensive questionnaires or expensive experimental studies.

The study has shown how activity data could help define risk markers for cardiovascular and metabolic diseases. Since activity data is readily available with wearable technologies, future studies could even be conducted using wearable sensor data donated by the public.

“ Assoc Prof Yeo Khung Keong, Senior Consultant at NHCS’ Department of Cardiology said, “Our study suggests that wearable sensors may in the future play a role in aiding the diagnosis of heart conditions. We hope to expand this further. In the coming years, the team plans to further examine wearable sensor data in cohorts of patients with heart diseases.”

The study’s findings have been published in the journal PLOS Biology <http://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.2004285>. Funding for the study was provided by SingHealth, Duke-NUS Medical School, NHCS, Singapore National Medical Research Council, the Lee Foundation and the Tanoto Foundation.

FIVE DISTINCT MULTIMORBIDITY GROUPS IDENTIFIED AMONG ASIANS WITH HEART FAILURE

Study found that comorbidities among Asian patients with heart failure naturally clustered in five distinct groups, namely elderly/atrial fibrillation (old, more atrial fibrillation), metabolic (obese, diabetic, hypertensive), young (younger, low prevalence of comorbidities), ischaemic (ischaemic etiology), and lean diabetic (diabetic, low prevalence of obesity).



Heat failure is a condition in which the heart loses the ability to pump enough blood to the body's tissues. Multimorbidity, or multiple comorbidity (more than one illness or disease occurring in one person at the same time), or multiple chronic conditions, is common in patients with heart failure especially in Asia, where almost two-thirds of patients with heart failure were found to have multimorbidity. Multimorbidity can impede survival and complicate the diagnosis, treatment, and outcomes of patients with heart failure and yet, previous studies have only investigated single comorbidity in isolation.

The study, led by Dr Jasper Tromp, Research Fellow from the National Heart Research Institution Singapore (NHRIS), analysed data on 6,480 patients with chronic heart failure from across 11 Asian regions (Hong Kong, Taiwan, China, Japan, Korea, India, Malaysia, Thailand, Singapore, Indonesia, and the Philippines), and identified patterns of multimorbidity among the patients and their association with the patients' quality of life and health outcomes. Five multimorbidity groups were identified (refer to concept figure below) with distinct geographic distributions across Asia.

From the data, the median number of comorbidities was three, and 81% of the patients had two or more comorbidities in addition to heart failure. Among all comorbidities, hypertension was the most common, followed by coronary artery disease and chronic kidney disease.

Most noteworthy in the study was the prominence of the lean diabetic group in Southeast Asia, particularly Singapore and Malaysia. The lean diabetic group consisted of patients of intermediate age (mean age 66.1 years) with a strikingly high prevalence of diabetes despite a low prevalence of obesity. They also had high prevalence of hypertension, chronic kidney disease, anaemia, and coronary artery disease. These patients were commonly of Malay ethnicity and from high-income regions. These also appeared to be the sickest patients, had the worst quality of life with the worst signs and symptoms of heart failure and frequent history of hospitalisation for heart failure.

The data on the lean diabetic group in Southeast Asia came as a surprise, given the rise in obesity from the region with rapidly growing population. Previous studies have shown that the prevalence of diabetes is increasing among Asian individuals and that diabetes occurs on average at a far lower BMI. The high proportion of chronic kidney disease in these patients potentially attributed to their worst outcomes, with more than twice as many deaths or hospitalisations for heart failure compared to the young group.

"The study's findings underscore the importance of multimorbidity in patients with heart failure and the need for more comprehensive approaches in phenotyping patients with heart failure and multimorbidity," said Dr Tromp.

The study used latent class analysis to identify multimorbidity patterns and assessed differences in quality of life using the Kansas City Cardiomyopathy Questionnaire.

