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IPPT FOR SENIORS DETECTS FRAILTY AT EARLY STAGE

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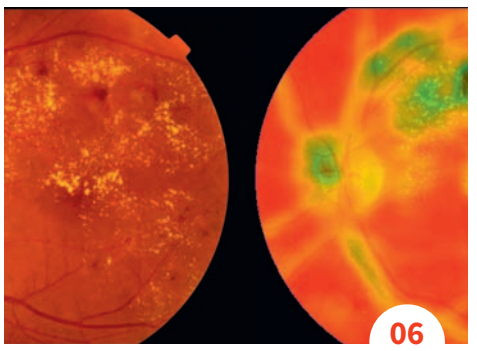
PHOTO: ANGELA GUO



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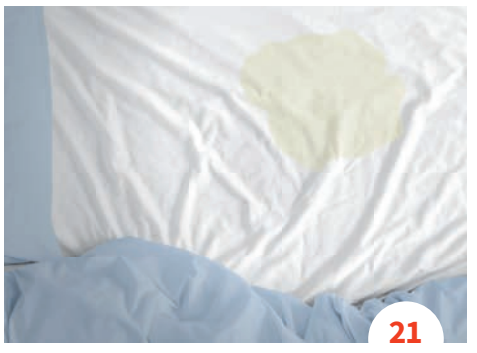

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Catch them before they fall

Hospitals and community services are partners in running a fitness test to detect the early signs of frailty in senior citizens, before they become vulnerable to serious health problems. By Eveline Gan

GROWING OLD AND BECOMING weak and frail often seem to go together. But frailty doesn't have to be a consequence of growing old. And even for those who have begun showing signs of weakness, the condition can be turned around with better nutrition, exercise and greater social interaction.

For that reason, a team from Singapore General Hospital (SGH) and Sengkang General Hospital (SKH) has developed a simple but comprehensive screening programme to identify people aged 55 and older at risk of frailty.

The Individual Physical Proficiency Test for Seniors (IPPT-S) – much like the physical fitness test for national servicemen – assesses the flexibility, range of motion, strength, balance, coordination and endurance of older people, and is conducted in partnership with community partners and volunteers.

"While Singapore's life expectancy is one of the highest in the world, people living longer may not be mirrored by them living healthier in old age, with the likelihood of the last 10 years of life being spent in disability," said Dr Laura Tay, Senior Consultant, Department of General Medicine, SKH.

According to Associate Professor Ng Yee Sien, Senior Consultant, Department of Rehabilitation Medicine, SGH: "The development of frailty as one ages is very subtle, and often goes unnoticed until a health crisis occurs.

"Based on evidence-based practices, the IPPT-S programme aims to identify the robust, pre-frail and frail in the elderly living in the community, so that targeted interventions can happen [before they end up in hospital]."

A pilot run of the IPPT-S done in June-July 2017 and involving 100 senior residents in the Rivervale neighbourhood of Sengkang picked up a number of frail and pre-frail seniors. Prof Ng said 30 per cent of the participants were found to be in the pre-frail and 2 per cent in the frail stages.

PHOTOS: ANGELA GUO

Comprising nine fitness stations, the Individual Physical Proficiency Test for Seniors or IPPT-S measures fitness indicators such as flexibility, endurance, strength, balance and coordination. Those who do not meet the "Pass" requirements are considered to be frail or at the pre-frail stage. For example, the grip strength test, which Mr Loy See Wee is doing in this picture, gauges upper-limb strength and general physical health. Mr Loy is in his late 60s.

> **THE DEVELOPMENT OF FRAILTY... IS VERY SUBTLE, AND OFTEN GOES UNNOTICED UNTIL A HEALTH CRISIS OCCURS.**
>
> ASSOCIATE PROFESSOR NG YEE SIEN, SENIOR CONSULTANT, DEPARTMENT OF REHABILITATION MEDICINE, SGH

A questionnaire – a part of the test that looks at nutritional status, ability to perform daily living activities, and other health aspects such as mood and cognition – found that more than 22 per cent were at risk of being malnourished, while more than 26 per cent might be depressed.

Both malnutrition and depression can significantly contribute to frailty. For instance, an elderly person who is malnourished is seven times more likely to suffer from frailty than someone who isn't.

Studies have shown that frailty, when detected early, is reversible with lifestyle changes such as exercise, nutritional support and cognitive interventions. "In other words, we can help these seniors make lifestyle

Identifying the robust, pre-frail and frail in the neighbourhood's elderly will facilitate timely, targeted intervention.

> Continued on page 4

> *Continued from page 3*

Catch them before they fall

changes to nip any problems before their conditions get more complex," said Prof Ng.

The IPPT-S provides an objective measure of the physical fitness of the elderly, and comprises nine tests that take about 30 to 40 minutes to complete.

For example, a six-minute walk gauges the level of endurance, while the 10m walk assesses strength and general physical health. The back-scratch test, where one hand reaches over the shoulder to touch the other which is placed behind the back, indicates upper limb flexibility.

Other tests include 30-second chair stands, a grip strength test, and a modified sit-and-reach test performed while seated on a chair.

Upon completing the programme, participants receive a Pass, Silver or Gold award and a health booklet of their results. Those who do not meet the "Pass" requirements are considered to be frail or pre-frail, and will be referred to primary health or specialist care for further assessment and follow-up.

In the next three years, the team hopes to reach out to at least 2,000 seniors living in the eastern part of Singapore that the SingHealth Regional Health Systems serve.

Social services like AMKFSC, which was a partner in the pilot project, will play a vital role in community screening activities, said Prof Ng.

"From the word 'go', we wanted to work with community partners like AMKFSC for both screening and post-screening follow-up activities," he said, adding that these organisations will conduct the IPPT-S at their senior activity and day rehabilitation centres in housing estates for the convenience of their residents.

Community partners and volunteers will also be trained to follow up with participants, including running structured exercise and nutrition programmes co-developed with SKH.

Frailty red flags

A frail older person may experience three or more of the following symptoms, said Associate Professor Ng Yee Sien, Senior Consultant, Department of Rehabilitation Medicine, SGH. Those who experience one or two signs are considered to be in the pre-frail stage.

- Unintentional weight loss of at least 4.5kg in the past year
- Feeling weak, having difficulty standing or climbing stairs unassisted
- Feeling so exhausted that every task feels like it requires a huge effort
- Low level of physical activity, including things such as housework and exercise
- Slow walking speed

One of the fitness tests includes a 10m walk to assess the strength and general health of the participant.

Diabetes and obstructive sleep apnoea seem to go together

Greater public awareness of the possible links between type 2 diabetes and obstructive sleep apnoea is needed to help patients with either condition better manage their health. By Lediati Tan

IF YOU HAVE TYPE 2 DIABETES, there is a chance that you might also be suffering from obstructive sleep apnoea (OSA), a sleep disorder in which the patient experiences pauses in breathing and loud snoring throughout the night.

No firm link has been established, but studies have suggested an association between the two conditions: people with diabetes tend to have OSA, and vice-versa. Diabetics with OSA also tend to have a poorer ability at controlling their blood sugar levels.

Still, people suffering from either condition should be wary of the possibility of the other developing, doctors from the SingHealth Duke-NUS Sleep Centre warned.

"We know that lots of patients with OSA may not know they have OSA, including those with diabetes. If their OSA isn't treated, their diabetes may not be well controlled," said Dr Toh Song Tar, Head, SingHealth Duke-NUS Sleep Centre.

"We have patients whose glucose was not well controlled, but once their OSA was treated, their blood sugar control improved," added Dr Toh, who is also Senior Consultant, Department of Otolaryngology, and Director, Sleep Disorders Unit, Singapore General Hospital (SGH).

PHOTOS: ALVINN LIM

People with type 2 diabetes might also suffer from obstructive sleep apnoea, according to a study by SingHealth Duke-NUS Sleep Centre's Dr Toh Song Tar (left) and Dr Mok Yingjuan.

> **THE EXISTENCE OF A LINK BETWEEN OSA AND DIABETES WOULD NOT BE SURPRISING BECAUSE BOTH SHARE A COMMON RISK FACTOR: OBESITY.**
>
> DR MOK YINGJUAN, DIRECTOR, EPIDEMIOLOGY AND PUBLIC HEALTH, SINGHEALTH DUKE-NUS SLEEP CENTRE

People who are overweight have a greater chance of developing OSA. This is because fat tends to get deposited around the neck or soft tissue of the upper airways, leading to a narrowing of the airways and subsequent development of OSA. They are pulled out of deep sleep repeatedly during the night when airflow is blocked – this automatic response prompts the person to wake so that the airway reopens for normal breathing.

"They get sleep deprivation, which sets up a whole cascade of endocrine abnormalities that predisposes someone to take in more high caloric food. Bingeing on food leads to obesity again, and alters the glucose metabolism again," said Dr Toh.

The body responds to the periodic falls in blood oxygen levels – or intermittent hypoxia – in a number of ways, which together affect glucose metabolism and insulin sensitivity, said Dr Mok Yingjuan, Director, Epidemiology and Public Health, SingHealth Duke-NUS Sleep Centre.

"The existence of a link between OSA and diabetes would not be surprising because both share a common risk factor: obesity," said Dr Mok, who is also Consultant, Department of Respiratory and Critical Care Medicine, Changi General Hospital.

A 10 per cent increase in weight has been shown to cause a six-fold increase in the risk of developing OSA, while a weight gain of 5kg or more significantly increases the risk of developing diabetes, she said, citing various studies done overseas.

Singapore has the second highest incidence of diabetes among developed countries, after the United States. According to 2015 statistics from the International Diabetes Federation, nearly 13 per cent of those aged 20 to 79 in this country have diabetes.

At the same time, data from the Singapore Health Study 2012, a cross-sectional population study conducted on adults aged 21 to 79, estimated that 18 per cent of Singapore's adult population have OSA.

Singapore's diabetes rate is expected to worsen with more young adults getting obese: 35 per cent of people between 25 and 36 years of age can be expected to be diabetic by the time they are 65.

You are susceptible to obstructive sleep apnoea if you

- Are overweight, male and middle-aged
- Smoke
- Frequently snore – and loudly
- Wake up feeling unrefreshed
- Often feel tired and sleepy through the day

Diabetes patient Mr Koh Lai Hwa underwent an overnight polysomnography at SGH to analyse his sleep patterns, and was later found to suffer from obstructive sleep apnoea.

Artificial intelligence comes to eye care

The future has arrived. Machines with artificial intelligence can now accurately screen patients for some major eye diseases. By Veronica Koh

Prof Wong Tien Yin (right) and Dr Daniel Ting (below, right) have their sights set on deploying the AI system by the end of 2018.

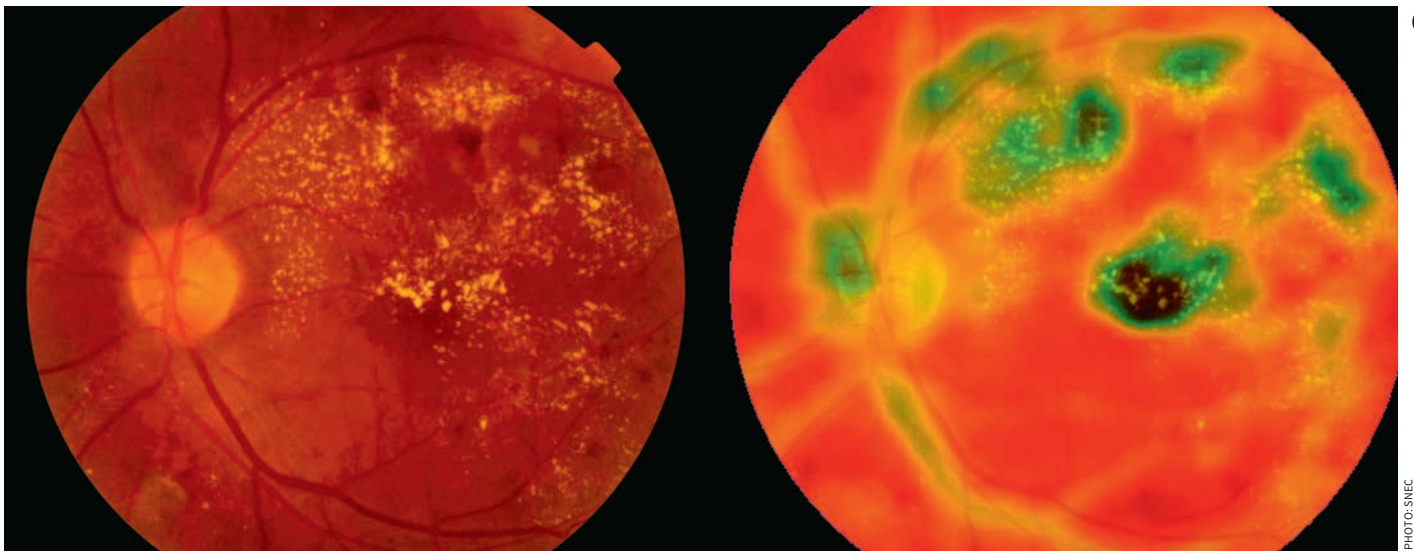


PHOTO: SNEC

Eye affected by referable diabetic retinopathy (far left). Near left, a heat map generated by the AI System shows areas affected by diabetic eye-related changes.

