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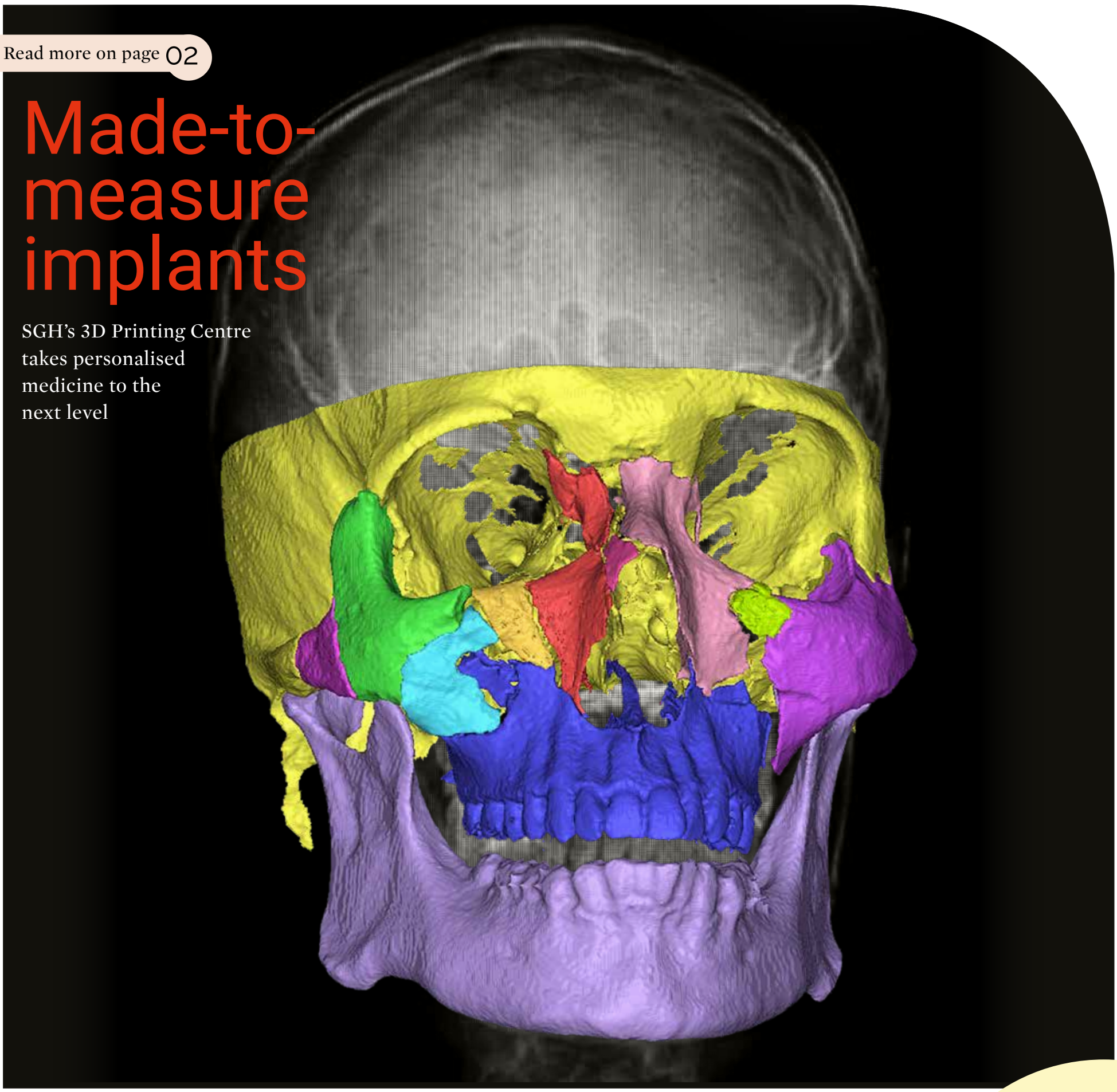
Made-to-measure implants