ELDERLY/AF	METABOLIC	YOUNG	ISCHAEMIC	LEAN DIABETIC
HONG KONG JAPAN KOREA	MALAYSIA PHILIPPINES SINGAPORE TAIWAN	CHINA INDIA JAPAN KOREA THAILAND	INDIA INDONESIA MALAYSIA	HONG KONG MALAYSIA SINGAPORE
CHARACTERISTICS <ul style="list-style-type: none"> Oldest with highest prevalence of AF and stroke More often with HFpEF Concentric remodelling 	CHARACTERISTICS <ul style="list-style-type: none"> High prevalence of obesity, hypertension and diabetes More often with HFpEF Concentric remodelling 	CHARACTERISTICS <ul style="list-style-type: none"> Few comorbidities More often with HFrEF Eccentric hypertrophy Best outcomes Best effect of medication 	CHARACTERISTICS <ul style="list-style-type: none"> Male patients with CAD and ischaemic aetiology of HF More often with HFrEF Eccentric hypertrophy Second worst outcomes 	CHARACTERISTICS <ul style="list-style-type: none"> Most often diabetic with low BMI More often with HFpEF Concentric hypertrophy Worst outcomes and quality of life

The above table is a summary of the distribution of multimorbidity groups by region and the study findings. AF=Atrial Fibrillation; BMI=Body Mass Index; CAD=Coronary Artery Disease; HF=Heart Failure; HFpEF=Heart Failure with preserved Ejection Fraction; HFrEF=Heart Failure with reduced Ejection Fraction.



NHCS STANDS PROUD, EARNS RECOGNITION

NHCS was off to a good start on its 20th birthday, receiving several awards at the Singapore Health Quality Service Awards (SHQSA) 2018 and Singapore Cardiac Society (SCS)'s 30th Annual Scientific Meeting (ASM).



The SHQSA 2018 saw NHCS walked away with 1 Superstar Award, 20 Star Awards, 29 Gold Awards, 67 Silver Awards and 2 Team Merit Awards.

SHQSA 2018



SHQSA is a nationwide platform that honours healthcare professionals who have demonstrated remarkable commitment in delivering quality care and excellence service. Organised by the SingHealth Duke-NUS Academic Medical Centre since 2011, participating organisations include public healthcare institutions, community hospitals, agencies from the intermediate and long-term care sector and private healthcare institutions. SHQSA 2018 saw a total of 117 award winners from NHCS, with one Superstar Award conferred to Sister Tina Teo, Senior Nurse Manager from Cardiac Catheterisation Laboratory. Being in the field for 35 years, Tina thinks that being able to make a positive impact on the lives of others is what drives her and keeps her going as a nurse.

SCS'S 30TH ASM

2018 is also an exciting year for SCS, as it held its 30th ASM at the Grand Copthorne Waterfront Hotel in April, and NHCS bagged several awards. The SCS lecture – "65 Years of Echocardiography, Past, Present and Beyond", was delivered by Assoc Prof Ding Zee Pin, Senior Consultant at the Department of Cardiology, NHCS, who is a recognised leader in the field of echocardiography. Prof Koh Tian Hai, Senior Advisor and Senior Consultant at NHCS' Department of Cardiology, was presented with the honourable SCS Lifetime Achievement Award during the event. Two of our NHCS researchers, Leng Shuang and Ris Low, also won the first two prizes of the Young Investigator's Awards with their papers.



Assoc Prof Ding presenting the SCS lecture.



Prof Koh (right) conferred the SCS Lifetime Achievement Award.



Leng Shuang (right) winning the first prize of the Young Investigator's Award with his paper "Metabolomics Perturbations Associated with Left Atrial Phasic Function by Cardiac Magnetic Resonance Feature Tracking in Asymptomatic Community-based Population".



Ris Low (right) winning the second prize of the Young Investigator's Award with her paper "Diagnostic Performance of Simplified Method for Non-invasive CT Fractional Flow Reserve Measurement Compared with Invasive FFR".

Our heartiest congratulations to all the award recipients and winners!