AT THE SINGAPORE NATIONAL Eye Centre (SNEC), screening machines with artificial intelligence are proving that they can think and decide like humans.

These machines can screen patients for diabetic retinopathy and other related eye diseases by referencing a database of almost half a million retinal images from multi-ethnic populations in Singapore and globally.

The images are stored in what is called an Artificial Intelligence System (AI System), which was jointly developed by SNEC, Singapore Eye Research Institute (SERI) and the National University of Singapore's (NUS) School of Computing.

Claimed as a world's first, the system has proved to be highly accurate in identifying images with and without eye disease. It can also detect glaucoma and age-related macular degeneration.

Results of a study on its use were published in the peer-reviewed *Journal of the American Medical Association* in December last year.

For the study, researchers worked with several leading global eye centres, including those in Australia, China, the United States, Mexico and Hong Kong. Many of the retinal images used in the system came from these countries.

It thinks like a person

The AI System is able to screen for eye diseases like a trained professional because it has, at its core, a Deep Learning System.

According to Professor Wong Tien Yin, Medical Director, SNEC, and Chairman, SERI, the Deep Learning System uses an innovative algorithmic approach to "train" technology to think and decide like humans.

"It can process large amounts of raw data, and recognise intricate structures and patterns that may not be visible to the human eye," said Prof Wong, the study's senior author, and Vice-Dean, Duke-NUS Medical School.

He said it will be useful in screening patients for diabetic retinopathy in Singapore and elsewhere.

"In countries that have these screening programmes, such as the United Kingdom and Singapore, it will increase efficiency and reduce costs by replacing a large proportion of what now requires human assessment."

It will also make it easier to set up screening programmes in communities of the future, as it could largely be done by artificial intelligence.

"It will also save costs, and improve the efficiency of healthcare systems by allowing ophthalmologists and optometrists to concentrate only on diabetic retinopathy cases that require treatment."

> THE DEEP LEARNING SYSTEM CAN PROCESS LARGE AMOUNTS OF RAW DATA, AND RECOGNISE INTRICATE STRUCTURES AND PATTERNS THAT MAY NOT BE VISIBLE TO THE HUMAN EYE.
>
> PROF WONG TIEN YIN, MEDICAL DIRECTOR, SNEC

There are plans to develop more complex algorithms to train the Deep Learning System to do even more.

"The next step is to train the AI system to predict which patients will have eye diseases in the future, by simply looking at their retinal images before they develop any disease," said Prof Wong.

Why artificial intelligence is needed

Diabetic retinopathy is a leading cause of preventable blindness among working Singaporeans. There are about 600,000 people with diabetes aged between 18 and 69 here.

Diabetic patients can suffer vision loss from damaged blood vessels in the retina. An estimated one in three people with diabetes has this condition, but many affected are unaware they have it.

The most effective way of preventing unnecessary vision loss from diabetic retinopathy is early screening and treatment. The Singapore Integrated Diabetic Retinopathy Programme was set up to do just that.

Currently, the programme relies on the grading of retinal photographs by trained professional graders or optometrists. However, with diabetes on the rise, screening challenges include the training and retention of professional graders and optometrists, the availability of and access to screening services, and the financial sustainability of these programmes in the long run.

These challenges indicate a clear need for a more accurate, efficient and cost-effective method of detecting diabetic retinopathy. This is where artificial intelligence comes into the picture.

Stocking the image bank

Researchers hope to boost the number of retinal images they have to five million in the future.

"Ours is currently the largest dataset in a Deep Learning System to screen for diabetic retinopathy and other sight-threatening conditions such as glaucoma and age-related macular degeneration," said Dr Daniel Ting, Associate Consultant, Cataract and Comprehensive Ophthalmology Department, SNEC.

"Artificial Intelligence is deemed to be the fourth industrial revolution in human history. In healthcare, we need to embrace this technology early to improve work efficiency, while maintaining the high standards of clinical care," said Dr Ting, who is also Assistant Professor, Duke-NUS Medical School, and lead author of this study.

The AI system is being further tested in the Singapore Integrated Diabetic Retinopathy Programme alongside screening by professional graders or optometrists.

Once tests are satisfactorily completed, it could be in use by the end of 2018.

Other possible objectives are to have it predict other diabetes-related complications, such as stroke, coronary diseases and chronic kidney diseases in people with the illness.

Campus-wide expertise for SGH casualties unit

This unit will be housed at new Emergency Medicine Building to be built, and linked to SGH, national centres.

SingHealth's senior management and guests at the groundbreaking ceremony of the new SGH Emergency Medicine Building: (from left) Professor Ang Chong Lye, former SGH CEO who played a key leadership role in the development of the project; Associate Professor Ng Wai Hoe, Medical Director, NNI; Professor Kenneth Kwek, CEO, SGH; Dr Lam Pin Min, Senior Minister of State in the Ministry of Health; Professor Ivy Ng, Group CEO, SingHealth; Mr Chan Heng Kee, Permanent Secretary, MOH; and Professor Fong Kok Yong, Chairman, Medical Board, SGH.

AS THE POPULATION grows and demographics change, patients needing urgent medical services are likely to seek treatment for highly serious and complex conditions. So in the coming years, when a casualty arrives at Singapore General Hospital's (SGH) new emergencies unit, he will benefit from the expertise of multiple disciplines from across SGH as well as its sister institutions within the SingHealth Group.

"Complex illnesses are becoming more common, and will need faster and even more effective interventions involving different medical specialties," said Professor Kenneth Kwek, Chief Executive Officer, SGH, and Deputy Group CEO (Organisational Transformation and Informatics), SingHealth.

He noted that the needs and types of patients seen at the emergency department have evolved over the years – patient attendances have increased from about 64,000 in 1979 to more than 130,000 in 2017. Meanwhile, more elderly patients with complex conditions like cancer, stroke, heart disease and kidney problems are being treated, with features seldom seen even 20 years ago, partly because people are living longer on advances in medical care. In 2017, 34 per cent of SGH emergency patients were 65 years and older, versus 25 per cent in 2007.

The patient-centric approach that the Department of Emergency Medicine – which began 70 years ago in 1948 as the Casualty and Outpatient Services Unit – will be possible because it will take up a larger area at a new 12-storey hospital structure being built.

To be known as the Emergency Medicine Building, it will be connected to the main SGH complex and its full range of diagnostic and interventional facilities, as well as the expertise of the hospital's specialists and those of the SingHealth Group's national centres at SGH Campus, including for stroke, heart-related conditions and cancers.

"Our new flagship multi-storey Emergency Department will not only be supplying the hardware to keep up with growing patient numbers, national needs and our emergency team's advancements, but also the heart-ware, as we bring together specialists from multiple disciplines," said Prof Kwek.

"For example, teams from National Heart Centre Singapore, National Neuroscience Institute and our Department of Emergency Medicine will come together to introduce new patient-centric care pathways for stroke and cardiac treatments, to improve outcomes and a smooth patient journey in an emergency care setting."

When ready by 2023, the new structure will house acute medical wards, pharmacy and support operations, and a decontamination station for mass casualties in the event of industrial or terror incidents. In a national health crisis, all capabilities at SGH and the national specialty centres on the Campus can be activated quickly to mount a concerted response.

Helping more cardiac arrest victims survive

Four new initiatives are underway to enable paramedics to do more for victims on the way to hospital. By Annie Tan

WHEN SOMEONE COLLAPSES from a sudden cardiac arrest and no one is on hand to quickly pump his chest to get his heart to beat again, the victim is unlikely to make it alive to a hospital.

That is why a slew of initiatives have been introduced in recent years to get bystanders to perform CPR (cardiopulmonary resuscitation) and to use an AED (automated external defibrillator) to administer electric shock to restart the heart of the person who suffers a sudden cardiac arrest. Survival rates have increased markedly as a result.

Singapore General Hospital (SGH) and the Singapore Civil Defence Force (SCDF) want to scale up these life-saving efforts by having ambulance and other emergency services staff perform more interventions on the way to hospital. They will introduce four initiatives, one a year from 2018: manual defibrillators; team cardiopulmonary resuscitation; a new impedance threshold device that increases blood flow to the heart; and the drug amiodarone.

"We have been partnering the SCDF in rolling out various interventions to improve the survival rate of cardiac arrest victims. It is our hope that more lives can be saved by paramedics through the timely administration of ambulance-based interventions," said Associate Professor Marcus Ong, Senior Consultant, Department of Emergency, SGH, and Medical Director, Unit for Pre-hospital Emergency Care, Ministry of Health.

Colonel (Dr) Ng Yih Yng, Chief Medical Officer, SCDF, added: "We are compressing everything within the first few minutes so as to complete resuscitation before the person arrives at the hospital. This gives victims the best chance of survival."

During a cardiac arrest, blood stops flowing to the brain and vital organs. Every minute that the heart stops working, the odds of surviving a cardiac arrest are lowered by 10 per cent. So CPR should be applied in the first few minutes of the heart stopping. After 20 to 30 minutes, he would have suffered permanent brain damage. Worse, he might already have died.

The survival rate for cardiac arrest victims whose hearts could be restarted by defibrillation increased from 2.5 per cent in 2001 to 21 per cent in 2015 after the introduction of mechanical CPR devices, more AEDs in public areas, CPR public education, and other programmes.

Although the tenfold increase over the last 15 years is encouraging, that figure can be improved further, given that places like Seattle are able to achieve a 50 to 60 per cent survival rate for this group.

PHOTOS: JUSTIN LOH

Functioning like an F1 pit-stop crew, the team of four firefighters will rotate tasks and provide continuous CPR in the quickest possible time. In addition, an impedance threshold device – to enhance blood flow back to the heart during CPR – will be added to their life-saving kits.

> **THROUGH THESE NEW INTERVENTIONS, WE HOPE TO BRING SURVIVAL RATES UP BY 10 PERCENTAGE POINTS TO 30 PER CENT.**
>
> ASSOCIATE PROFESSOR MARCUS ONG, SENIOR CONSULTANT, DEPARTMENT OF EMERGENCY, SGH

The four ambulance-based interventions relook current practices, and are tweaked to make CPR and other first responses more efficient. They will be implemented nationwide, with data collected and analysed each year to judge their effectiveness.

For instance, paramedics use an AED to determine if a shock is necessary. Chest compressions then need to be halted while the AED is analysing the heart rhythm.

To minimise these pauses during resuscitation, paramedics will be trained to perform manual defibrillation. "A well-trained paramedic can recognise heart rhythms that need defibrillation in one to two seconds [instead of 10 to 20 seconds that the AED needs to analyse heart rhythm]. This minimises unnecessary pauses," said Prof Ong.

Another key initiative is to offer victims high-performance team CPR. A trained fire-biker starts CPR and defibrillation as soon as he reaches the victim. The fireman on a bike can reach the victim in about half the 11 minutes that an ambulance typically takes.

To beat the ticking clock, a team of four firefighters will be dispatched in addition to the fireman on the motorbike. Together with paramedics, the team will function like a Formula one pit-stop crew, rotating tasks and providing continuous CPR in the quickest possible time.

To further boost the effects of CPR and raise the chances of survival, an impedance threshold device will be added to the array of equipment carried by paramedics. The device enhances blood flow back to the heart during CPR, and significantly improves blood circulation to the brain and vital organs.

To correct heart rhythm problems and help restore a normal heart beat, the drug amiodarone will be given to cardiac arrest victims, in addition to adrenalin (now routinely administered to enhance resuscitation).

