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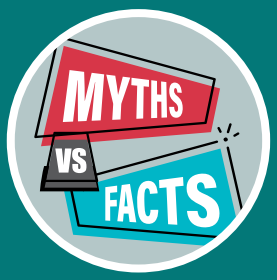
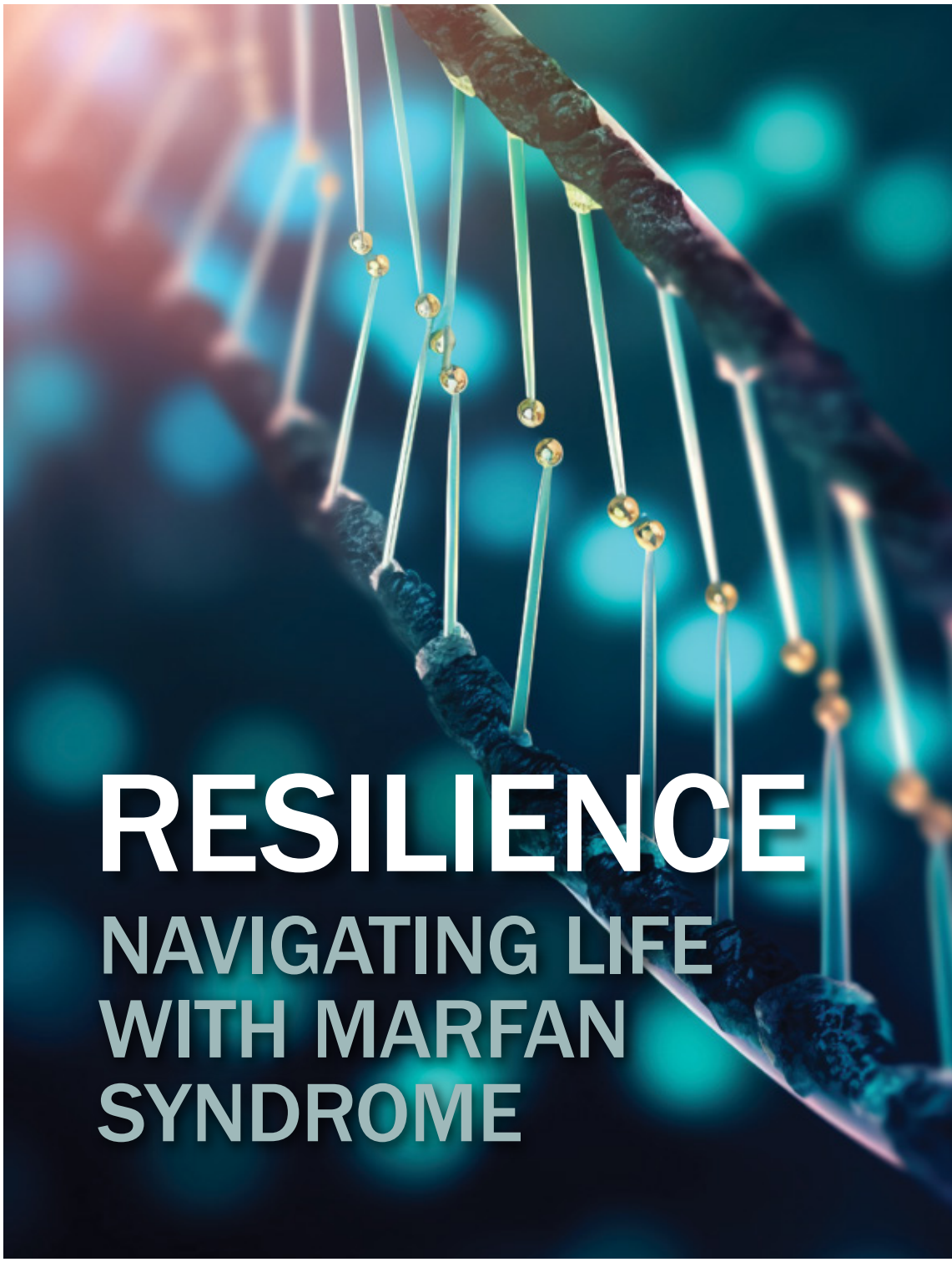


BUSTING ATRIAL FIBRILLATION MYTHS FOR HEART HEALTH

A DOUBLE FEAT: MINIMALLY INVASIVE DOUBLE VALVE SURGERY

THE BURDEN AND RISK OF CARDIOVASCULAR DISEASE



RESILIENCE

NAVIGATING LIFE WITH MARFAN SYNDROME

RESILIENCE

NAVIGATING LIFE WITH MARFAN SYNDROME

At just seven years old, Revathi felt a difference that set her apart from her peers. While playing with kids her age, she often found herself short of breath, needing breaks more frequently than others. Little did she know that this was just the beginning of a life journey intertwined with the complexities of Marfan syndrome - an inherited congenital disorder affecting the connective tissues of the heart and great vessels (the large vessels and veins that are directly connected with the heart), eyes, bones, and other organs. Her story, filled with childhood curiosity and unexpected challenges, revealed how she faced life's obstacles with unwavering strength.