SGH's 3D Printing Centre takes personalised medicine to the next level



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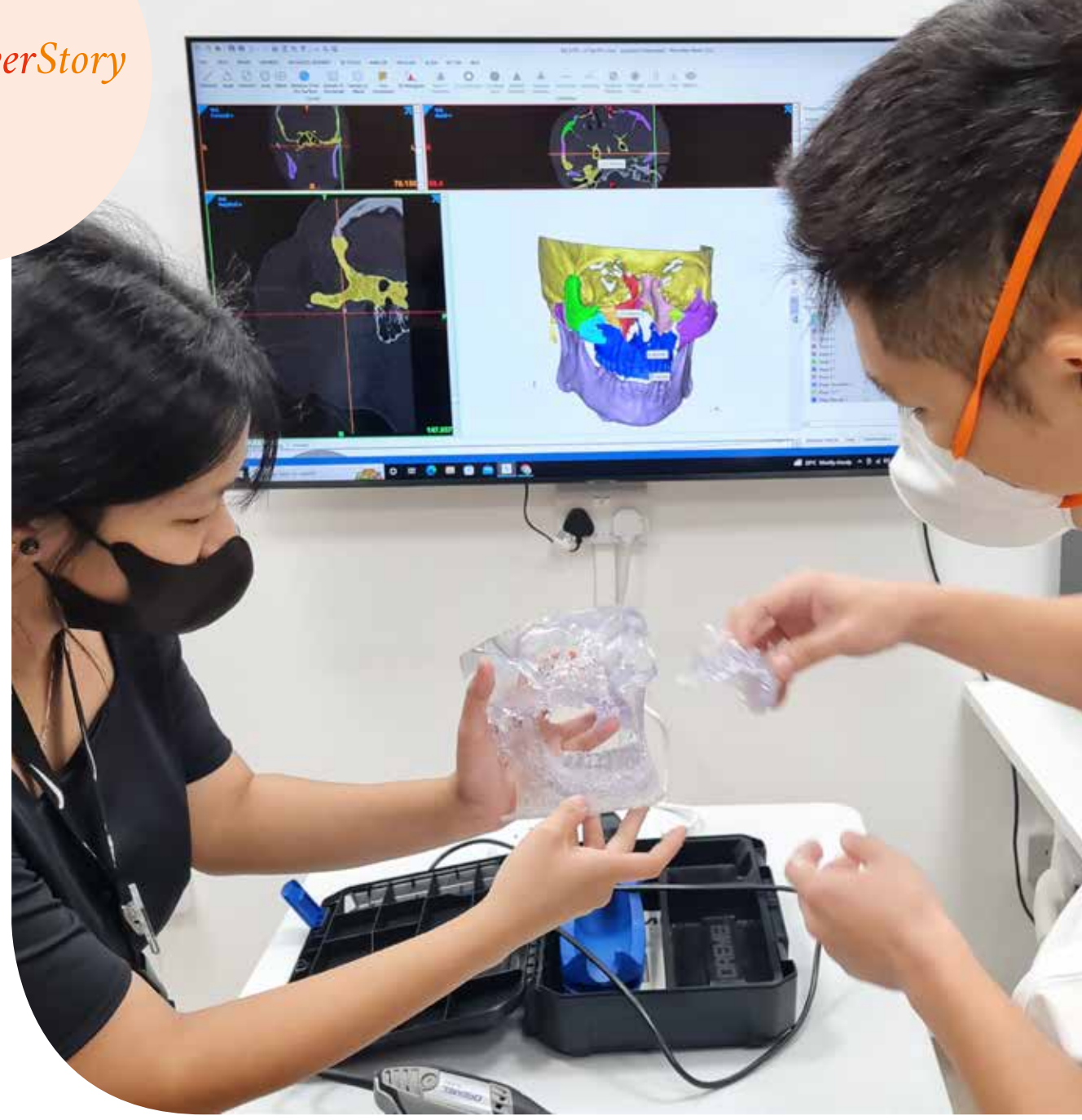

(Cover and right) Scanned images are converted to 3D models. In this case, 3D-printed parts aided surgeons in repairing a patient's skull fractured in an accident.