"Through these new interventions, we hope to bring survival rates up by 10 percentage points to 30 per cent," said Prof Ong.

Still, he added, the assistance provided by the public is "pivotal".

"The public can help by calling 995, performing CPR, and using an AED when they see someone collapse," he said, noting that the percentage of bystanders performing CPR has improved from 22 per cent in 2011 to 54 per cent in 2015.

New drugs for cholesterol

People with high cholesterol levels who cannot tolerate statins, or find it does not work for them, now have new drugs that may help. By Suki Lor

PHOTO: 123RF

Patients find the subcutaneous jab off-putting, even though it is convenient and almost painless.

ABOUT 70 PER CENT OF patients admitted to National Heart Centre Singapore (NHCS) with heart attacks have unhealthy low-density lipoprotein (LDL) or bad cholesterol levels.

After a heart attack, doctors typically start them on high doses of statins. These are drugs proven to save lives and prevent deaths by reducing both inflammation in coronary arteries and recurrent heart attacks.

However, after a year on statins following a heart attack, one in two on the medication still cannot reach target cholesterol levels, said Dr Jack Tan, Deputy Head and Senior Consultant, Department of Cardiology, NHCS.

This led Dr Tan to start giving two new drugs – alirocumab or evolocumab – to patients. The drugs were approved by the Health Sciences Authority last year for use on people who have had a heart attack, or are at a high risk of one. These are patients who cannot reach their target levels while on conventional treatment, or cannot tolerate the usual high-intensity statins.

The drugs have had positive data from a worldwide study that also included participants from Singapore. Alirocumab was found to be much more effective in reducing LDL levels than high-dose statins, while having barely any side effects, said Dr Tan, who is also Adjunct Assistant Professor, Duke-NUS Medical School.

> **THE PREFERRED WAY TO USE BOTH DRUGS IS IN COMBINATION WITH A STATIN, BECAUSE THEY COMPLEMENT STATINS AND PRODUCE BETTER RESULTS WHEN PAIRED UP.**
>
> DR JACK TAN, DEPUTY HEAD AND SENIOR CONSULTANT, DEPARTMENT OF CARDIOLOGY, NHCS

Made by different companies, both alirocumab and evolocumab act similarly. They target and inhibit a protein called PCSK9, which prevents the breakdown of LDL receptors in the liver. These receptors remove harmful LDL cholesterol from the blood.

Who are these drugs for?

Currently, NHCS has 20 patients on either one of the two new drugs. They are those at high risk of a heart attack, who cannot tolerate high-dose statins, or have not been able to reach target levels.

Alirocumab is prescribed in two doses (no difference in price), and evolocumab in a standard dose. Both are taken once a fortnight through subcutaneous injections.

Except for patients who cannot tolerate statins, Dr Tan said the preferred way to use both drugs is in combination with a statin, because they complement statins and produce better results when paired up. He said they complement statins in treating patients who are at a high risk of a heart attack but cannot reach target LDL cholesterol levels with statins alone.

The drugs are also given to people with an inherited condition called homozygous familial hypercholesterolemia, where the bad cholesterol is so high that even the strongest doses of statins cannot reduce it to target levels.

One in 300 to 500 people have this condition in the milder heterozygous form. "From young, their baseline cholesterol is very high. So they have heart attacks earlier in life. If their condition is more severe, they can have heart attacks as young as in their 20s because their cholesterol is sky-high," said Dr Tan.

Dr Jack Tan said that patients with very high cholesterol levels may have heart attacks earlier in life.

Patients have two considerations regarding the drugs: cost, and that the drugs have to be injected, which some find off-putting, although the jabs are convenient and almost painless.

One month's treatment with alirocumab or evolocumab is about $600 at NHCS, as subsidies are not available for these non-standard drugs. Comparatively, the high dose of the generic statin, atorvastatin, costs $18 per month before subsidy, and $4.50 on a 75 per cent subsidy.

Side effects of statins

Statins work for the majority of patients with high cholesterol, but some people suffer side effects.

These include myalgia (muscle pain) and fatigue. In very rare cases (less than 3 per cent of patients), it can cause liver abnormalities. Rarer still is that less than one in a thousand develop rhabdomyolysis, where muscles die, causing the kidneys to fail.

Dr Tan said doctors usually do blood tests for patients within the first three months of prescribing statins to see if the drugs are working, and to check for side effects. The tests look into liver enzymes, kidney function and the lipid cholesterol panel.

"Side effects are uncommon. For liver failure to result from statins is very rare, but to cause a bit of enzyme rise is not uncommon, so when we see that, they'd be classified as statin-intolerant. This means they have side effects from statins, and we can't push up the dose anymore."

Try lifestyle changes first

Doctors recommend lifestyle changes as the first line of defence to attain healthier LDL cholesterol levels, said Dr Tan.

While how much LDL the body produces is largely predetermined by a person's genes, diet is still important.

"If you eat bad, oily food and have the bad genes, it's doubly worse," said Dr Tan. He advised cutting back on meat and oily and processed food, and moving towards a plant-based diet to help bring LDL cholesterol to healthier levels.

PHOTO: DARREN CHANG

TO BETTER NURSING

MDIS student and full-time nurse Sim Ying Yen is studying to become better at her job, and one day attain a leadership position to improve nursing as a whole.

When she was studying for her diploma in nursing, Sim Ying Yen remembers fondly being a nurse on the go. Community health nursing being one of her favourite subjects, it meant she learnt on the job as part of a mobile clinic team providing healthcare to rural communities.

"I learned a lot from this experience and felt a real sense of fulfilment from being able to use the limited resources we had to help the impoverished," says Ying Yen, 26, who now wants to be upwardly mobile.

Eager to improve her skills and knowledge in nursing, with an eye on a future leadership position, the Malaysian is now concurrently working at a private hospital in Singapore and studying for a Bachelor of Science Nursing (Top-up) at MDIS.

She started the two-year programme, which is accredited by the Singapore Nursing Board, in January 2018 and will graduate in 2020 with a degree awarded by Edinburgh Napier University in the UK.

Edinburgh Napier is ranked among the top 5 per cent of universities, according to the Times Higher Education World University Rankings 2018.

Ying Yen says she chose this programme because it would help her attain the knowledge and soft skills required to be a nurse leader for tomorrow, such as taking a bigger-picture view of health care as a whole and understanding the processes that can help improve the overall standard of nursing.

"The knowledge and soft skills acquired will allow me to pursue a position of leadership in nursing. Teaching has become a future goal, and I hope to pursue graduate education in the future."

As a Staff Nurse II at a private hospital, Ying Yen's duties include providing routine nursing care in a multidisciplinary ward (general and surgical cases).

"We emphasise patient care by providing focused care to the patients, with a ratio of one nurse to two or three patients. My ward is also known as the 'happy ward' as I take care of maternity [and postnatal] cases too!"

Ying Yen enjoys the content of her classes and the nurturing approach of her lecturers, and she also appreciates the flexibility she has to fit both work and study into her schedule.

"Classes [at MDIS] are scheduled according to the student's flexibility and work hours. Thus, this would include day and night classes to accommodate nurses who are working day or night shifts."

With a commute of up to 30 or 40 minutes from her workplace to school, she has found her programme "challenging but manageable".

"Our lecturers are friendly and very approachable, which creates a safe learning environment for us to make mistakes and learn from them. I look up to them as role models for their professionalism and experience."

What's more, she has found studying while balancing a full-time job beneficial.

"I personally think that studying while working gives me the drive I need and helps me apply what I learn in the wards to my academic knowledge and vice versa. I also think that this has made me become a better critical thinker simply by applying what I learnt in school."

Though nursing was not initially her first career choice – she wanted to be a psychologist – she calls herself blessed and is thankful to have found her vocation.

"I love how this career teaches me to be empathetic and professional with day-to-day challenges. It's a career that offers financial stability and lifelong learning."

As for her current studies, she highly recommends the course to other nurses who wish to challenge their skills and look forward to changing the landscape and practice of nursing for the better.

Now, fewer surgeries cancelled

Better evaluation of patients before operations has reduced last-minute cancellations. By Sol E Solomon

PHOTO: NHCS

When elective surgeries are cancelled at the last minute, they lead to, among other things, booked operating theatres that cannot be used at short notice.

AN IMPROVEMENT PROJECT by nurses has more than halved the last-minute cancellations of elective surgeries at National Heart Centre Singapore (NHCS).

Previously, around 11 per cent of operations at the Cardiothoracic Surgery Unit were unavoidably cancelled. After some changes, cancellations dropped to 5 per cent.

The main change was the setting up of a Pre-Operative Evaluation Clinic run by the cardiothoracic surgery unit. It is staffed by a doctor and a nurse from the unit, two clinic nurses and a physiotherapist.

Together, they do comprehensive pre-admission checks on patients to avoid, as far as possible, any reason to cancel surgeries.

These include the following steps:

- Blood tests are reviewed a week or two before surgery.
- A pharmacist will go through patients' medication to ensure they do not self-medicate (for example, use traditional herbal medicine).
- Patients with loose teeth or poor oral hygiene will be referred to a dentist before surgery.
- Patients will also be referred for financial counselling to medical social workers if needed.
- Patients and their families will be shown a pre-operation Intensive Care Unit orientation video so that they better understand the hospitalisation process.

Ms Huang Na, Senior Staff Nurse, NHCS said these checks and the video will help allay patients' anxieties, and ensure they are better prepared for their operations mentally, physically, psychologically and even financially.

"We ensure all pre-op tests are done and results are within the acceptable range. If there are abnormalities, the surgeon will be alerted. The aim of proper and early assessment is to reduce avoidable cancellations. In addition, these patients risk a heart attack while waiting for a new operation date," she said.

In their review of previous cancellations, the team nurses found that a common reason was the inadequate stopping of patients' antiplatelet (blood thinning) medication.

Patients scheduled for a heart bypass operation need to stop taking these drugs five to seven days before surgery. This is to clear the drug from the body, or there may be excessive bleeding during or after surgery.

Another reason was patients not having dental clearance for the operation. Oral bacteria is the most common cause of prosthetic valve infections, so patients going for heart valve surgery need a dentist's confirmation that oral infections are not present.

Yet another reason was the need to further investigate patients for whom general anaesthesia could pose a risk.

It was obvious that they had to reduce last-minute cancellations. Booked operating theatres could not be used at short notice, wasting the time of surgeons and others, and frustrating patients and their families, who arrive mentally and psychologically prepared for the operation.

Singapore Cord Blood Bank offers family storage

New initiative combines family storage of cord blood with the option for donation later on. By Veronica Koh

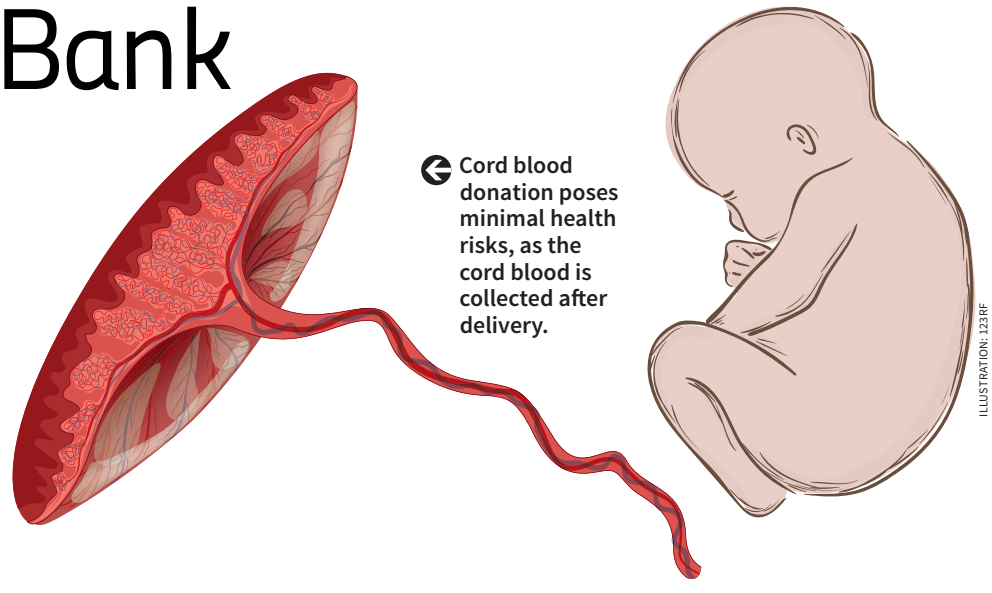


ILLUSTRATION: 123RF

Cord blood donation poses minimal health risks, as the cord blood is collected after delivery.