The beginning of challenges and a series of procedures

Revathi's early years were a mix of confusion and fear. Her troubles surfaced when teachers observed her consistent struggles in reading words from the classroom board. A subsequent check-up revealed a dislocated eye lens, the first sign of Marfan syndrome. This marked the start of Revathi's frequent visits to hospitals. Multiple tests later confirmed her diagnosis of Marfan syndrome, a condition largely unknown at the time due to the limited information available, especially with the internet not being common then. As Revathi's condition did not seem immediately life-threatening, her family, not fully aware of the implications, was therefore not overly concerned.

Revathi's life took a significant turn as she approached 18, when she began experiencing persistent pain in her hips and legs. Despite seeking help from a local general practitioner, her discomfort was dismissed as typical sprains, attributed by her youth. Unbeknownst to her, these were early signs of arthritis. The real turning point came at 21 when her left leg, finally unable to support her weight, start to give way, causing frequent falls and excruciating pain during walks — an alarming development that caught her off guard. Tests later revealed that she had advanced arthritis, a facet of Marfan syndrome that she had yet to fully comprehend. The condition left Revathi unable to walk, plunging her into a three-year period of wheelchair confinement. As she was deemed too young for conventional treatments, she could not opt for typical treatment for advanced arthritis – a hip replacement procedure that is commonly recommended for the elderly.

Fortunately, hope arrived with the introduction of a revolutionary implant for her legs. In 2010, Revathi underwent her first procedure for her left leg, and in 2017, she embraced another for her right leg. These treatments, though tough, were crucial in Revathi's continued journey of strength amid the challenges of Marfan syndrome.

The next few years saw Revathi addressing long-standing vision issues through a lens replacement procedure for her right eye. She is also due for a left eye lens replacement, followed by a significant open-heart surgery to correct her enlarged aorta (vessel from the heart), and a subsequent brain surgery to rectify her cerebrospinal fluid leak which is causing daily migraines. She is currently relying on heavy painkillers to cope with the pain from migraines, just to find reprieve in sleep.

Revathi's true heartbreak and toughest decision came when she found out she was pregnant, and that her heart will not be able to endure the pregnancy journey. Supported by her husband, they

Revathi and her brother are very close, often offering support for one another as both shared the same rare condition - Marfan syndrome.

made the painful decision to terminate the pregnancy. Yet, despite the painful loss and as surgeries for her eyes, heart, and brain loom on the horizon, Revathi's fight for life persists.

Finding hope in advocacy and support

When asked what gives Revathi the courage to keep on fighting, she shared, "I'm never a quitter. Life is harsh, and it's far from easy. But I remind myself to take one step at a time. I refuse to stay still, and I firmly believes there's always a silver lining at the end of it all."

Revathi also finds solace in her only brother, who was also diagnosed with Marfan syndrome. With shared fate, the siblings often confide in each other, exchanging experiences and information. They also attended support groups and find comfort through shared stories of similar plight. Emphasising the power of knowledge, Revathi believes that staying informed plays a crucial part in managing her condition.

MARFAN SYNDROME

TYPICAL DISTINCTIVE PHYSICAL CHARACTERISTICS MAY INCLUDE:

- Tall and thin body frame
- Long arms, legs, fingers and toes
- Flat feet
- Protruding or indented chest bone
- Severe short-sightedness

Marfan syndrome is caused by mutation in the FBN1 (fibrillin) gene resulting in changes in the production of fibrillin-1 and altering the structural integrity of connective tissues found in various organs throughout the body such as in the heart, great vessels, joints, eyes etc. The abnormal connective tissue in patients with Marfan syndrome cannot support normal organ or joint function resulting in joint dislocation, scoliosis, eye lens dislocation, leaky heart valves and enlarged heart vessel.

It is estimated that one in 3,000 - 5,000 people are born with Marfan syndrome worldwide. Marfan syndrome can occur in all races and affect both genders equally.