JOURNEYING AS ONE HEART – BEGINS FROM PATIENTS’ HOME

Year 2018 marks NHCS’s 20th anniversary with the theme “Journeying as One Heart”. Not forgetting the patients who are the key partners in our journey, the staff banded together to visit our patients and give their homes a good spruce up.

Named the “home grooming project”, more than 30 NHCS staff volunteered and gathered together on a Saturday to visit five patients’ homes, most of which were one-room rental flats. Even though it was the first time for NHCS to embark on such a project, the team worked well, splitting into different groups with each managing an area of the project – from logistics to funding. The Nursing Outreach and Wellness Council prepared goodie packs for the patients while staff, and housekeeping and maintenance contractors of NHCS, offered their expertise in cleaning, electrical and drilling works.

80-year-old Madam Yeo is one of the patients who had her home visited by the team in Bukit Ho Swee. Never had the team dreamed that the home they were responsible for would be in such a dire state – the unit was so infested with cockroaches that the pests could even be found breeding beneath the carpet flooring. In the end, the team had to find insecticide solutions and sprays to get rid of the house pests. The NHCS staff even removed the flooring to ensure that the floor stays infestation-free. It may be a tedious job but what matters most to the team was that Madam Yeo has a clean and safe environment to stay.

This may have been a one-day project but it has brought warmth to the hearts and souls of everyone involved. Inspired by the success of this initiative, plans are already underway for another round of the home grooming programme.

Indeed, the old adage from Mother Teresa ‘Let no one ever come to you without leaving happier’ rings true as staff at NHCS continue on this journey, caring for our patients at their bedside, and at their home – staff and patients beating as one heart.



Above: Prof Kenny Sin, Deputy Medical Director, together with Chief Nurse, Ms Amy Tay, of NHCS, also paid a visit to the patients’ homes to understand their living conditions, as well as to distribute lunch to the hardworking NHCS staff.



Right: Gearing up early in the morning – packing gifts and supplies before setting off.



Madam Yeo’s bedroom – before and after the cleaning.

Below: Doctor turning into a handyman to install a new bed frame for the patients.



Warmed hearts and big smiles from the teams of the NHCS’ home grooming programme.



BREATH OF HOPE – LUNG TRANSPLANTATION

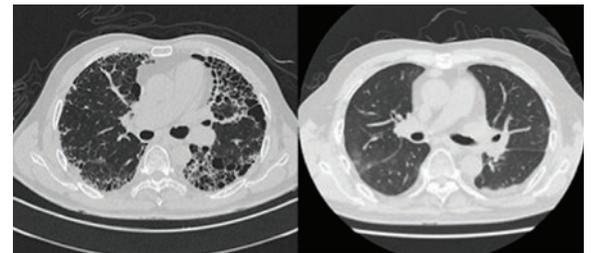
*By Dr Ong Boon Hean
Consultant, Department of Cardiothoracic Surgery
Acting Director, Lung Transplant Programme, NHCS*

Lung transplantation is often the last hope for patients with end-stage lung disease.

Our lungs play a critical role in our body, helping to extract oxygen from the air we breathe and removing carbon dioxide and other waste gases that our body does not need. When our body starts to show symptoms like shortness of breath, wheezing, chronic cough, chronic chest pain and coughing up blood, they may be warning signs that our lungs are having difficulty performing their normal functions. For people with severe, symptomatic and progressive lung disease that is refractory to conventional therapy, sometimes, a life-saving lung transplant may be their only hope.

Lung transplantation is an effective treatment for patients with end-stage lung disease – a condition where the lungs are so diseased that they can no longer perform their normal function to obtain sufficient oxygen for the body. Due to breathing difficulties, pre-lung transplant patients often have severe limitations in their activities of daily living, and they are also frequently admitted into the hospital for exacerbations of their underlying lung disease. During the lung transplant operation, the failing lung of a patient with advanced lung disease is replaced with a healthy lung from a recently deceased, brain-dead donor. However, though rare, part of a lung can be taken from a living person for lung transplantation. Patients with successful lung transplantation can expect to have an improved quality of life and increased long-term survival. They are able to return to a normal life, exercise, work and travel after a period of recovery from their operation, without many of the previous restrictions.