SINGAPORE'S ONLY PUBLIC CORD blood bank is offering cord blood storage services following demand for such a facility from parents.

Under Singapore Cord Blood Bank's (SCBB) new community cord blood banking service, introduced earlier this year, parents can now store their baby's cord blood for their own use, with the choice of donating the cord blood later for others to utilise.

"The service arose from repeated requests from parents who wanted to store their baby's cord blood with SCBB, with the option to donate later," said Mrs Tan-Huang Shuo Mei, Chief Executive Officer, SCBB.

With more than 50 per cent of cord blood neither donated nor stored privately, offering cord blood storage services could encourage more donations. According to SCBB, about 60 per cent of patients who require life-saving stem cell transplants in Singapore are unable to find a match from bone marrow donors and public cord blood banks, while the numbers worldwide range between 65 and 80 per cent.

SCBB was established in 2005 as a non-profit organisation for collecting cord blood donations. Its priority is to ensure that Singapore has a healthy pool of cord blood available to meet the transplant needs of the country's multi-ethnic population.

"The biggest use of cord blood stem cells is in the area of allogeneic bone marrow transplantation, where an unrelated recipient is transplanted using cord blood for a variety of blood disorder diseases," said Associate Professor Aloysius Ho, Medical Director, SCBB, adding that with advances in stem cell research, cord blood stem cells may be used to treat more conditions and diseases in the future.

Mrs Caz Lim has used SCBB's family banking service. According to this mother: "The option to donate to the public cord blood inventory after we choose not to store it for our family provides us with the best of both worlds. SCBB has facilitated many transplants in Singapore and around the world, which assures me that my baby's cord blood is in good hands."

SCBB's efforts have saved at least 226 lives around the world. Conditions treated include blood cancers and disorders such as different types of leukaemia and lymphoma, as well as immune disorders like the potentially fatal severe combined immunodeficiency and chronic granulomatous disease.

Donating cord blood to SCBB is free, but family storage for an initial five years will cost between $1,800 and $2,200. The fee is to cover administration, registration, collection, processing and testing. The service contract can be renewed every five years.

Cord blood donation is medically safe, posing minimal health risks to the mother and baby as the cord blood is only collected after delivery. The blood is taken from the umbilicus vein in the section of the cord that remains attached to the placenta, not the baby.

SCBB's community cord blood banking service is available at KK Women's and Children's Hospital, National University Hospital and Singapore General Hospital, and will be made available soon at local private hospitals.

For more information about donating or storing cord blood, visit www.scbb.com.sg.

Colour blindness linked to diabetes

People who have had type 2 diabetes for six years or more are more prone to developing colour blindness, a study has found. By Sim Ee Waun

ALTHOUGH WORLDWIDE ONLY A small percentage of people are born with colour blindness (colour vision impairment), a local study has found a link between this eye condition and type 2 diabetes.

Researchers found that age and the duration of diabetes are factors associated with colour blindness – a condition where patients cannot see the correct colour of things, and their life and work are affected by it.

The study revealed that colour blindness affects 22.3 percent of people with type 2 diabetes. Those who have had the illness for six years or more have a higher incidence of colour blindness. The risk of getting it increases with each year that patients suffer from it.

As the incidence of diabetes is expected to rise in the future, so may the number of people with colour blindness, said Dr Tan Ngiap Chuan, Director, Research, SingHealth Polyclinics, who led the research with Ms Samasri Kallakuri, Lecturer, Singapore Polytechnic.

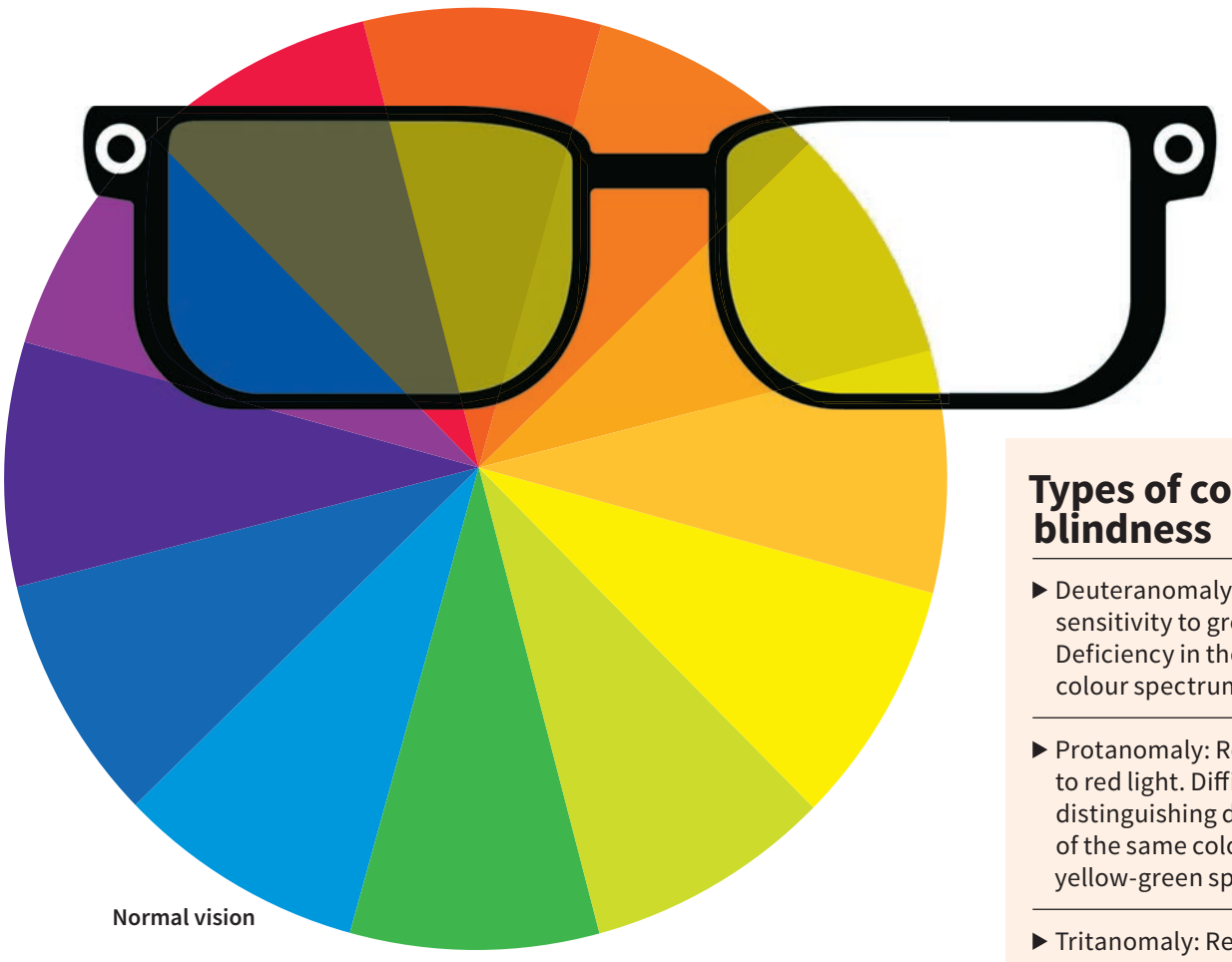
"Diabetes makes people more prone to eye diseases. It can damage the retina and cause blood vessels to bleed, which is the main cause of blindness in Singapore. But little has been done to understand how it contributes to colour blindness,"

> **DIABETES MAKES PEOPLE MORE PRONE TO EYE DISEASES. IT CAN DAMAGE THE RETINA AND CAUSE BLOOD VESSELS TO BLEED, WHICH IS THE MAIN CAUSE OF COLOUR BLINDNESS IN SINGAPORE.**
>
> DR TAN NGIAP CHUAN, DIRECTOR, RESEARCH, SINGHEALTH POLYCLINICS

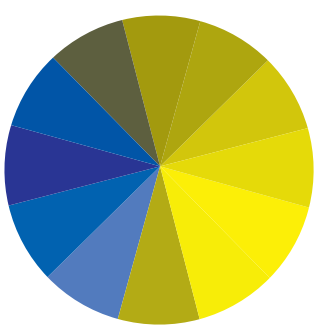
said Dr Tan who is also Academic Vice Chair (Research), SingHealth Duke-NUS Family Medicine Academic Clinical Programme.

It was also found that people with poorer vision are more prone to getting this eye problem.

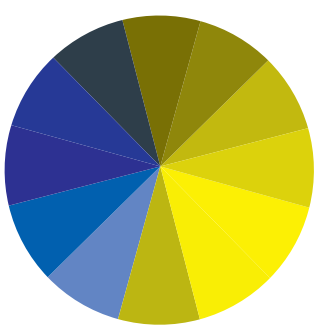
"Interestingly, ethnicity, gender and employment were not significant factors associated with colour blindness. There was also no association with hypertension, dyslipidemia, coronary, cerebro-vascular and renal diseases," he said.



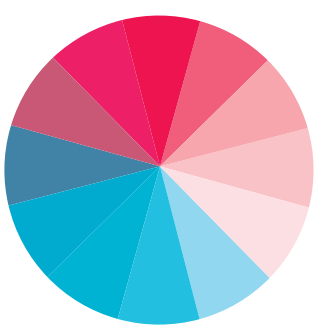
Normal vision



Deuteranomaly



Protanomaly



Tritanomaly

Studying the problem

About 850 people aged 21 to 80, from different ethnic groups, who had diabetes for at least two years, took part in the study at Pasir Ris Polyclinic from 2013 to 2015.

Researchers collected data on the duration of type 2 diabetes and its complications and treatment, blood pressure, weight, body mass index, and demographic and medical profiles. Participants also did tests for oral glucose tolerance, glycated haemoglobin and fasting lipid profiles.

The next thing for researchers is to explore if a simple colour screening test can be incorporated into the primary health screening process, particularly of diabetes patients, because early detection is key to managing it.

Patients are currently screened with a Farnsworth D-15 instrument where they have to arrange 15 coloured discs onto numbered caps, in a graduated sequence of closely matching hues, to form a circular diagram. An abnormally arranged diagram would indicate which type of colour blindness they have.

Dr Tan said that ultimately, the take-home message is to live a healthy lifestyle and not to succumb to diabetes as far as possible.

"If you already have diabetes, then you have to manage it properly to prevent the onset of colour blindness," he said.

Dr Tan emphasised the importance of living a healthy lifestyle in order not to succumb to diabetes.

Types of colour blindness

- Deuteranomaly: Reduced sensitivity to green light. Deficiency in the red-green colour spectrum.
- Protanomaly: Reduced sensitivity to red light. Difficulty in distinguishing different shades of the same colour in the red-yellow-green spectrum.
- Tritanomaly: Reduced sensitivity to blue light. Deficiency in the blue-yellow spectrum. It is the most prevalent form of colour blindness in people with type 2 diabetes.

Who is most affected?

- **Cooks:** They may find it hard to tell fresh vegetables from discoloured ones – for example, they see red tomatoes as brown, or are unable to tell raw meat from cooked ones.
- **Electricians:** Their jobs can become dangerous since they cannot distinguish between coloured wires and so cannot tell which is the dangerous live wire.
- **Drivers:** They cannot tell red from green traffic lights, and dangerously rely on the position of the coloured lights instead. This was one reason which prompted the study. A colour blind man had come to the polyclinic for an eye test to renew his driver's licence, but he could not tell the stop and go signs apart. Instead, he relied on the position of the lights to guide him.
- **Others:** Also affected are pilots, architects, designers, marine navigators and horticulturalists.

Critical illness cover comes in different shapes, sizes

ILLUSTRATIONS: 123RF

Having insurance to cover critical illnesses like cancer is important. But how should one choose from the array of different products available? By Corinne Kerk

RECEIVING A DOCTOR'S diagnosis of a serious illness can be worrying. It's not just because of the illness, which can involve major surgeries and long-term hospital care, but the costs of treatment and potential loss of income also add to the burden of coming to grips with what is often a life-changing disease.