Selected photos featured were taken prior to the COVID-19 pandemic. For all recent photo shoots, safe distancing measures were adhered to.

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Safer surgeries with 3D printing

Harnessing the potential of 3D printing to take personalised medical services to the next level

by Goh Bee Lian

As hospitals transform processes to deal with the challenges of an ageing population, adopting high-tech initiatives to aid their efforts is advancing quickly.

At Singapore General Hospital (SGH), a 3D Printing Centre has been established, with the initial focus on producing 3D-printed patient-specific 3D models to help in pre-surgical planning and rehearsal of uncommon and complex operations. "SGH is harnessing the potential of 3D printing and expanding its use to achieve better patient care, starting with the launch of our very own 3D Printing Centre in SGH," said Dr Mark Tan, Clinical Lead, 3D Printing Centre, SGH, and Consultant, Department of Diagnostic Radiology, SGH. "Currently, 3D models allow surgical teams to rehearse complex cases, as well as to pre-size and pre-shape implants to the patient's anatomy before operations to improve their fit, patient outcomes and to decrease operative time."

Indeed, said Dr Tan, requests to turn scans into 3D models are rising, either for surgical planning or implants. "We've been utilising 3D-printed models and implants, as well as performing research and development, in clinical 3D printing for a number of years as we see potential to improve patient care. One example is the 3D-printed custom bioresorbable implants, which give patients new treatment options," he added.

Sunken chest

In December 2021, SGH pioneered a treatment using a 3D-printed implant on a 20-year-old man with a condition known as *pectus excavatum* or sunken chest.

He was born with a chest that curved inward from the top to the bottom, preventing both lungs from expanding fully, said Dr Chew Khong Yik, Senior Consultant, Department of Plastic, Reconstructive and Aesthetic Surgery, SGH. The deformity also pushed his heart against his left lung.

The patient first underwent a traditional treatment to insert a stainless steel bar into his chest to push it outward. His extensive deformity, however, meant that the lower part of his chest still curved inward. "We could

Sunken chest

Pectus excavatum or a sunken chest is not as rare a condition as some may think. It occurs in one in every 300 births. However, the severity varies, from the very mild, which does not need medical attention, to moderate and severe, where functional issues like breathing may be affected.

Of those born with the defect, 10 to 20 per cent of cases are severe. Men are more likely to suffer from social embarrassment as they have to bare their chests swimming or stripping down during National Service, for instance, and this can lead to anxiety and other mental health issues.

PHOTO: VERNON WONG

The 3D models use colours to better differentiate parts of the bone structure.

Surgeons can plan and rehearse surgical procedures using 3D models, and this leads to better outcomes, says Dr Chew Khong Yik.

PHOTO: VERNON WONG

With computer-aided design and manufacturing technology, we are able to create an implant that can fill the defect exactly.

Dr Chew Khong Yik
Senior Consultant, Department of Plastic, Reconstructive and Aesthetic Surgery, Singapore General Hospital

"We've been utilising 3D-printed models and implants, as well as performing research and development, in clinical 3D printing for a number of years," says Dr Mark Tan.

have used a fat graft but, in a chest, it can be pulled down by gravity. When the patient runs or marches, the graft may move up and down, which can look unsightly," said Dr Chew.

A second steel bar was not used on the lower deformity as the patient's functions, like breathing, were not affected. Instead, a medical team led by Dr Chew turned to another method of addressing the concavity of the chest.

Working with local medical devices company Osteopore International, a bioresorbable polymer implant was developed for the patient. The custom-fitted porous structure embedded with bone marrow taken from the patient's thigh bone acts as a scaffold for the patient's own bone cells to regenerate and grow. Over two years, the implant will slowly dissolve, leaving the patient with a corrected chest that is made up of his own bone.