NHCS is the only institution in Singapore that performs lung transplantation. A total of 13 lung transplants have been done since the inception of the lung transplantation programme in 2000. Most of the transplants were carried out for patients with chronic obstructive pulmonary disease (COPD) (54%) or interstitial lung disease (36%). NHCS' clinical outcomes for lung transplant recipients are comparable with those reported internationally, with one-year survival rate of 83.3% and five-year survival of 50% for the period of 2006 to 2016. These figures have improved over the years and the outlook is expected to improve further with advances in lung transplantation. However, the average time on the waiting list is 1.2 years, as there is generally a low consent rate for lung donation. Lung donation is not covered by the Human Organ Transplant Act (HOTA), unlike the cornea, kidneys, liver and heart. Thus, if the deceased donor had not given his or her consent to donate his or her lungs, or other organs, prior to his or her demise, or there was no consent from the relatives after the declaration of the donor's brain death, the lung or other organs cannot be recovered for the purpose of transplantation.



A computed tomography (CT) scan of a patient's chest with underlying idiopathic pulmonary fibrosis pre-lung transplantation (left) and post-lung transplantation (right).



ARE YOU SUITABLE FOR A LUNG TRANSPLANTATION?

Our multi-disciplinary team of pulmonologists, thoracic surgeons, clinical coordinators, psychiatrists, dietitians, physiotherapists and medical social workers will meet each referred patient and review his or her medical records to determine the suitability for lung transplantation. If the patient is found to be a suitable transplant recipient, a comprehensive pre-transplantation work-up consisting of blood, sputum and urine tests, chest x-ray, CT scans, bone mineral densitometry, radionuclide studies, lung function testing, echocardiogram as well as cardiac catheterisation, will be performed.

Following the evaluation, if the patient meets all the qualifying criteria for lung transplantation, he or she will be placed on a waiting list for the transplant. If a suitable donor is found, the patient will undergo the transplant operation to have either one (single lung transplantation) or both (bilateral lung transplantation) lungs replaced.



LUNG TRANSPLANT REFERRAL CRITERIA

Patients are considered potential candidates for lung transplantation if they have severe, symptomatic and progressive lung disease that is refractory to conventional therapy, with an estimated life expectancy of less than 18 months despite optimal medical therapy.



INDICATIONS FOR LUNG TRANSPLANT REFERRAL

1. **Severe, irreversible, progressive lung disease**
 - a. Severe COPD with chronic respiratory failure and deteriorating clinical course
 - b. Idiopathic pulmonary fibrosis, or other end-stage fibrotic lung disease
 - c. Bronchiectasis with chronic respiratory failure and deteriorating clinical course
 - d. Pulmonary arterial hypertension, NYHA class III/IV with progressive disease
 - e. Other end-stage lung disease*
2. **Symptomatic, poor quality-of-life and oxygen-dependent**
3. **Limited life expectancy – high risk of death from lung disease in the next two to three years**
4. **Age of 65 years old and below**
5. **Satisfactory motivation, psychosocial profile and support system**



CONTRAINDICATIONS FOR LUNG TRANSPLANT REFERRAL

1. **Active smokers**
2. **Cancer**
3. **Non-compliance to medical treatment or pulmonary rehabilitation**
4. **Other significant medical condition or organ dysfunction (cardiac, renal, liver, brain)***
5. **Extreme debilitation***

*Transplant physicians will assess on a case-by-case basis.