This is where critical illness insurance comes in. Those with such insurance will welcome the fixed lump sum that is paid following diagnosis or after a surgical procedure covered by the policy. The payout at least helps ease anxiety.

Before rushing out to buy a critical illness policy, however, note that such policies are structured differently.

"There are a lot of ifs and buts in insurance policy terms and conditions. So you need to read the fine print very carefully, especially since policy wordings for all stages of critical illness coverage can be very complicated," said Ms Michelle Ee, Director of Wealth Management, Financial Alliance.

For a start, a critical illness policy can be bought as an individual product or as a rider to a life policy. Riders attached to a whole life insurance plan may expire when the insured reaches the age of 65 years. So buying one that is lifelong is preferred, especially with people generally living longer these days, said Ms Ee.

Choosing critical illness products isn't just a matter of deciding between riders or individual products. They come in a plethora of permutations – coverage of one, some or all the 37 critical conditions defined by the Life Insurance Association Singapore, as well as those outside this group, and for different stages of disease.

How the disease is defined is important. Only the severe stages of 37 medical conditions have standard definitions across the industry. Definitions of their early stages, and for other conditions and their stages, are set by individual insurers. So a payout will only be made if an illness fits the description in the policy. For instance, NTUC Income defines early thyroid cancer as a tumour that is less than 2cm in diameter, whereas for Tokio Marine, it is less than 1cm.

Serious illness products can cover the illness at different stages, or for the full duration of the disease. But coverage of the earlier stages is usually not crucial, as out-of-pocket expenses at that point aren't usually very large. Early stage cancers like breast or prostate, for instance, don't usually require lengthy medical leave, so the financial impact isn't huge. Moreover, Singapore citizens and permanent residents are already protected against large hospital bills with MediShield Life, or a private Integrated Shield Plan (for higher hospital and surgical or H&S coverage).

"So about 80 to 90 per cent of their medical expense will likely be covered under a comprehensive H&S policy," said Ms Ee, noting that while early critical illness cover may offer peace of mind, the premium is significantly higher than for a conventional policy covering just the advanced stage of the disease.

For instance, for a sum assured of $250,000, a 35-year-old non-smoker male pays a $720 annual premium for a critical illness rider covering just the advanced stage, compared to $3,395 to cover the illness through every stage.

As with most insurance products, critical illness policies usually have a waiting period of 90 days from the date that coverage begins. If certain illnesses are diagnosed or surgery is carried out during the waiting period, no benefits will be paid.

Then there is the survival period – which can range from seven to 30 days – which is how long the insured must live after being diagnosed before benefits are paid. If the insured dies within this period, the death benefit will be paid, but not for the critical illness, which is likely to be significantly higher. The death benefit of standalone term plans that cover critical illnesses may be nominal, such as $10,000 or $15,000.

Once a serious illness is diagnosed and a claim made, most critical illness policies will terminate. Apart from leaving the consumer without insurance protection, it is usually difficult or almost impossible to buy another health insurance plan.

Moving away from standard features in critical illness policies

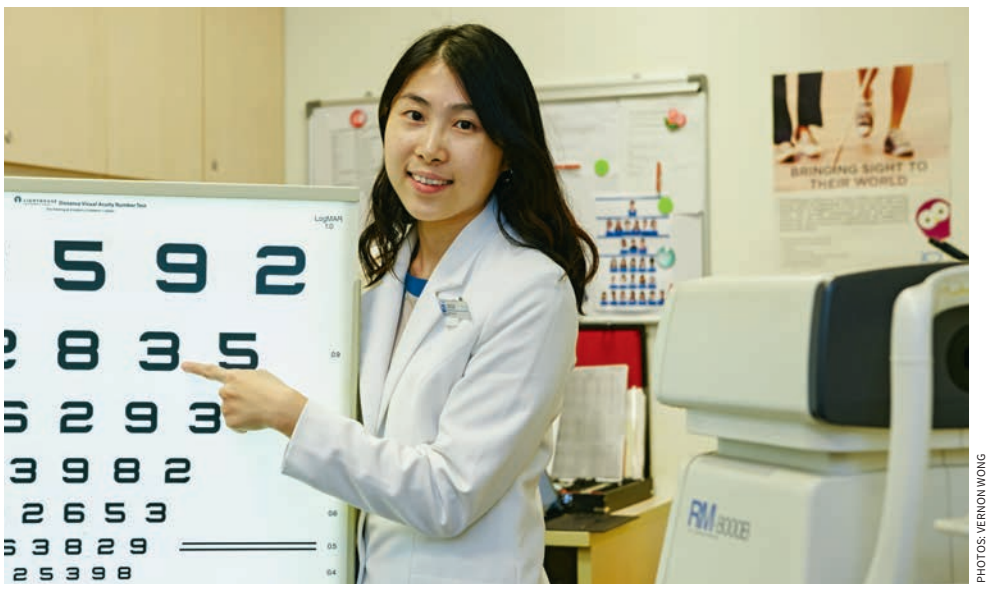
To meet changing demands, some insurers have introduced policies in recent years with features such as allowing for multiple critical illness claims or specific to certain diseases like diabetes and cancer. For more information on these and products offered by other insurers, go to their respective websites.

Policy Name	Insurance Company	Features
PRUmultiple	Prudential	Three critical illness claims, including two cancer claims
My MultiPay	Aviva	Early critical illness cover that potentially allows for more than one critical illness claim, with limits and restrictions for multiple claims
Triple Critical Cover	AIA	
Diabetes Care	AIA	Covers five diabetes-related complications – blindness, kidney failure, stroke, heart attack and coronary artery by-pass surgery – with premiums that remain unchanged throughout policy
Cancer Protect	NTUC Income	25 per cent of sum assured upon diagnosis of early stage cancer, without the payout reducing the basic sum assured **Upon diagnosis of advanced stage cancer, 100 per cent of sum assured is paid out** **If no claim is made for an early stage cancer, an additional 25 per cent of the sum assured will be paid out**
TM Protect Cancer	Tokio Marine	50 per cent of sum assured upon diagnosis of early stage cancer **Upon diagnosis of advanced stage cancer, 100 per cent of sum assured is paid out** **If a claim is made for early stage cancer, only remaining sum assured is paid upon subsequent diagnosis of advanced cancer**

How to really help

Handling a heart-rending case of a teenager with vision loss taught this optometrist real ways of helping such patients.

By Corinne Kerk



PHOTOS: VERNON WONG

Ms Lynn Tan said helping patients as part of a multidisciplinary team, which includes opthalmologists, occupational therapists and medical social workers, is more effective because together they are able to render holistic care.

THE PATIENT, A 16-YEAR-OLD Ukrainian girl, was suffering from toxic optic neuropathy, a condition where the optic nerve is damaged, causing vision loss.

She was referred to Optometrist Ms Lynn Tan, Low Vision and Optometry Service, Singapore National Eye Centre (SNEC) for help in adapting to life with low vision.

Ms Tan, who is also a certified low vision therapist, found that she had to pull out all the stops in order to really assist the teenager.

She rang organisations that specialise in helping the blind to get help for the teen, but the girl's language limitations proved a barrier.

Eventually, the teen was referred to an occupational therapist at Singapore General Hospital (SGH) to learn how to cope with her daily living activities, and also the Singapore Association of the Visually Handicapped, where she learnt mobility skills and even took up art and music lessons.

Ms Tan stayed in touch with the patient for around a year, monitoring her status and coordinating help for her. During that time, she picked up valuable information on how to really help such patients. "I got a clearer idea of what to do to really help them."

It takes a team

The majority of patients at the low vision clinic are elderly people with conditions such as macular degeneration, diabetic retinopathy and glaucoma. A small number – about 5 per cent – are young patients aged 20 and under.

One of her main tasks is prescribing vision aids such as glasses and magnifiers for them. She also explores with them the use of assistive technologies such as smartphone apps for the visually impaired.

"They're often hesitant about using vision aids because they think people find them weird. But we tell them not to care what others think as long as the device helps them," she said. "One patient, who was prescribed a magnifier, took the advice and later declared that his quality of life had improved."

But sometimes even vision aids cannot help. "Then we'll refer them to an occupational therapist who specialises in low vision, who can teach them how to cope with the basics of daily life, such as preparing a simple meal, doing household chores, getting a drink and caring for themselves."

> **IF WE HAVE THE SPACE, WE CAN SHOWCASE ALL THE DEVICES WE HAVE AND DO MOCK-UPS. THIS WOULD MAKE THE SITUATION AS CLOSE TO REAL LIFE AS POSSIBLE, AND HELP PATIENTS IN THEIR DAILY LIVES.**
>
> OPTOMETRIST MS LYNN TAN, LOW VISION AND OPTOMETRY SERVICE, SNEC.

She finds that helping patients is more effective now that she is part of a multidisciplinary team that includes ophthalmologists, occupational therapists and medical social workers.

"Previously, when patients told us how they kept bumping into people, or not being able to do things at home, I could only prescribe visual aids. Now, as a team, we can give them holistic care."

This care includes sending patients aged 50 and above for subsidised rehabilitation, where they learn how to cope safely and confidently at home and in the community.

After means testing, they may join the Senior Eye Rehabilitation programme, which is available at SNEC, SGH, National University Hospital and Tan Tock Seng Hospital.

It is a programme by Temasek Foundation Cares in partnership with the Agency for Integrated Care, and supported by the Tote Board. Its aim is to build community capability among older people in low vision rehabilitation.

Patients on the programme often retain usable vision, and can learn ways to function effectively and safely within their homes and community with the help of a multidisciplinary team of ophthalmologists, optometrists, occupational therapists and social workers.

Outside of work

Ms Tan has her family to thank for encouraging her to study optometry at Singapore Polytechnic. She has since obtained a Bachelor of Science in Optometry and specialised in the area of low vision rehabilitation.

One of Ms Tan's main tasks is prescribing vision aids to patients, which may include smartphone apps.

Her dream as a low vision therapist is to have a low vision rehabilitation centre.

"Right now, we only have a room. If we have the space, we can showcase all the devices we have, do mock-ups, and have a proper room for doctors, optometrists and occupational therapists to see patients," she said. "That way, we can make the situation as close to real life as possible, and help patients in their daily lives."

Meet the 'Mad Scientist'

His mind is full of questions, he takes work home, and if there are tissue samples for his research, he will personally go and get them – day or night. By Suki Lor

PHOTO: JUSTIN LOH

Dr Chen Yong clinched the celebrated but tongue-in-cheek "Mad Scientist Award" for his wholehearted dedication to research. His biggest current project is looking for the cause of a lethal intestinal inflammation in premature babies, so that it can be prevented.

THOSE WHO KNOW Dr Chen Yong, say he deserves the accolade.

Dr Chen, Staff Physician, Department of Paediatric Surgery, KK Women's and Children's Hospital (KKH), was one of 10 people honoured at the SingHealth Duke-NUS Research Appreciation Awards, all of which were humorously named.

He received the "Mad Scientist Award" while others received similarly tongue-in-cheek ones such as the "Most Caffeinated Award" and the "Yoda Grand Master Award".

Known for his complete dedication to his research, his award citation gave one example of this – that as long as he is in town, he personally collects tissue specimens for his research, no matter what time of the day they are available.

"Every sample is precious," he explained. "Its quality impacts the findings of the research. So, as the investigator, I try my best to ensure they are collected and preserved well."

Premature babies the focus

Currently, the samples are for his research into necrotising enterocolitis – a lethal inflammation of the intestines, especially of the small intestine of premature babies. It occurs soon after birth and can turn gangrenous. Worldwide, around 7 per cent of babies with very low birth weight develop it, and one in three of those affected die.

Dr Chen said many babies lose part of their small intestine, and in extreme cases, almost the whole organ. "If they lose half, they can still survive, but if it's most, it's very difficult for them."

If the whole intestine is lost, the infant will never be able to feed by mouth but rely on intravenous feeding, which may be costly, and puts them at risk of infections and liver damage.

Dr Chen's mission is to pin down the cause and prevent the disease. So far, he has had one hypothesis, which he tested and proved at the Hospital for Sick Children in Toronto in 2016, when he was there on a grant from the Ministry of Health's National Medical Research Council.