To create the 3D implant, the patient's chest was first scanned in a CT scanner, and the image converted into a file that can be used to make the 3D model implant. SGH and Osteopore International worked closely using physical as well as virtual models to adjust and size the implant to be as near as possible to the structure of his body to reconstruct the chest deformity. The final implant was produced by Osteopore International for surgery.

"We believe our technique would enable more patients to come forward and seek treatment for this deformity. The implant is not permanent and is made using their own body tissue. With imaging-rendered technology, we can achieve perfect symmetry of reconstruction by using mirror-imaging techniques. With computer-aided design and manufacturing technology, we are able to create an implant that can fill the defect exactly," said Dr Chew.

Creating a 3D model of the patient's chest has other benefits, said Dr Tan. It can be used for planning and rehearsing the surgery, boosting the surgical team's confidence in performing the operation. This allows the operation to go more smoothly, cuts surgery and anaesthesia times and results in a quicker recovery for the patient, he added.

PHOTO: VERNON WONG

PHOTO: VERNON WONG

During surgery, we need to push aside muscles, and sometimes it is difficult to know the exact location of each vertebra. With the 3D model, we were able to carry out the surgery more quickly and safely.

Dr Reuben Soh
Senior Consultant, Department of Orthopaedic Surgery, Singapore General Hospital

Severe spinal deformity

A patient, Ms Chong Li Fong, was born with scoliosis, where the spine curves as a result of irregular growth during adolescence. The deformity, while visible, did not affect her until she hit her 50s, when she began to experience pain when sitting, standing and walking.

SGH sees an average of 500 scoliosis cases each year, of which 10 to 15 per cent require spine correction surgery. Many patients, however, hesitate to undergo the procedure because of potential surgical risks and complications such as paralysis. To overcome this, 3D-printed models to plan and prepare for complex cases like Ms Chong's have now begun to be used.

With a personalised, life-size replica, the surgical team is able to see every detail of the spine and determine the safest way to perform the procedure. In Ms Chong's case, Dr Reuben Soh, Senior Consultant, Orthopaedic Surgery, SGH, was able to use the model to show and explain to her the condition of her spine and what he would do during the procedure. This boosted her confidence and she agreed to the spine surgery. She had consulted other doctors before but was reluctant to undergo surgery as she was fearful of the risks.

"Using 3D technology, we were able to print out a model of the vertebrae and see which had worn out. During surgery, we need to push aside muscles, and sometimes it is difficult to know the exact location of each vertebra. With the help of the 3D model, we were able to carry out the surgery more quickly, neatly, optimally and safely," said Dr Soh.

As 3D printing at SGH was still in its infancy then, Dr Soh enlisted the help of Associate Professor Too Chow Wei, Senior Consultant, Department of Vascular and Interventional Radiology, SGH, to map Ms Chong's spine by CT scan. The model was then sent to an overseas 3D printing company.

With the 3D model, the medical team was able to identify which of Ms Chong's bones were deformed and where they were in relation to the spinal cord. Bones that were not located close to the spinal cord could be cut more quickly. Without the 3D print, a CT scan would have to be used during the operation, with time needed for the images to be processed into a 3D image. With the 3D model, surgery time was reduced by about two hours.

Post-surgery, Ms Chong can stand straight and is 8 to 10cm taller than before. She goes about her daily activities without pain, and even takes hour-long walks with her father.

Dr Soh continues to work with Assoc Prof Too on developing 3D models of very complex spine conditions, as well as of spinal deformities caused by tumours.

What is 3D printing?

In 3D printing, thin layers of materials are fused, one at a time, from a digital file, to produce a three-dimensional object. The materials used in 3D printing range from plastics and carbon fibre to glass fibre and even chocolate and pasta. Three-dimensional printing has been applied in medicine since the early 2000s, with the technology first used to make dental implants and customised prosthetics. It has since evolved to produce bones, ears, exoskeletons, tissues and organs.

PHOTOS: VERNON WONG

Medication safety champions are appointed at pharmacies and wards to address the LASA issue, says Ms Yeap Ching Yee.