For more information on the NHCS lung transplant programme or should you wish to refer a patient for consideration for lung transplantation, please contact:

Clinical Coordinator
**Mechanical Circulatory Support,
 Heart and Lung Transplant Unit**
 National Heart Centre Singapore
 5 Hospital Drive, Singapore 169609

Tel: **6704 8130**
 Email: **transplant.office@nhcs.com.sg**

CONTACT US



GP FAST-TRACK APPOINTMENT

Local Referrals Tel **(65) 6704 2222**
 Overseas Referrals Tel **(65) 6844 9000**

NHCS CALL CENTRE

Tel **(65) 6704 2000**
 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**

CARDIOTHORACIC SURGERY

NHCS' Department of Cardiothoracic Surgery specialises in diagnosing and treating disorders of the heart, lung and chest surgically. Cardiovascular surgery includes valve repair and replacement, coronary artery bypass graft surgery, aortic aneurysm repairs, peripheral vascular surgery, mechanical heart assist device implantation, and heart and lung transplantation. The thoracic surgery team also specialises in diagnosing and providing surgical care to patients with disease of the lungs, trachea, oesophagus, chest wall and mediastinum.

OUR SPECIALISTS

Assoc Prof Kenny Sin Yoong Kong	<i>Deputy Medical Director and Senior Consultant</i>
Asst Prof Tan Teing Ee	<i>Head and Senior Consultant Director, Quality Management Director, Medical Informatics Co-Director, Heart Transplantation & Mechanical Assist Device Programme Deputy Head and Senior Consultant</i>
Asst Prof Lim See Lim	<i>Senior Consultant</i>
Assoc Prof Chua Yeow Leng	<i>Director, Operating Theatres Senior Consultant</i>
Assoc Prof Soon Jia Lin	<i>Senior Consultant</i>
Asst Prof Victor Chao Tar Toong	<i>Senior Consultant Director, Vascular Laboratory</i>
Dr Naik Madhava Janardhan	<i>Senior Consultant</i>
Dr Mathew Chakaramakkil Jose	<i>Consultant Acting Director, Cardiothoracic Surgery Intensive Care Unit</i>
Dr Ong Boon Hean	<i>Consultant Acting Director, Lung Transplant Programme</i>
Dr Chua Kim Chai	<i>Associate Consultant</i>
Dr Philip Pang Yi Kit	<i>Associate Consultant</i>
Dr Soo Ing Xiang	<i>Associate Consultant</i>
Dr Kang Ning	<i>Associate Consultant</i>

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

NEW INDEX DETECTS RISK OF HEART FAILURE IN HYPERTENSIVE PATIENTS

Researchers from NHCS developed a novel Remodelling Index (RI) that is a potentially more accurate marker to identify and risk-stratify hypertensive patients who are at increased risk of developing heart failure.



Hypertension or high blood pressure refers to the condition in which the blood is pumped around the body at too high a pressure. This causes the thickening of the heart muscles (or left ventricular hypertrophy) that is associated with cardiovascular complications such as heart failure, coronary heart disease, heart attack and stroke. The thickening of the heart muscle is initially adaptive, but with time the left ventricle decompensates and ultimately, heart failure ensues.

In Singapore, hypertension is a fairly common problem. Almost one in every four Singaporeans aged 30 to 69 years has hypertension. The older you are, the more likely you would have hypertension. In the 60 to 69 years age group, one in every two Singaporeans has hypertension. Individuals may also have different responses to hypertension – one may develop heart failure while the other remains well, despite both sharing similar blood pressure profiles. To make matters worse, hypertension is difficult to spot because most patients do not have any symptom. Currently, the diagnosis and management of hypertension rely primarily on the accurate measurement of peripheral blood pressure, which sometimes can be unreliable as factors such as the time when the blood pressure is measured, the location where the blood pressure is measured, and even the observers who are taking the blood pressure, can affect blood pressure readings and significantly affect diagnostic accuracies.