Revathi's residing doctor, Assoc Prof Tan Ju Le, Senior Consultant from the Department of Cardiology, and Director of the Adult Congenital Heart Disease (ACHD) programme, explained, "Some people may be born with Marfan syndrome, but symptoms can develop gradually over several years. The severity of symptoms of Marfan syndrome varies from person to person, even among affected family members, making the condition complicated and unpredictable."

Assoc Prof Tan further shared that among people with Marfan syndrome, about 75% of them would have inherited the genetic change from one of their parents. As some people with Marfan syndrome may have a mild form of the disorder, the parent may not have realised they have the condition. The other 25% of people who have it, arise from a new spontaneous mutation in the gene. Once a patient is diagnosed with Marfan syndrome which is an autosomal dominant condition, there is a 50% chance this can be passed to his or her offspring.

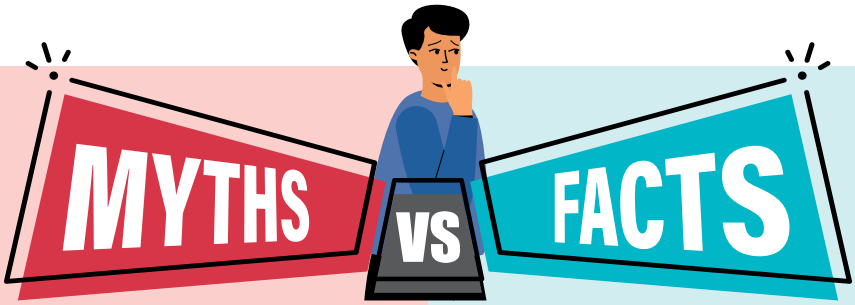
BUSTING ATRIAL FIBRILLATION MYTHS

FOR HEART HEALTH

Atrial fibrillation is an abnormal heart rhythm characterised by rapid and irregular beating of the heart. It occurs more commonly as age increases.

Atrial fibrillation is the most common abnormal heart rhythm that affects millions in the world. While it can occur in individuals of any age, it tends to be more prevalent among the elderly. Those afflicted with atrial fibrillation face a five-fold increase in risk of stroke, due to the possibility of blood clots formation within the heart. Apart from the risk of stroke, the condition also makes one's heart feel like it is racing, creating an uncomfortable and uneasy feeling. If poorly controlled, this may lead to weakening of the heart.

Despite the familiarity of atrial fibrillation as a condition, it is often accompanied by common myths and misconceptions, which can lead to unnecessary fears and confusion, and even result in delayed or inappropriate management. Let us debunk some common myths surrounding atrial fibrillation and shed light on the facts for a better understanding of this prevalent heart rhythm disorder.



"Atrial fibrillation will go away on its own and treatment is not needed."

The incidence of atrial fibrillation increases with age and in most patients, atrial fibrillation tends to be progressive. Other conditions such as high blood pressure, diabetes or stroke also occur with increasing age and are also risk factors for the development of stroke in patients with atrial fibrillation.

Thus, in the majority of patients with atrial fibrillation, treatment becomes more important with time. The main goals of treatment include reducing stroke risk with blood thinners and controlling atrial fibrillation with medication or procedures.

"I have atrial fibrillation but feel absolutely well. Hence, I am not at increased risk of stroke."

It has been estimated that 40 percent of patients with atrial fibrillation do not experience any symptoms at all and they do not know that they have atrial fibrillation. The risk of stroke is increased in atrial fibrillation regardless of whether it causes any discomfort.

In fact, a significant proportion of patients are unfortunately diagnosed with atrial fibrillation only after a stroke occurs because they were never aware of it prior.

"I can't drive or engage in physical exercise if I have atrial fibrillation."

People with atrial fibrillation can continue to drive and exercise if their condition is controlled and if they are not prone to fainting. In fact, people with atrial fibrillation should continue to exercise to maintain a healthy lifestyle.

"I can only depend on surgery or pacemakers to treat atrial fibrillation for good."

Some people are under the impression that atrial fibrillation can only be treated with surgery or pacemakers, and are hence understandably hesitant to come forward to receive treatment.

Atrial fibrillation can be managed with medication to restore a normal heart rhythm or gain control of the fast heart rates when it occurs. Blood thinners are commonly prescribed to prevent stroke.

Your doctor, however, may also recommend procedures such as catheter ablation, which has been proven to be more effective in controlling atrial fibrillation than medication alone.

"Taking blood thinners for atrial fibrillation puts me at unacceptable risk of bleeding."