Look the same, sound the same, but not the same

Measures to prevent confusion surrounding medications with similar names or appearance.

by Thava Rani

Just three letters differentiate the medications hydralazine and hydroxyzine. The former is an anti-hypertensive, while the latter is an anti-histamine used to relieve itchiness or sneezing.

Then there are look-alike drugs. The antibiotic co-trimoxazole 80/200mg tablet is a round white tablet in an aluminium foil strip, very much like the tolbutamide 500mg tablet, which is used in the management of diabetes.

A LASA list is shared among the three SingHealth community hospitals. "This allows staff to learn from each other," says Ms Yeap Ching Yee.

'Look alike, sound alike' or LASA medications like those mentioned above are an added challenge for healthcare workers who handle them on a daily basis. Hospitals therefore go to great extents to ensure errors are minimised when patients are given their medication. Pharmacists and nurses go through seven checks — right patient, medication, time, dose, dosage form, frequency and route — before handing the medication to the patient.

This vigilance is not without reason. Accidental overdosing may result in the patient experiencing adverse drug reactions or be at an increased risk for side effects. On the other hand, when patients receive a smaller dose than they should, the treatment may be ineffective.

"If a patient takes the wrong medication, there may be a need for lab monitoring of vital signs to make sure the patient does not suffer any adverse reaction from it," said Ms Yeap Ching Yee, Pharmacist, Sengkang Community Hospital (SKCH).

The SingHealth Community Hospitals (SCH) maintains a LASA list that is shared among the three community hospitals under its care, namely SKCH, Bright Vision Community Hospital and Outram Community Hospital. "This allows staff to learn from each other and ensures they are competent when rotated among the three hospitals," said Ms Yeap.

Within the pharmacy, preventive measures are also in place. For instance, drugs that are similar in appearance have their bins labelled with a bright 'LOOK-ALIKE' sticker. The names of the drugs they are similar to are listed on the bin too. As for medications that sound alike, capital letters are used on the labels — HydrALAzine vs HydrOXYzine — to highlight the differences. For medications that are available in multiple dosages, the strengths of the drugs are stated in bold red font to help staff tell them apart. All LASA items and multiple-strength preparations are also intentionally placed apart from one another.

Errors can occur during prescription, packing or administering but the risk is highest when the medication is being administered to the patient. Ward staff are therefore extra cautious when giving medication to the patients, especially when dealing with unfamiliar or infrequently used drugs or drugs that are relatively new.

To address the potential risk of medication errors associated with LASA drugs, SCH has appointed staff champions at each of its hospitals. At the pharmacy, one Pharmacy Technician is appointed the medication safety champion to regularly update new drug packaging and raise any concerns related to LASA items.

Similarly, a staff nurse from each ward is appointed the medication champion. "The staff nurses disseminate latest standard medication policies, obtain feedback on any challenges encountered during serving of medications, empower and support other colleagues to understand the importance of medication safety and offer guidance when required," said Ms Yeap.

When medication errors or near-misses do occur, they are promptly shared through the pharmacy chat group. This serves to alert other staff and prevents similar incidents from recurring or occurring elsewhere.

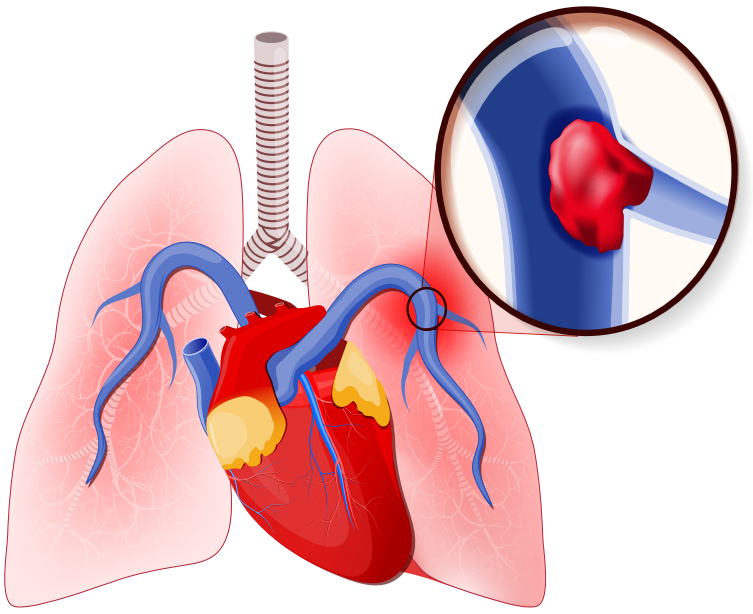
Training is also crucial, added Ms Yeap. The pharmacy and nursing teams worked together to create in-house medication management through presentation slides and the dissemination of LASA lists to clinical staff. Additionally, the SCH patient safety bulletin is also in place and shared regularly with all staff so that they are aware of medication safety measures. "All these measures drive continuous learning and sharing, and help to reduce confusion and address the potential risk of medication errors associated with LASA drugs," she said.