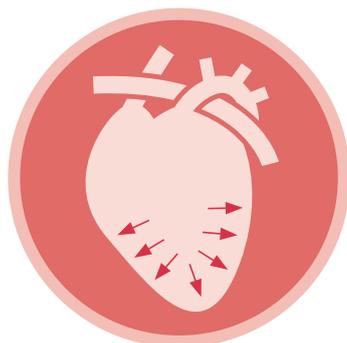
With a preliminary study of 256 patients which began in 2016, doctors now may be able to find way to identify patients with hypertension who are on the onset of developing complications, even before symptoms appear, by using a more reliable marker – the RI. More tests will also be done over a longer period of time to research on the RI.

Our heart generally responds to stress in two ways, either by increasing in volume (size), or increasing in wall thickness. The RI is thus based on the biophysical model of the heart – how the heart responds to stress – by considering both the volume and the wall thickness. The harder it is for the heart to cope with the stress, the lower the RI will be.

The study began with establishing normal RI through taking readings from 180 healthy volunteers, taking into consideration the age and gender differences, and checked against 256 hypertensive patients recruited under the programme. The hypertensive patients underwent comprehensive cardiovascular assessment including 24-hour ambulatory blood pressure, electrocardiography, echocardiography, cardiovascular magnetic resonance, and cardiac biochemical markers.

Results showed that patients with increasing hypertrophy (or heart wall thickening) were associated with progressive reduction in the RI. It was also observed that scarring in the heart muscles (or cardiac fibrosis), which is a common cause of end-stage heart failure, is present in about 15% of the patients. The RI therefore holds the potential in defining the tipping point before heart failure occurs in these patients (in other words, “risk-stratifying” them) who may potentially benefit from more timely and aggressive management or novel targeted anti-fibrotic therapies.

The RI was derived using a spherical model according to the LaPlace's Law - a principle of physics that the tension on the wall of a sphere is the product of the pressure times the radius of the chamber and the tension is inversely related to the thickness of the wall.



LaPlace's Wall Stress = Pressure x

Dilation
Hypertrophy

Remodelling Index (RI)

“The ultimate aim is to establish the Remodelling Index as a good marker to monitor the progression of the disease and the patient’s response to treatment, so that personalised treatment can be given to our hypertensive patients. This is an active area of future research,” said Asst Prof Calvin Chin, Consultant, Department of Cardiology, NHCS, and lead investigator of the study.

BRINGING CARDIOLOGY SPECIALTY CLOSER TO HOMES

NHCS has collaborated with Sengkang General Hospital (SKH) to set up a cardiology specialty clinic within SKH, which is slated to open in the second half of 2018.



Sengkang General Hospital is slated to open in second half of 2018. (Photo courtesy of SKH.)

The cardiology specialty clinic will be helmed by a team of cardiologists and staff from NHCS, so patients can be assured of consistent level of care similar to what they receive at NHCS, at the clinic at SKH. The hospital is located next to Cheng Lim LRT station and close to Sengkang MRT station.

Comprising a strong multi-disciplinary team of medical, nursing and allied health professionals, the clinic will offer a comprehensive range of services in the diagnosis and management of heart disease. Patients living in north-east who are referred by their family physicians or polyclinics for management of heart-related disease will be seen at this specialty clinic.

Asst Prof Jack Tan, who is the Deputy Head and Senior Consultant at Department of Cardiology, and Director of the Coronary Care Unit at NHCS, will be leading the team at SKH. The subspecialties such as echocardiography, interventional cardiology, electrophysiology, heart failure and cardiac rehabilitation, will be provided at the new clinic.

“We are bringing the same level of expertise from NHCS to SKH, so patients living around the north-east parts of the island would not have to travel far for specialised cardiac care,” said Asst Prof Tan.

Apart from collaborating with NHCS, SKH will also be working with other national specialty centres to provide specialised services for multiple disciplines at SKH for the convenience of the residents in the north-east region of Singapore.