It is natural to be concerned about the side effects of medication. The risk of bleeding from taking blood thinners is low with the current blood thinners available, compared to older formulations. The risk of serious bleeding is estimated to be about 1% a year.

Your doctor will recommend blood thinners if the risk of stroke outweighs the risk of bleeding. Preventing stroke is of great importance as stroke arising from atrial fibrillation tend to be more severe.

Atrial fibrillation is usually progressive and often needs lifelong therapy. Besides seeking treatment early, there are ways to manage the condition, to slow down or stop the progression. In addition to seeking treatment, other ways to help include:

- Quit smoking
- Abstain from alcohol intake or reduce it as much as possible
- Lose weight and try to achieve a healthy BMI (between 18.5 to 22.9 kg/m^2)
- Aim for good control of high blood pressure, cholesterol and diabetes if these conditions are present
- Maintain an exercise routine with 30 minutes of moderate-intensity aerobic exercise, 5 times a week and gradually increase this to 300 minutes a week.

A video version of the contents on how Dr Julian Tay, Assoc Consultant, Department of Cardiology, debunked myths on atrial fibrillation is available here:

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ELECTROPHYSIOLOGY AND PACING

NHCS has a wealth of experience in the treatment of heart arrhythmia, abnormal heart rhythm. NHCS cardiac electrophysiologists evaluate patients with recurrent fainting or near-fainting episodes, rapid heart rate, palpitations and abnormally slow heart rate.

Electrophysiology and Pacing procedures include:

- Electrophysiology study
- Pacemaker/ Lead extraction
- Permanent pacemaker, biventricular pacing and implantable cardioverter-defibrillator (ICD) implantation
- Radiofrequency ablation of atrial fibrillation and other arrhythmias

OUR SPECIALISTS

Assoc Prof Ching Chi Keong	Chief Data and Digital Officer Director of Electrophysiology and Pacing Senior Consultant
Asst Prof Daniel Chong	Senior Consultant
Asst Prof Eric Lim	Senior Consultant
Asst Prof Ho Kah Leng	Senior Consultant
Dr Teo Hooi Khee	Consultant
Dr Julian Tay	Associate Consultant
Dr Pung Xuanming	Associate Consultant

For the full list of NHCS services and specialists, please visit www.nhcs.com.sg.

A DOUBLE FEAT

MINIMALLY INVASIVE DOUBLE VALVE SURGERY

Heart valve disease is the leading cause of cardiovascular morbidity and mortality globally[1]. Common valve diseases include stenosis (valve narrows and does not open properly) of the aortic valve and the mitral valve, and tricuspid valve regurgitation (valve becomes 'leaky' and does not close properly). When one or more valves do not work properly, blood flow is affected and this will put extra strain on the heart and make it work harder.

Advances in treatments for heart valve disease

Most patients with heart valve issues typically have one or more damaged heart valves which can be managed with medication to alleviate the symptoms, or surgery to repair or replace the valves.

Traditionally, an open-heart surgery is the only option to repair or replace the damaged heart valves, which requires a long recovery period. In the last decade, advanced valve therapies such as the Transcatheter Aortic Valve Implantation (TAVI) and MitraClip, have increasingly become more common and mature in technique, offering a lifeline to patients who are at high risk for conventional surgery.

First of its kind procedure

More recently, NHCS performed its first minimally invasive double valve repair procedure, an endoscopic-assisted double valve surgery where both damaged heart valves are corrected in one procedure.

"NHCS has been providing minimally invasive valve repair and replacement via thoracotomy (small incisions) on the side of the chest between the ribs for suitable patients, as the benefits are evident including minimising the need for blood transfusion during operation, faster recovery and shorter hospital stay," said Asst Prof Chua Kim Chai, Senior Consultant, Department of Cardiothoracic Surgery.

Asst Prof Chua Kim Chai performing a minimally invasive cardiac surgery.

A case study: Minimally invasive double valve repair

81-year-old Mdm Ong suffered from severe heart valve disease for decades. She had mitral stenosis and tricuspid regurgitation, and had multiple hospital admissions for heart failure symptoms such as shortness of breath and an overload of fluid in her body arising from her heart condition. Mdm Ong had declined surgery due to considerable risks associated with an open-heart surgery. However, over time, her symptoms worsened and she could not walk more than a few steps without stopping to rest.