Good practices for the home

We recommend that patients and their caregivers apply the following tips to prevent medication errors at home:

- Make a medication list and keep it up-to-date; take note of any changes in packaging/brands (pharmacists will usually remind the recipient if there are any changes)
- Read labels carefully during administration
- Follow dosing instructions exactly
- Use a pillbox to organise medicines if required, and double check during the packing process
- Try not to obtain medicines from many different locations as the packaging may look different and increase risk of confusion

Turning the tide on blood clots



Singapore General Hospital's new rapid-response service aims to expedite critical medical decisions and treatment logistics for patients with severe pulmonary embolism to achieve better health outcomes.

by Vicki Yang

Pulmonary embolism (PE), one of the most common complications seen in hospitals, can kill if not identified and treated promptly.

As such, a new Singapore General Hospital (SGH) service has been created to provide fast and coordinated care to ensure better health outcomes for patients with acute PE or blood clot in the lung. "Pulmonary Embolism Response Team (PERT) is a rapid-response team with multiple specialists to expedite the decisions, diagnoses and logistical planning for very sick PE patients," said Dr Kristen Alexa Lee, Consultant, Department of Vascular and Interventional Radiology, SGH.

Besides Dr Kristen Alexa Lee, PERT includes (left) Associate Professor Too Chow Wei, Senior Consultant, Department of Vascular and Interventional Radiology, SGH; and (right) Dr Sewa Duu Wen, Senior Consultant and Head, Department of Respiratory and Critical Care Medicine, SGH.

"PE is often called a silent killer because, when caught too late, patients may develop cardiac arrest and pass away," says Dr Cheong May Anne (centre), seen here with two other members of the PERT team: (left) Dr Ho Vui Kian, Senior Consultant and Head, Intensive Care Medicine, SGH; and Dr Mathew Jose Chakaramakkil, Consultant, Cardiothoracic Surgery, SingHealth.

"PERT is a rapid-response team with multiple specialists to expedite the decisions, diagnoses and logistical planning for very sick PE patients" says Dr Kristen Alexa Lee.

PE occurs when a blood clot develops in a blood vessel, often in the veins of the legs, and travels to a lung (pulmonary) artery, where it can block blood supply to the lungs. Significant blockage can lead to low oxygen levels, pressure buildup in the right side of the heart and, in severe cases, death. "PE is often called a silent killer because, when caught too late, patients may develop cardiac arrest and pass away. Our aim is to pick it up beforehand, as PE is highly treatable and preventable," said Dr Cheong May Anne, Associate Consultant, Department of Haematology, SGH.

This multidisciplinary initiative has a core team staffed by specialists in respiratory and critical care, anaesthesiology, interventional radiology, cardiothoracic surgery, haematology and cardiology.

The roles of each specialty come into play the moment a patient arrives at the hospital, all the way to discharge. First, the critical care specialists manage the overall clinical picture of the patient when he displays PE symptoms, such as breathlessness. They stabilise his condition, check for PE through a computed tomography (CT) scan and look for signs of right heart dysfunction (when the heart's right ventricle is too weak to pump enough blood to the lungs).