> **EVERY SAMPLE IS PRECIOUS. ITS QUALITY IMPACTS THE FINDINGS OF THE RESEARCH. SO, AS THE INVESTIGATOR, I TRY MY BEST TO ENSURE THEY ARE COLLECTED AND PRESERVED WELL.**
>
> DR CHEN YONG, STAFF PHYSICIAN, DEPARTMENT OF PAEDIATRIC SURGERY, KKH.

His hypothesis was that the disease is caused by a lack of oxygen in the intestines during feeding, which together with digestion need oxygen. As the intestines of premature babies are not yet fully developed, they lack the mechanism to drive sufficient blood there during feeding, thereby depriving the organ of oxygen.

Dr Chen developed a specific way to test blood flow in the intestines with a special microscope, which tracks how blood flow changes in baby mice during feeding. He hopes his research will lead to a change in clinical practice, to fine-tune the feeding regimen of premature babies, and prevent the disease.

Part clinician, part scientist

Medicine was an obvious career for Dr Chen, who hails from Wuhan, China, but he is now a Singapore citizen, living here with his wife and two children.

In high school, he had a penchant for biology. "I was able to remember the contents of biology easily, compared to other subjects," he said. With this talent, he easily tackled the heavy medical tomes at university and became one of the top medical graduates in the school.

After a master degree in surgery and practising as a surgeon in China, he came to Singapore as a researcher for the Institute of Molecular and Cell Biology at the Agency for Science, Technology and Research (A*STAR). While working there, he completed a doctorate in molecular biology before joining KKH in 2009.

He now spends 30 per cent of his time on research and the rest on patients. "I'm part clinician, part scientist. It's the best way for me to work since I like both."

As a scientist, he is always curious. "When faced with a disease, I always ask how does it happen, how can I cure it, and most importantly, how to prevent it."

He hopes to spend more time on research because it could ultimately save lives, and to continue clinical work because treating patients keeps the research questions coming.

In fact, he is so driven, he takes work home. "Many nights, after dinner, I work till bedtime." Fortunately for this "Mad Scientist", his wife, who is a teacher, understands, and his children are proud of his work... not to mention his cool award.

Get outdoors to lose fat

PHOTO & ILLUSTRATION: 123RF

A research team led by Professor Peter Light of the Alberta Diabetes Institute has found that fat cells lying just under the skin are sensitive to sunlight.

"When the sun's blue light wavelengths – the light we can see with our eyes – penetrate our skin and reach the fat cells just beneath, lipid droplets reduce in size and are released out of the cells. In other words, our cells don't store as much fat."

The fat cells shrink in size too. This layer of fat is the "major fat depot in humans", say the study authors.

In light of this, anyone for spending more time outdoors?

Source: University of Alberta

Nerve pain? Try eating less gluten

Gluten sensitivity is known to cause abdominal pain, bloating and gas, but recent research indicates that it is also linked to nerve pain.

Nerve damage (neuropathy) causes weakness, numbness, and pain in the hands and feet.

According to Dr Panagiotis Zis, lead author of a study at the University of Sheffield, for susceptible individuals, eating gluten causes an immune reaction that, in this case, damages nerves, which can be painful.

"A strict, gluten-free diet removes the main factor triggering the inflammation, allowing the immune response to calm down."

The team found that patients on gluten-free diets were 89 per cent less likely to suffer pain, although they could not confirm why.

Source: American Academy of Neurology

EVERY HOUR
14
units of blood are used in Singapore.

EVERY DAY
325
units of blood are needed.

EVERY YEAR
118,750
units of blood are required for 2018.

A healthy adult has
4-5 LITRES
of blood, and it is safe to donate
350-450ML
every three months.

1 HOUR TO SAVE 3 LIVES

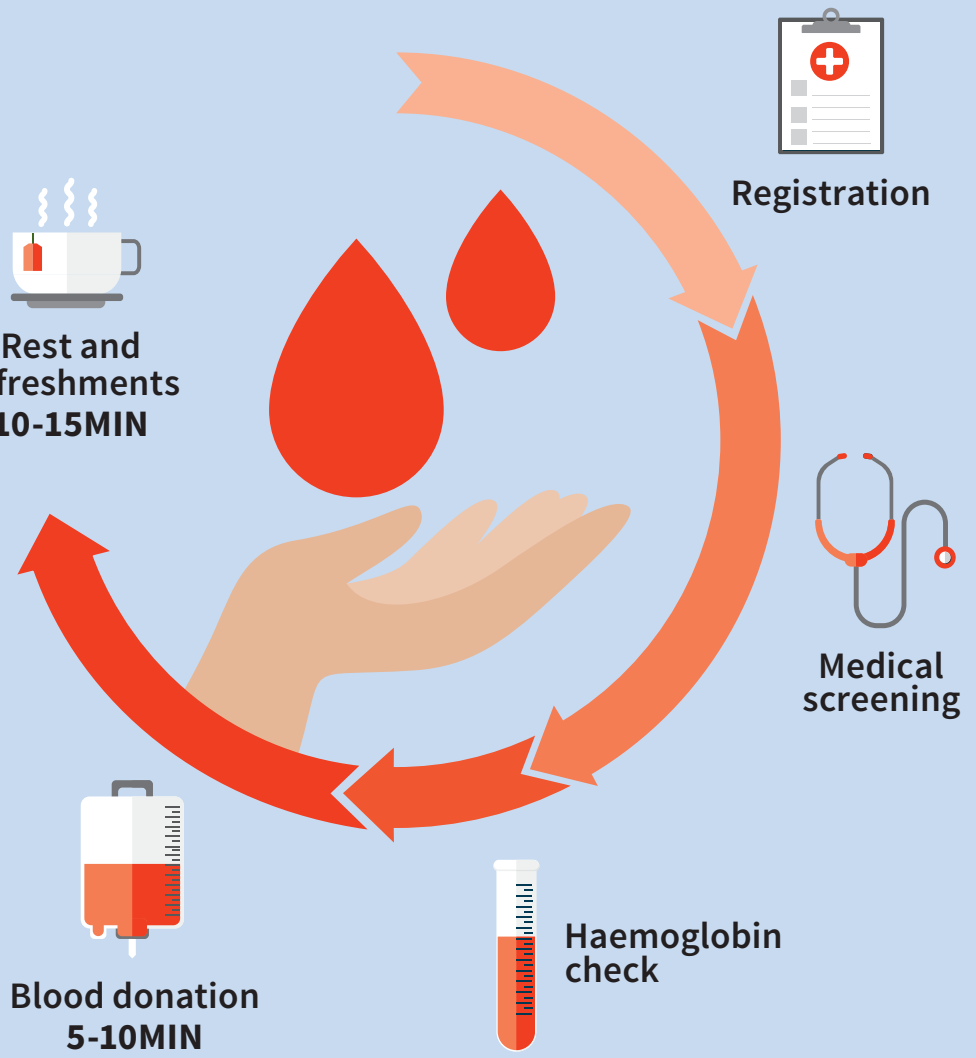
Donating blood is easy, safe and helps save lives.

WHO CAN DONATE?

DONORS MUST:

- be 16 to 60 years old
- weigh at least 45kg
- generally be in good health
- not have had symptoms of infection such as a sore throat or cough one week before, or a fever three weeks before donation

For more information, go to **www.hsa.gov.sg/content/hsa/en/Blood_Services/Blood_Donation/Can_I_Donate/Donor_Criteria.html**



IT IS SAFE

- Donating blood will not harm the body nor weaken the immune system.
- One won't catch diseases by donating blood, as strict hygiene protocols are observed. All equipment used are new, sterile and discarded after one use.
- Before the process, a medical examiner screens the potential donor's health and haemoglobin level – as of January 2018, the minimum level required for females is 12.5g/dL, and at least 13.0g/dL for males.
- The donated blood goes through stringent testing for diseases and blood typing. It is then separated into red blood cells, platelets and plasma for later use.

HOW BLOOD IS USED

Donated blood is used either in its original form – for **medical emergencies** or **surgical procedures** – or **broken down into platelets**. Beneficiaries include those with cancer or leukaemia, patients with blood disorders, or new-born babies with medical conditions.

1 BAG OF BLOOD CAN SAVE 3 LIVES

Regular blood donations ensure a steady
6-day supply of blood
is maintained in Singapore's national inventory.

Avoid the walk-in queue and make an appointment online at Donorcare@HSA or call 6220-0183 to donate at four centrally located donation centres:
• Bloodbank@HSA, at the Health Sciences Authority *(opposite Outram Park MRT Station)*
• Bloodbank@Dhoby Ghaut, at Dhoby Xchange of Dhoby Ghaut MRT Station • Bloodbank@Westgate Tower *(near Jurong East MRT Station)*
• Bloodbank@Woodlands, at Woodlands Civic Centre *(opposite Causeway Point, Woodlands MRT Station)*

FIND OUT MORE AT WWW.HSA.GOV.SG OR WWW.REDCROSS.SG

ILLUSTRATIONS: 123RF

TEXT: SOL E SOLOMON

Heart devices may ward off sudden death

In an emergency such as a heart attack, heart devices already implanted in the body can prevent the attack from becoming serious or fatal. By Annie Tan

A CARDIAC ARREST TAKES PLACE when the heart stops beating. Sudden and deadly, it can happen without warning.

In a public place, a person can be rescued if someone uses an Automated External Defibrillator (AED), which delivers an electric shock to the heart to restore a normal rhythm.

But AEDs are not usually kept in homes, where 70 per cent of cardiac arrests occur, said Dr Ching Chi Keong, Senior Consultant, Department of Cardiology, and Director, Cardiac Electrophysiology and Pacing, National Heart Centre Singapore (NHCS).

"Patients typically only have a window of 10 minutes to be rescued. Without timely rescue, they may suffer permanent brain damage, which may leave them bed-bound or in a wheelchair, or result in death," said Dr Ching who is also Adjunct Associate Professor, Duke-NUS Medical School.

Enter the ICDs

This is where Implantable Cardioverter Defibrillators (ICDs) come in. They are like miniature AEDs implanted in the chest wall. They can help patients by automatically picking up life-threatening heart rhythms and delivering lifesaving shocks, usually within a minute.

NHCS does about 200 ICD implantations every year. Dr Ching said this device is 99 per cent effective in preventing deaths from cardiac arrests.

Implanting an ICD in a patient is a minimally invasive operation, which can be done within an hour with sedation and local anaesthetic.

Post-operation discomfort is manageable, and the risk of complication is less than 1 per cent.

Patients can expect to be on their feet after surgery and return home the very next day. The wound will heal over the next seven to 10 days.

After surgery, patients will not have to make major lifestyle changes. They can go jogging, swimming and even travelling. Some famous people who have had an ICD implanted include former US Vice-President Dick Cheney.

But there are precautions that they have to take after having the device implanted.

"We don't recommend extremely vigorous shoulder exercises on the same side as the operation, such as hard swings and pull-ups. Patients with an ICD should also avoid arc welding, and be careful when operating heavy vibratory tools such as drills, because these quick, repetitive movements may confuse the ICD device," said Dr Ching.

Why the low take-up rate?

Although the quality of ICDs has improved over the years, the take-up rate is still low.

The latest generation of devices are smaller (about 40cc in volume) and more comfortable. They have evolved to also reduce inappropriate shocks caused by abnormal heart rhythms not associated with cardiac arrest. The battery life has also increased from four to seven years, and most ICDs are now MRI-safe.

> **PATIENTS TYPICALLY ONLY HAVE A WINDOW OF 10 MINUTES TO BE RESCUED. WITHOUT TIMELY RESCUE, THEY MAY SUFFER PERMANENT BRAIN DAMAGE.**
>
> DR CHING CHI KEONG, SENIOR CONSULTANT, DEPARTMENT OF CARDIOLOGY, AND DIRECTOR, CARDIAC ELECTROPHYSIOLOGY AND PACING, NHCS

Despite the benefits, studies show that patients still fight shy of them. One study of 704 Singaporean patients who were eligible for ICDs found that only 9.4 per cent underwent the procedure.

Another showed that out of the 240 patients who declined having the devices implanted, the death rate at two years was 20 per cent. One in three deaths was due to cardiac arrest, which might have been prevented if the ICDs were implanted, said Dr Ching.

Top reasons for refusing the implantation were the high cost, the invasive nature of the procedure, fear of complications, and the advanced age of patients, according to a paper published in the *Singapore Medical Journal* last year.

"The majority of patients believed that medication or diet and exercise could prevent cardiac arrest, and 48 per cent were not aware that the key function of an ICD is to prevent cardiac arrest. Once the heart is damaged, there are no known reliable and consistent therapies that can restore its function," said Dr Ching, highlighting the importance of awareness.