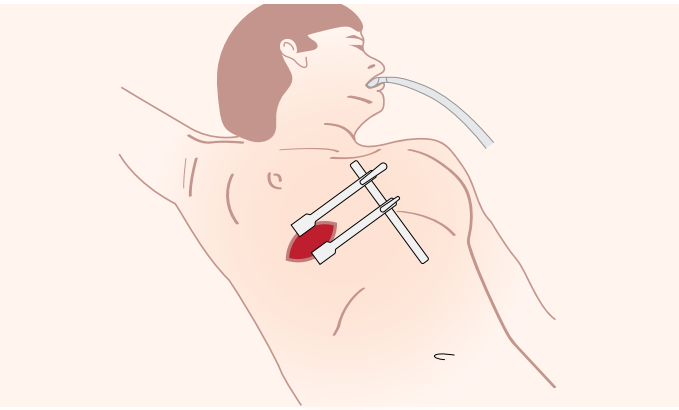
Despite her advanced age and the severity of both heart valves, Mdm Ong had no other major health issues. Judging from the severity of her heart condition, an open-heart surgery would have been the only option to improve her health and quality of life. However, given her age, the risks in open-heart surgery would be greater including longer recovery time, potential wound complications and lingering breathlessness.

Upon further assessment of Mdm Ong's health condition, a mini thoracotomy mitral and tricuspid surgery was recommended.

During the surgery, small incisions were made in the side of the chest and long instruments were inserted into the incisions to reach the damaged valves. Asst Prof Chua successfully replaced her mitral valve, which was too thick and stiff to function properly, with an artificial valve, and repaired her leaky tricuspid valve by tightening the ring (annulus) around the valve using a medical device.

Now, with advancements in minimally invasive surgery allowing both of her damaged valves to be corrected in one procedure, Mdm Ong is back on her feet faster than expected and walking without feeling breathless.

In contrast to traditional surgeries, which offer an unobstructed view of the surgical field, Asst Prof Chua shares, "Performing minimally invasive procedures can pose challenges, and their success relies on careful pre-operative planning. In the case of a double valve surgery, the surgeon must enter both the left and right heart atria instead of just one, as well as have mastery of the technique to impede blood flow into the atrium to gain a good visual of the valve."



An illustration of how a right mini thoracotomy is done, with a thin video camera inserted through a small incision.

Who is suitable for a minimally invasive double valve procedure?

Generally, minimally invasive (double) valve procedure is beneficial to most suitable patients as it is less invasive and offers faster recovery. However, Asst Prof Chua shared that there are exceptions, such as individuals who have had previous chest wall surgery, and those with high lung artery pressure or very poor heart function.

He added, "Patients are advised to go for thorough assessment by doctors to determine an appropriate treatment option to achieve the best outcome. Those who lead an active lifestyle or are expected to have delayed chest bone healing from an open-heart surgery, are expected to benefit the most from minimally invasive procedures."

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MINIMALLY INVASIVE VALVE PROCEDURES IN NHCS

There have been significant advancements in advanced valve therapies such as in the techniques and devices used, leading to improved outcomes. Increasingly, NHCS is seeing more patients being aware of the benefits of less invasive techniques which has considerably lower risks compared to conventional surgery. Other minimally invasive valve therapies that NHCS offers include:

ENDOSCOPIC-ASSISTED

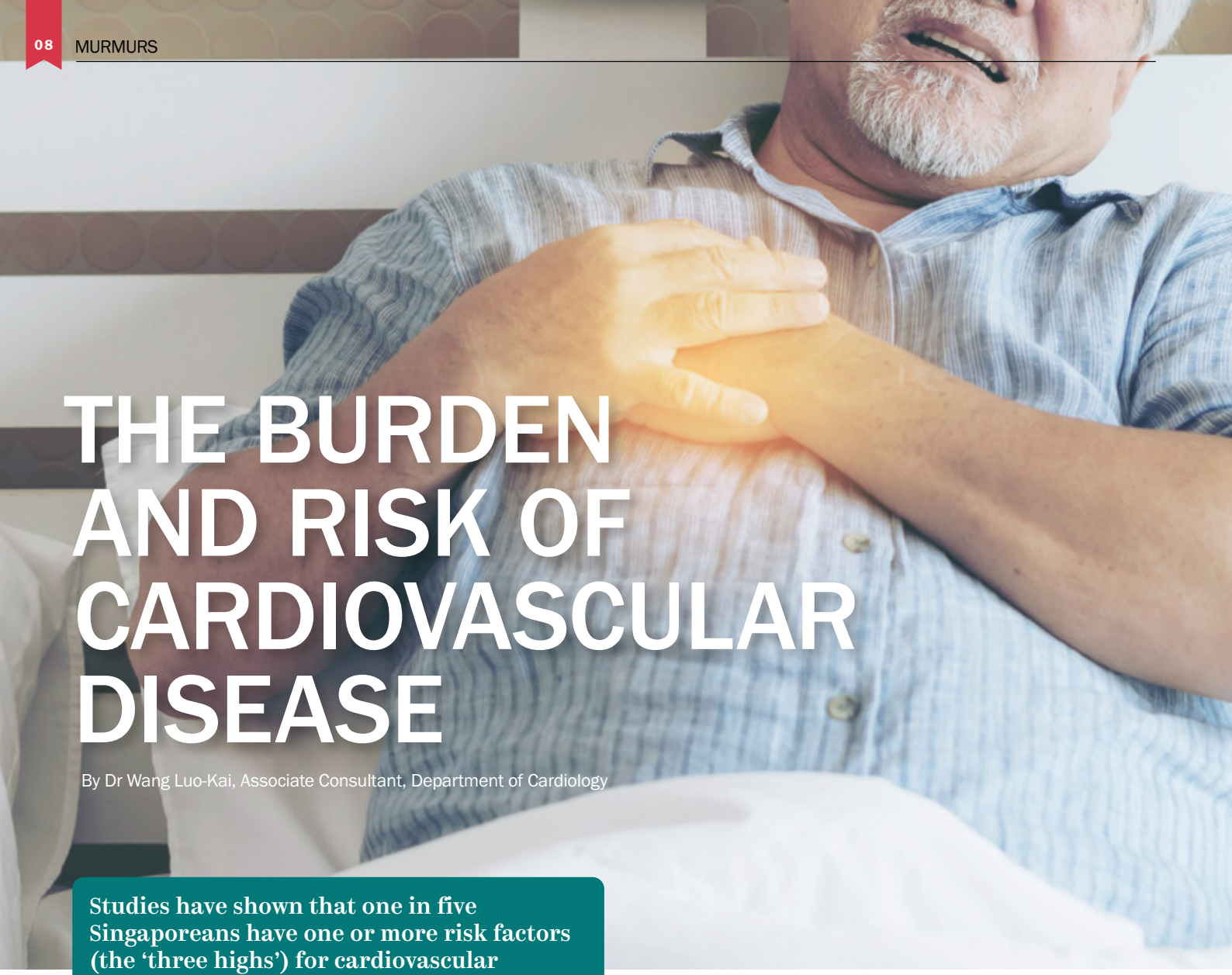
Endoscopic-assisted procedures where a fibrescope with lens at one end and video camera at the other allows the surgeon to view and operate the inside of the body:

- Partial sternotomy aortic valve replacement
- Mini thoracotomy mitral repair/ replacement
- Mini thoracotomy tricuspid repair/ replacement
- Mini thoracotomy mitral & tricuspid repair/replacement

CATHETER-BASED

Catheter-based procedures where a thin tube called a catheter, carrying a small device, is inserted into a blood vessel, and guided to the area requiring repair/replacement:

- Transcatheter Aortic Valve Implantation (TAVI)
- MitraClip
- TricValve
- TriClip



THE BURDEN AND RISK OF CARDIOVASCULAR DISEASE

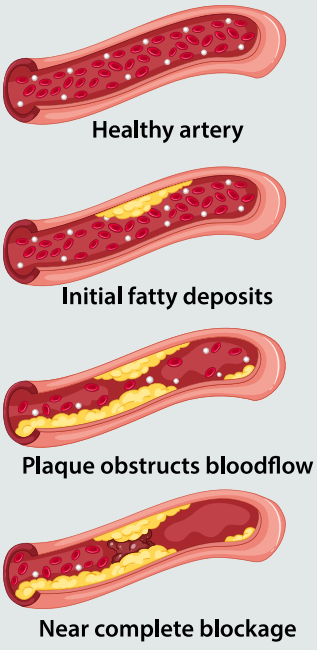
By Dr Wang Luo-Kai, Associate Consultant, Department of Cardiology

Studies have shown that one in five Singaporeans have one or more risk factors (the 'three highs') for cardiovascular disease. These risk factors can increase your risk for heart attack by more than three times.

Cardiovascular disease (CVD) is the top cause of mortality in Singapore, accounting for 31% of deaths locally in 2022[1]. CVD is a spectrum of disease which covers four main areas: coronary artery disease, cerebrovascular disease, peripheral artery disease and aortic aneurysm.