For patients with PE and concerns of right heart dysfunction, PERT is activated. This requires the core team to convene on a secure hospital group chat to discuss imaging and laboratory findings as well as treatment options. Haematologists provide expertise on medications, such as blood thinners. Interventional radiologists and cardiothoracic surgeons offer interventions to expedite removal of blood clot from the lungs. Interventional radiologists place catheters, under image guidance, through a small incision in the groin or neck into the pulmonary arteries. Clot-busting agents are then given directly to break down the clot. Special suction devices can also be placed in the clogged arteries in a similar fashion to suck out clots.

The PERT service also ensures the long-term care and management of patients. Following discharge, patients are referred to other SGH services such as the thrombosis outpatient clinic for follow-up.

The reduced time taken for communication among the specialists involved in treating severe PE and coordination of patient logistics means taking advantage of the critical window of time for prompt and early treatment before the tide turns. "A common scenario before PERT was established was that a surgeon had to talk to five different groups of people for the different types of interventions. During this process, there may be gaps in coordination and fragmentation of care. A consolidated multidisciplinary management is essential and that is the concept of a PE response team," said Dr Cheong.

Individualised care

Since its formalisation in November 2021, PERT has been activated more than 70 times.

The increasing incidence of PE that the hospital sees is due to Singapore's ageing population, a surge in cancer-related blood clot blockages and, more recently, patients with COVID-19 that place them at a higher risk for the condition. "The fact that this team is multidisciplinary means many different eyes and perspectives come together to give the best personalised care to the patient," said Dr Cheong.

The next phase for PERT is to ensure awareness of the service across various disciplines at SGH such that all patients can receive timely care when severe PE is diagnosed. Engagement of teams caring for cancer patients and post-surgical patients is essential as these patients are at a higher risk of developing blood clots.

A longer-term goal is to develop a seamless healthcare experience between hospitals for enhanced patient care. "As PE patients can come from different healthcare clusters and hospitals, we hope to provide the highest level of care through harmonisation across institutions and offer PE care in a seamless and personalised manner," said Dr Lee.

Predicting early heart disease in the elderly

National Heart Centre Singapore researchers have uncovered a link between sarcopenia and the heart, a discovery that could potentially identify elderly individuals at risk of heart disease.

by Elena Owyong

As people age, their muscles gradually weaken, resulting in a medical condition called sarcopenia, or age-related loss of muscle mass. Individuals with sarcopenia fall frequently, walk slowly and struggle with daily activities such as climbing the stairs.

In Singapore, sarcopenia's prevalence in the population is estimated to be 13 per cent, but significantly higher in older adults, at 30 per cent.

In 2014, a research team led by Associate Professor Angela Koh, Senior Consultant, Department of Cardiology, National Heart Centre Singapore (NHCS), conducted a longitudinal study to understand the link between sarcopenia and the heart.

Explaining the motivation for the study, Assoc Prof Koh said, "While the occurrence of skeletal muscle degeneration with ageing is known, the impact of sarcopenia on the ageing heart has not been identified." Skeletal muscles are muscles attached to the bones that help individuals to move; they also form the bulk of our muscles.

The study, known as the *Cardiac Ageing Study*, analysed 300 people in Singapore aged between 40 and 80 years. The researchers conducted various scans and assessments such as echocardiograms, skeletal muscle measurements and hand grip strength tests. An echocardiogram allows doctors to identify heart problems and determine whether heart problems are causing symptoms like chest pain and shortness of breath.