"The paper suggests that patients don't know they are at risk of sudden death. They also perceived that their doctor's recommendation wasn't a strong recommendation," said Dr Ching.

His advice to patients is to actively find out their ejection fraction (EF) from doctors. The EF measures how well the heart is pumping out blood. A normal EF should be 55 and above. Patients with an existing heart condition and EFs of less than 40 per cent should consider ICD therapy, on top of their current medication.

"This is especially important if they had previous episodes of sustained palpitations that lasted for minutes, and that led to unexplained fainting spells."

He said greater awareness will help to prevent high-impact complications and sudden deaths from cardiac arrests.

PHOTO: 123RF

Once the heart is damaged, there are no known reliable and consistent therapies that can restore its function, said Dr Ching.

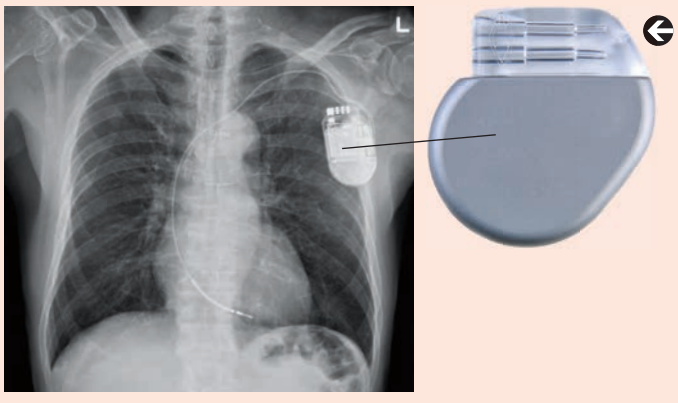


PHOTO: NHCS

Like a miniature AED, the ICD pictured on the right, is able to pick up life-threatening heart rhythms and deliver lifesaving shocks, usually within a minute.

PHOTO: NHCS

Dr Ching highlighted the importance of raising awareness about ICDs and their key function of preventing cardiac arrest.

PHOTO: ISTOCK; ILLUSTRATION: 123RF

Teenage bed-wetting: a cause for worry?

When teenagers still have "accidents", it's time to get to the underlying cause of their problem. By VK Santosh Kumar

WHEN A TEENAGER suddenly starts to wet his bed, he might do well to adopt a more relaxed attitude, especially towards school.

Burning the midnight oil in a bid to get high grades – and often with pressure from parents – can lead to physical and mental exhaustion, and such deep sleep at night that he fails to get the signal to wake up to empty his bladder, said Dr Ng Lay Guat, Senior Consultant, Department of Urology, Singapore General Hospital (SGH).

This is often a phase that the young person grows out of once the stressful period passes, she said. While bed-wetting among teens isn't common, the three or four cases she sees in a year are typically secondary school "high-flyers" who get "accidents" before a major event like their O-level examinations, for instance.

"They work hard in the day, so we might ask them to moderate the amount of work that they do to get them to have adequate rest and sleep better," said Dr Ng.

Because of the stigma and embarrassment associated with bed-wetting, these young people mostly don't seek advice until they really need to – for instance, before attending a school camp. Ironically, because they may not sleep well in camp, they don't tend to wet their bed when they attend such events.

"The sleep pattern is very important. If they don't sleep well, they are easily woken up by the feeling of urinary urge. They wake up to go to the toilet. But because of their high-flying status, they get very stressed before such events," said Dr Ng.

Children typically learn to control their bladder by the age of three years, although some will continue to have "accidents" till they are older. "Beyond the age of 12 years, we should investigate for underlying issues," said Dr Ng.

One way of getting to the root of the problem involves keeping what Dr Ng called a voiding diary – a record of the amount of liquids consumed; when the patient empties his bladder; the amount; as well as when he accidentally wets himself – for three days.

The diary provides an insight into the person's habits and condition.

"That diary is very important. For instance, it might tell us that the patient is okay during the day, but then he passes a lot of urine at night. From the patient's profile and diary, we can go on to investigate further. If we think it's sleep apnoea, we would refer them to an otolaryngologist," she said.

From the diary, a pattern might show that the patient passes a lot of urine at night, which is not common, said Dr Ng, noting that urinating excessively at night can happen to children who are very obese and suffer from obstructive sleep apnoea, where breathing is interrupted during sleep. People with sleep apnoea have raised atrial natriuretic hormone secretion, which leads to increased urination at night.

Bed-wetting teens tend to be high-achieving secondary school students.

For some, it may be a simple case of drinking too much water before bedtime. When advised to drink less, the problem goes away.

The diary may show that this is an issue throughout the day. In such cases, treatment will depend on the underlying bladder issue. Urinating excessively can be due to many things. Some people may have an overactive bladder, which leads to poor bladder control, or they have a problem with a small and stiff bladder.

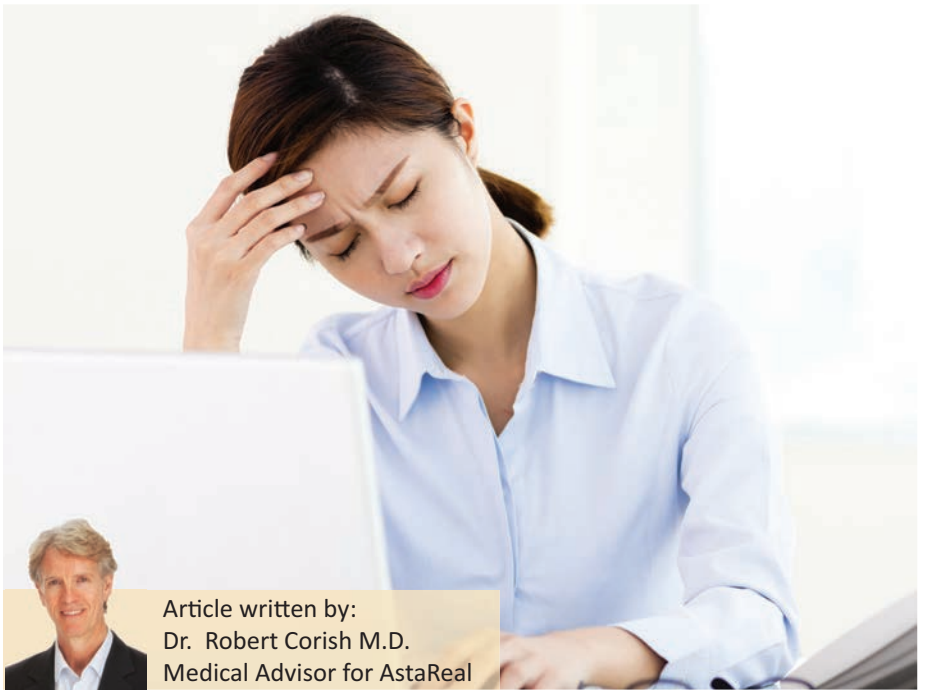
Seemingly unrelated conditions like diabetes insipidus – an imbalance of water in the body that leads to intense thirst even after drinking fluids, and subsequent excretion of large amounts of urine – or undiagnosed diabetes mellitus can also lead to excessive water consumption and urination throughout the day, said Dr Ng. The toilet habits noted in the voiding diary provide cues on the patient's condition, so they can then send the patients to see the relevant internal medicine physicians for further treatment, she added.

Treatment is based on identifying what will work best for the situation. Lifestyle changes – such as limiting fluid intake in the evening and studying in a stress-free environment – may be all that is needed.

Alarms and medication are other options. For instance, the alarm is set to wake the person during the night to go to the toilet, so that he doesn't sleep through and wet his bed.

Drugs to reduce urine production at night, help reduce bladder contractions or increase bladder capacity can also help. However, conservative measures like drinking less in the evening should go hand in hand with medications to help wean the patient off medications as soon as possible.

The Hidden Epidemic of "Tired All the Time"



Article written by:
Dr. Robert Corish M.D.
Medical Advisor for AstaReal

Fatigue and Tired All the Time (TATT)

"I have no energy", "I'm always tired" - these are the most common complaints made by people who experience fatigue. It is a universal problem that many people must deal with daily. To uproot this problem, we first must define what fatigue is and understand its causes and consequences before we can proceed to correct it.

To be clear, the kind of fatigue we are describing herein, is not the type of fatigue that is related to a disease such as heart failure, low thyroid function, anemia, chronic fatigue. Such fatigue associated with diseases has an underlying pathological cause. Rather, the fatigue I am referring to, is the kind that everyone experiences at some point, during the day, the week and especially during stressful times, and it does not simply go away with additional rest. It makes you feel "tired all the time (TATT)". Additionally, this common form of TATT-fatigue is a combination of both mental and physical tiredness since they are so inextricably linked together.

Classic examples of individuals who experience TATT include: busy parents - who are constantly on-the-go from morning until night, day after day, juggling between work and family...without a break! And not to forget about nurses, doctors, office workers, secretaries and executives - anyone with deadlines to meet, targets to achieve and responsibilities to fulfill. In truth, almost everyone knows how it feels to be TATT.

Biology of TATT and Mitochondria

Before we can decipher the reason behind such persistent tiredness, it is important to understand where our energy comes from to power all the activities of the body. Obviously, food is our fuel, but this fuel must first be efficiently converted into a usable form - 'biological energy' known as adenosine triphosphate (ATP) - which supplies the electricity that drives all the functions in the body. This ATP energy is manufactured in tiny power plants called mitochondria - found within the cells of our tissues and organs, all of which completely rely on the mitochondria to supply the energy required to function. In other words, every activity (thinking, driving, running, seeing, even breathing…) requires energy produced by the mitochondria.

As a prerequisite for this energy supply, the mitochondria within these cells rely on healthy nutrition (fuels), oxygen, water, and other targeted nutrients to function optimally. Whenever these essentials are lacking or deficient, mitochondria often struggle to produce barely sufficient energy to cope with stressful conditions. And we start to feel tired because our energy supply is unable to catch up with the requirement.

How Unhealthy Lifestyles Lead to TATT

Unhealthy and/or busy lifestyles are often the main drivers behind lower mitochondrial output and include factors such as: poor diet, insufficient sleep, inadequate hydration, lack of exercise, smoking, excess stress and over-indulgences (food and alcohol) - all of which generate excessive amounts of Reactive Oxygen Species (ROS) causing oxidative stress. ROS are harmful byproducts of metabolism and often attack healthy cells with their strong oxidizing power, causing inflammation, injury and dysfunction.

Under normal circumstances, the body handles these agitators with its own set of antioxidant defense; however, under high oxidative stress, the body's intrinsic antioxidant reserves have been depleted, the harmful effects of excess ROS become out of control and wreak cellular havoc. This has a tremendously negative impact on the mitochondria, causing a condition known as 'mitochondrial dysfunction': mitochondria generate less energy, which then leads to the condition we call TATT. On a side note, it has also been suggested that mitochondrial dysfunction is one of the major hallmarks of the ageing process, which is closely associated with such persistent tiredness.

The Good News

The good news is that medical science has been able to uncover some of the main pathways involved in mitochondrial dysfunction and thus it has provided us with a 'roadmap' by which we can prevent further mitochondrial damage, repair damaged pathways and lead us back to a functional and optimal state. This involves adjustments and modifications in our habits towards healthy lifestyles, such as: smoking cessation, exercise, healthy diets and adequate rest can have an incredible salutary impact on overall health and wellbeing.

Moreover, it is well-documented that specific targeted nutrition can both protect and improve mitochondrial efficiency to even greater levels, but we hardly get enough antioxidant protection from an average diet, let alone the unhealthy indulgences we sometimes pamper ourselves with. Ensuring that the mitochondria in all cells, tissues and organs receive abundant nutrition and energy to perform maximally is especially important for those who experience TATT. Therefore, a mitochondria-targeted supplement is advised to insure adequate antioxidant protection that cannot be provided by diet alone.

Astaxanthin - A Mitochondria-Targeting Nutrient

Astaxanthin is a red carotenoid produced by freshwater microalgae in response to environmental stress. Astaxanthin's unique molecular structure empowers it with potent antioxidant and anti-inflammatory properties, which allow the microalgae to withstand and repel harmful ROS, thereby preventing oxidative stress and surviving the crises.