Studies have shown that one in five Singaporeans has one or more risk factors for CVD, such as hypertension, high cholesterol, diabetes (commonly known as the 'three highs'), smoking and obesity. In combination, these risk factors can increase your baseline risk for heart attack by more than three times. Hence, it is important to screen for 'three highs', adopt a healthy lifestyle and understand our individual risks for CVD.

The underlying cause of CVD is atherosclerosis, that is, accumulation of plaque in the arteries which causes narrowing and eventual end organ damage. When coronary arteries narrow over time due to atherosclerosis, they eventually struggle to supply blood to the heart, which may lead to ischaemic heart disease and even myocardial infarction, commonly known as heart attack.



An illustration of how the plaque builds up in the arteries over time, narrows and eventually cause a blockage, stopping blood supply to the heart.

Primary Prevention is the Best Defence

The best way to prevent heart attack, or CVD from happening is taking early primary prevention, that is to screen for hypertension, high cholesterol, diabetes, and obesity.

Prior to taking preventive actions, it is important to be aware of individual's 10-year CVD risk. The Heart Disease Risk Calculator, available in the Health Buddy App, allows users to input parameters such as age, gender, race, smoking status, lipid and blood pressure profile, which will then generate an estimated 10-year CVD risk. There are three tiers of CVD risk classification in the calculator: Green for low to moderate risk, Amber for high risk, and Red for very high risk.

RECOMMENDED FOR	TO SCREEN FOR	SCREENING TEST	FREQUENCY
Individuals aged 18 years and above	Obesity	Body Mass Index (BMI)	Once a year
	Hypertension	Blood Pressure Measurement	Once every 2 years or more frequently
Individuals aged 40 years and above	Diabetes Mellitus	Blood Glucose Level	Once every 3 years or more frequently
	Hyperlipidemia	Blood Lipid Level	Once every 3 years or more frequently
	High Cholesterol		

Screening recommendations based on Ministry of Health's guidelines[2]

KNOW YOUR HEART DISEASE RISK AND BE EMPOWERED TO TAKE CHARGE OF YOUR HEALTH!

Note: The heart disease risk calculator is for general Chinese, Malay, and Indian adults between ages 20-79. It is not suitable for patients with diabetes or kidney disease, or those who previously had a stroke, heart attack or severe blockage in heart or limb arteries.

Managing High Cholesterol

The estimated 10-year CVD risk provides useful indication in managing high cholesterol – the higher the CVD risk, the lower the target for low-density lipoprotein (LDL) or 'bad' cholesterol level.

Based on the heart disease risk calculator, for individuals who are in the low to moderate risk category, medications such as statins should be considered when LDL is persistently more than 4.1 mmol/L, and the LDL target should be less than 2.6 mmol/L. For those who are at high risk category, LDL target should be less than 1.8 mmol/L, and those at very high risk category should already be on medications, and the LDL target should be less than 1.4 mmol/L[3]. The general blood pressure target for persons with hypertension and less than 65 years old is around 130/80 mmHg. For persons aged above 65 years old, blood pressure target should be around 140/80 mmHg[4].

Statins are the most common medication prescribed to reduce cholesterol. Statins help to slow down production of LDL and increase the ability to remove LDL in the liver. The anti-inflammatory properties also stabilise unstable plaque in heart arteries. Though there are known side effects such as muscle aches, they are considered rare (5%) and usually tolerated. Depending on one's condition, side effects could be overcome by either lowering the dose or switching to another class of statins. Liver inflammation is the rarer type of side effects and can occur up to 1% of patients.

A new class of injectables have emerged in recent years which offer as alternatives to patients who are unable to achieve target LDL levels, and are statin-intolerant, or are not suitable for regular therapies. These injectables are usually reserved for patients who are at high risk or have established CVD. PCSK9 inhibitors are another class of drugs that can lower LDL. They are monoclonal antibodies which block the action of PCSK9 (the protein that degrades LDL receptor). This in turn increases LDL absorption from blood stream into liver cells. It is administered via subcutaneous injection once every two weeks. Inclisiran is another type of injectable which reduces upstream PCSK9 production, and in turn increases LDL absorption. Like PCSK9 inhibitors, it is also injected subcutaneously, but at a much lower frequency of once every six months.