NHCS CARDIOLOGY @SKH [opening in second half of 2018]

Sengkang General Hospital

Opening Hours: Monday to Friday, 8.30am to 5pm

OUR SERVICES

■ Non-invasive diagnostic tests:

- Electrocardiography (ECG)
- Ambulatory ECG (Holter)
- Telemetry
- Ambulatory BP monitoring
- Treadmill stress testing
- Tilt-table testing
- Echocardiography (including transthoracic, transoesophageal and stress echocardiography)
- Nuclear stress testing
- Pacemaker interrogation

■ Invasive diagnostic cardiac investigations

■ Procedures

- Temporary and permanent pacemaker insertions
- Automatic Defibrillator insertions
- Intra-aortic balloon pump (IABP) insertion
- Emergency percutaneous transluminal coronary angioplasty (PTCA)

DEPARTMENT FACILITIES

■ Outpatient Clinic

■ Cardiac Laboratory

■ Inpatient wards including a Coronary Care Unit, High Dependency Unit and General Ward with monitored telemetry beds

The NHCS Cardiology @SKH team, led by Asst Prof Jack Tan (first row, second from the left), will be running the specialty clinic at SKH.





RESEARCH PUBLICATIONS

DECEMBER 2017 – APRIL 2018

DECEMBER 2017

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HEART & SOLE

Challenge — 29 JULY 2018

Active lifestyle is important in heart disease prevention and management. Join the NHCS Heart and Sole Challenge fun walk and race, and learn more about heart disease through the challenging and educational activities along the walk/race routes, and at the bazaar and exhibition.



RACE

FUN WALK

BAZAAR



RACE CATEGORY - Challenge your wit and grit

The **5km** Competitive Race category requires participants to form a team of 5 and complete mental and physical challenges along the race route to accumulate game points. Top 5 teams with the highest points will walk away with attractive prizes.

Minimum age: 16 years old (as of 1 January 2018)



FUN WALK CATEGORY

In the **5km** Fun Walk category, participants will visit various stations along the route to exercise and at the same time, learn about heart disease and active lifestyle.



REGISTER ONLINE

<http://www.nhcs.com.sg/nhcsheartandsole>



Location
SAFRA PUNGGOL
9 SENTUL CRESCENT,
SINGAPORE 828654

For more enquiries, please email nhcsheartandsole@nhcs.com.sg or call 6704-2389/2382 (Mondays to Fridays, 9am to 5pm).

	Registration Fees	Registration Time	Flag Off Time
Race Category	\$160 per team of 5	6.15am	7.30am
Fun Walk Category			
<i>Adult (above 12 years old)</i>	\$35 per person	7.30am	8.30am
<i>Child (12 years old and below)</i>	Free of charge		
<i>Group of 4 Adults</i>	\$130 per group of 4		

Prize Presentation and goodie bag collection: 10.00am

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12TH CARDIOVASCULAR UPDATE 2018

FOR PHYSICIANS, GPs, NURSES AND DOCTORS-IN-TRAINING

Given the enormous amount of new knowledge generated in each subspecialty of cardiology every year, there is a need to keep being updated on the latest advances in cardiovascular medicine. This course updates medical practitioners with a summary of the newly generated information relevant to general cardiology practice. This year, we have invited two guest speakers from Duke Health to share with us their knowledge in cardiology.

DATE: 14 – 15 July 2018

VENUE: Lecture Theatre, Level 7, National Heart Centre Singapore, 5 Hospital Drive, Singapore 169609

REGISTRATION FEES (prices are inclusive of GST):

1-DAY PASS (for those attending ONLY the Saturday programme)

- Physicians / GPs SGD150 nett
- Nurses / Doctors-in-Training SGD80 nett

2-DAYS PASS

- Physicians / GPs SGD200 nett
- Nurses / Doctors-in-Training SGD100 nett

APPOINTMENTS AND PROMOTIONS



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Chief Nurse, Nursing



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*Subspecialty interests:
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