Moreover, research has demonstrated that Astaxanthin has a high affinity for human cellular membranes and fits perfectly within the mitochondria - exactly where it is needed most to protect the mitochondria from harmful ROS.

Astaxanthin has been shown to:

1. Reduce oxidative stress associated with mitochondrial dysfunction
2. Preserve mitochondrial membrane integrity and energy production
3. Promote fatty acid (fuel) transport into the mitochondria for conversion into ready-to-use energy
4. Reduce inflammatory response in mitochondria

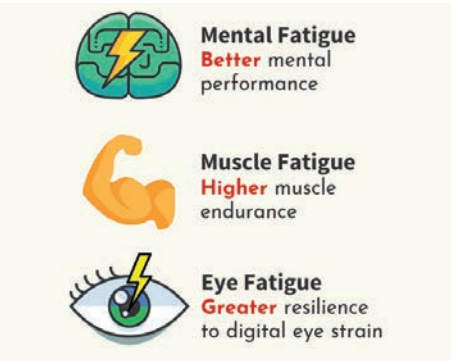
As mitochondria are ubiquitous in all cells of the body (except red blood cells), the protective effects of astaxanthin can be applied to multiple organ-specific TATT conditions.

Evidence-Based Anti-Fatigue Effects of Astaxanthin

Double-blind placebo-controlled studies in humans have demonstrated that astaxanthin reduces mental, visual and physical fatigue and improves endurance. One study comprised of two groups of individuals: Group A was supported by daily astaxanthin, whereas Group B received a placebo. Both groups were then subjected to a timed (30 minutes) continuous calculation challenge. The results indicated that Group A performance was superior, achieving significantly fewer errors when compared to the placebo Group B. This was particularly evident in the final 15 minutes when fatigue sets in.

The International Journal of Sports Medicine reported that professional cyclists receiving astaxanthin for 6 weeks were able to shave an average of 2 ½ minutes off their 20km cycling time trials compared to placebo. In another study, a group of European soccer players who had been receiving astaxanthin exhibited reduced blood levels of inflammatory biomarkers and lower quantities of lactic acid build-up (fatigue marker) compared to placebo, indicating lower muscle fatigue.

Multiple human studies have also shown that a daily dose (6 mg) of astaxanthin reduced eye fatigue, eye strain and improved visual acuity. In a Japanese study, half of the visual display terminal (VDT) workers who suffered eye fatigue were relieved from the condition after taking daily supplement of astaxanthin for 4 weeks, whereas almost everyone from the placebo group continued to experience eye fatigue.



All of these studies reflect astaxanthin's fatigue-fighting effects as they pertain to mitochondrial function, which is crucial in ensuring efficient energy production for the activities involved. Such targeted nutrition, together with healthy lifestyles, good hydration and stress relief will not only resist the fatigue of the daily grind, it will also pay huge dividends in improving energy levels, performance measures and overall wellness.

However, the only dietary sources of natural astaxanthin for humans are red seafood such as wild caught Alaskan Sockeye salmon, and it requires kilograms of salmon to be eaten every day to capture natural astaxanthin's health benefits. It is therefore recommended to obtain high quality natural astaxanthin in the form of health supplements, in order to reach the therapeutic levels of natural astaxanthin shown in clinical studies.

AstaReal® ACT2 contains natural astaxanthin which provides your body with total antioxidant support and clinically proven anti-fatigue effects. Product is available at selected clinics by prescription only

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HEALTH XCHANGE

Bringing baby out safely

Is it safe to take my baby out in public, and for how long?
It is important to give your baby a chance to explore the world, but it is equally important to consider things like where you are going, the weather and available facilities.

For instance, going to an enclosed, crowded environment with poor ventilation raises the chance of catching an infection, especially an airborne one such as respiratory pathogens and even chicken pox. So limit the time that your baby spends in places like expo fairs, crowded shopping centres and eateries. Babies, especially newborns, can also be overwhelmed by light and loud noise at these places.

Likewise, limit time in gardens and parks, as babies can get bitten by mosquitoes and other insects, and contract infections like dengue fever or the zika virus. Spending too much time outdoors in sunny Singapore can also put your baby at risk of heat exhaustion and sunburn. But this doesn't mean your infant shouldn't spend time outdoors, as limited exposure to sunlight puts it at risk of developing vitamin D deficiency. This deficiency can cause rickets – a softening and weakening of bones, and bone deformities.

Before going out in the sun, wear protective clothing and apply sunscreen to shield your baby from harmful direct sunlight. The American Academy of Paediatrics recommends that children under six months of age should be kept out of direct sunlight because of the risk of skin cancer.

Before heading out, check that the place you are going to is baby-friendly, as you will need facilities for changing diapers and breast-feeding. But diaper-changing stations can be breeding ground for germs, including those that cause hand, foot and mouth disease. Be sure to use antiseptic wipes to clean the diaper-changing table before placing your own diaper-changing mat on top of it. Also, wash your hands before and after changing diapers, and also before carrying your baby.

Remind friends and family, even if they aren't sick, to wash their hands before touching your baby.

Dr Alvin Ngeow, Associate Consultant, Department of Neonatal & Developmental Medicine, Singapore General Hospital

ILLUSTRATION & PHOTO: 123RF

CONTEST

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QUESTIONS

- **When it comes to assessing frailty in the elderly, what does the back scratch test entail?**
- **Which former US Vice-President has had an ICD implanted in his chest?**

Send your answers with details of your name, age, gender, address and telephone number to:
Email editor@sgh.com.sg (or)
Post The Editor, *Singapore Health*, Singapore General Hospital, Communications Department, #13-01 Surbana One, Blk 168, Jalan Bukit Merah, Singapore 15016.

Deadline May 31, 2018

Winners will be notified by phone or email. Please remember to send in all the details indicated above. Incomplete or multiple entries will not be considered.

WINNERS OF CONTEST 50
1. Idris Rahim 2. Serene Lee Siling
3. L Lim 4. Lim Thian Seng
5. Catherine Tay

Don't scratch that itch

Some of my grandkids are turning four years old, and one is two years old next month. There are lots of mosquitoes in our garden, and despite using citronella stickers that stick onto the outside of clothes, they still get bitten on their arms and exposed ankles.

What can we do if they get bitten, scratch feverishly and cannot sleep? Is baby Benadryl cream okay to use at their age? Can it be harmful to scratch, such that it opens up the bite and spreads the toxins so that it is not such a concentrated itch?

Generally, the citronella stickers without chemicals are safe for children to use. However, evidence has shown that these stickers may cause contact dermatitis in patients with eczema/sensitive skin. If you notice any rash or itch, please stop using it and consult a doctor.

Reactions to mosquito bites can be very itchy. Thus, barrier methods (like long-sleeved pants and shirts) and avoidance may be the most effective way to prevent the child from being bitten by mosquitoes. If the child has already been bitten, he or she will probably benefit from the use of anti-inflammatory topicals.

Do not touch or scratch the affected area because that may cause further inflammation and discomfort.

Dr Uma Alagappan, Consultant, Dermatology Service, KK Women's and Children's Hospital

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On 11 August 2017, Channel NewsAsia (CNA) reported, "Glucosamine supplements don't help knee or hip arthritis pain"

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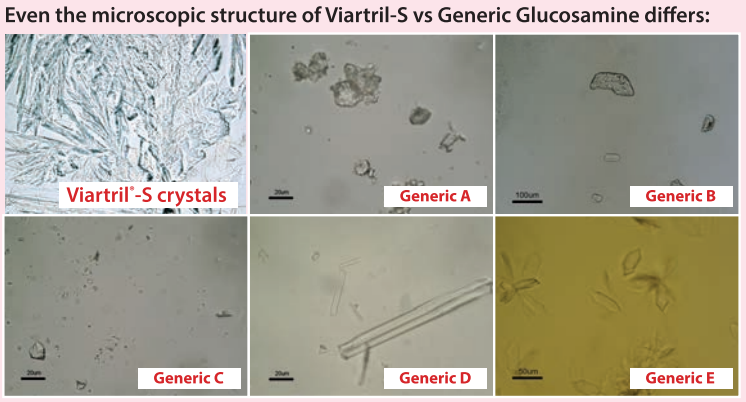

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Quoted from a European guideline:
"The European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO) advocates *the differentiation of prescription patented crystalline glucosamine sulphate from other glucosamine preparations*"

O. Bruyere et al, Seminars in Arthritis and Rheumatism 2014

Clinical Studies of Viartril-S vs Generic Glucosamine

More than 100 studies done on Viartril-S, the original & patented crystalline glucosamine sulphate, found it to be SAFE & EFFECTIVE including:

1) The role of diet and exercise and of glucosamine sulfate in the prevention of knee osteoarthritis: Further results from the PRevention of knee Osteoarthritis in Overweight Females (PROOF) study. **Seminars in Arthritis and Rheumatism, 2016.**
- Brand Used: Viartril-S

2) An algorithm recommendation for the management of knee osteoarthritis in Europe and internationally: a report from a task force of the European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO). **Seminars in Arthritis and Rheumatism, 2014.**
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3) Glucosamine therapy for treating osteoarthritis. **Cochrane Database, 2009.**
- Brand Used: Viartril-S

4) Total joint replacement after glucosamine sulphate treatment in knee osteoarthritis: results of a mean 8-year observation of patients from two previous 3-year, randomised, placebo-controlled trials. **Osteoarthritis and Cartilage, 2008.**
- Brand Used: Viartril-S

5) Glucosamine sulfate in the treatment of knee osteoarthritis symptoms: a randomized, double-blind, placebo-controlled study using acetaminophen as a side comparator. **Arthritis & Rheumatology, 2007.**
- Brand Used: Viartril-S

6) Glucosamine sulfate use and delay of progression of knee osteoarthritis: a 3-year, randomized, placebo-controlled, double-blind study. **Archives of Internal Medicine, 2002.**
- Brand Used: Viartril-S

7) Long-term effects of glucosamine sulphate on osteoarthritis progression: a randomised, placebo-controlled clinical trial. **The Lancet, 2001.**
- Brand Used: Viartril-S

Please consult your health professional for more clinical papers.

The Netherlands study* reported in CNA, analysed only 5 out of 21 eligible studies. The 5 studies which found glucosamine to be INEFFECTIVE are:

*Ref : http://dx.doi.org/10.1136/annrheumdis-2017-211149

1) Glucosamine and chondroitin for knee osteoarthritis: a double-blind randomised placebo-controlled clinical trial evaluating single and combination regimens. **Annals of the Rheumatic Diseases, 2015.**
- Brand Used: Generic Glucosamine

2) Clinical efficacy and safety of glucosamine, chondroitin sulphate, their combination, celecoxib or placebo taken to treat osteoarthritis of the knee: 2-year results from GAIT. **Annals of the Rheumatic Diseases, 2010.**
- Brand Used: Generic Glucosamine

3) Effect of glucosamine sulfate on hip osteoarthritis: a randomized trial. **Annals of Internal Medicine, 2008.**
- Brand Used: Generic Glucosamine

4) Glucosamine, chondroitin sulfate, and the two in combination for painful knee osteoarthritis. **The New England Journal of Medicine, 2006.**
- Brand Used: Generic Glucosamine

5) Effectiveness of glucosamine for symptoms of knee osteoarthritis: results from an internet-based randomized double-blind controlled trial. **The American Journal of Medicine, 2004.**
- Brand Used: Generic Glucosamine

A recent response to the Netherlands review quoted†:

"Glucosamine products other than prescription* crystalline glucosamine sulfate are not effective in hip or knee OA pain and function."

Unlike in Singapore, Viartril-S is a prescription patented crystalline glusosamine sulphate in some countries, including many European countries.

† *Different glucosamine sulfate products generate different outcomes on osteoarthritis symptoms. Annals of the Rheumatic Diseases, 6 Sept 2017.*

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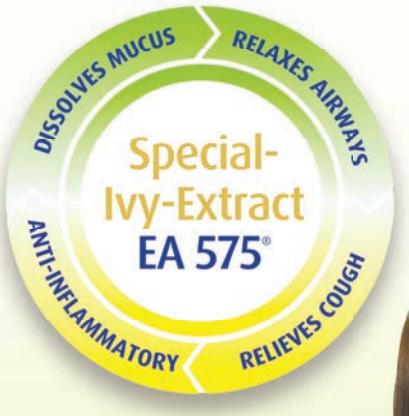

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