Medications for Diabetes and CVD

Diabetes mellitus (DM) is a common condition in Singapore, affecting around 10% of our adult population. It is imperative for patients with both diabetes and CVD to be on diabetic medications with cardiovascular benefits. Metformin, a medicine used to treat diabetes, reduces liver production of glucose and increases the body's sensitivity to insulin. It has been the mainstay of treatment of diabetes since the 1970s. It exerts cardiovascular benefits through improved blood vessel function, lipid control and weight loss. There are now newer glucose lowering medications which target numerous novel pathways to reduce cardiovascular and renal events in patients with diabetes.

Sodium-glucose co-transporter-2 (SGLT2) inhibitors, a type of oral medication used to treat type 2 diabetes, works by increasing glucose excretion through the urinary system. They exert cardiovascular benefits through improved blood pressure control, weight loss, and renal protection. Another class of medication to highlight is glucagon-like peptide 1 Receptor Agonist (GLP1- RA). They work by stimulating glucose dependent insulin release from pancreas, delaying gastric emptying and exerts cardiovascular benefit via blood pressure control, improve blood vessel function, reduction in inflammation and weight loss[5]. These two new classes of medications have robust data on CV benefits and has currently Class 1 indications for initiation for patients with diabetes and CVD[6].

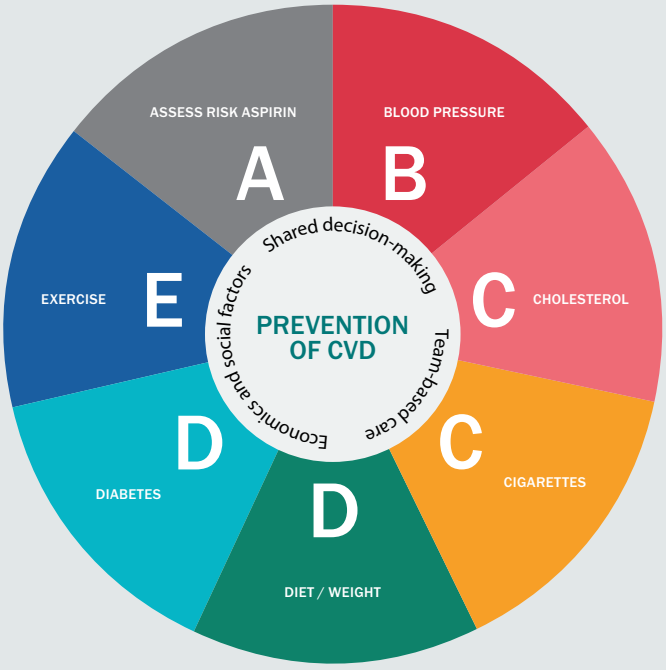
More Tools to Assess CVD Risk: Coronary Artery Calcium Score (CACS)

CACS is a measure of the amount of calcified plaque (calcium) in the walls of the arteries of the heart (blood vessels). A build-up of plaque can cause these arteries to become narrow, reducing the amount of blood, oxygen and nutrients to reach the heart. The calcium score is computed based on volume and density of the calcium deposits. The higher the score, the higher the CVD risk. It is measured through a non-invasive computed tomography (CT) scan of the heart and is currently the most widely adopted non-traditional CVD risk marker, due to its high sensitivity for atherosclerosis. CACS is utilised when there is a need to further refine the management of asymptomatic patients who are considered to be at moderate risk, to help determine whether to start medications such as statins and/or aspirin initiation[7]. CACS is not suitable for patients who are considered low risk, high risk or very high risk.

The decision to start medications is a shared one by both physician and the patient, after a thorough risk and benefit discussion.

CALCIUM SCORE	RISK OF CVD	TREATMENT RECOMMENDATIONS
0	Very low	Withhold statins
1-99	Mildly increased	Consider statins
100-299	Moderately increased	Statins are recommended Aspirin to be considered
> 300	Moderately to severly increased	Higher intensity statins are recommended Aspirin to be considered

Calcium score interpretation[7]



Adapted from the 2019 ACC guidelines[8]

Remember the 'ABCDE' for Primary Prevention

A: Assess 10-year CVD Risk. Consider aspirin for selective high risk patients

B: Broad target for blood pressure is 130/80 for hypertensive patients < 65 years old

C: Cholesterol management involves CVD risk assessment, lifestyle modification and calcium score in moderate risk patients. Patients should stop smoking altogether.

D: Diabetic patients with CVD should be on SGLT2 Inhibitors, GLP1-RA or metformin. A heart-healthy diet should focus on vegetables, fruits, nuts, legumes, fish and wholegrains.

E: Exercise for at least 150 minutes a week of moderate-intensity physical activity.

If we can do these ABCDEs well, we will have a very good chance of keeping heart attacks at bay!

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