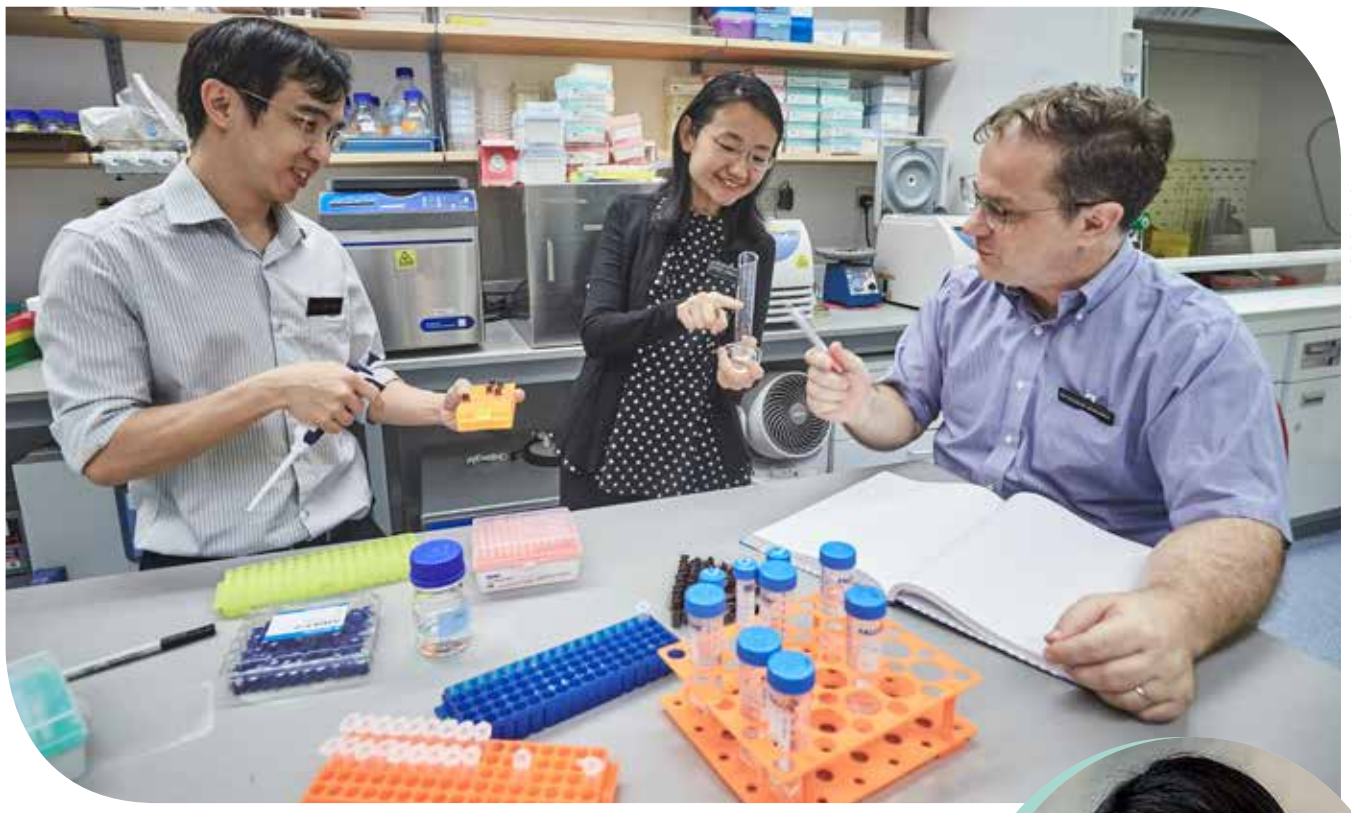


PHOTO: JUSTIN LOH

Assoc Prof Angela Koh (centre) led a team that conducted a longitudinal study to understand the link between sarcopenia and the heart. Others on the team include (left) Asst Prof Louis Teo, Senior Consultant, Department of Cardiology, NHCS, and Asst Prof Jean-Paul Kovalik, Director, Duke-NUS Metabolomics Facility, Duke-NUS Medical School

Skeletal muscle mass, function and heart structure

The five-year study found a strong link between skeletal muscle mass, function and heart structure. In fact, more than 20 per cent of older adults with sarcopenia had smaller hearts than those without sarcopenia, even after the findings were adjusted for age and body size. The team also ruled out other factors that could cause individuals to lose muscle mass, such as hypertension and diabetes, which could affect the study findings. Ultimately, the findings supported the team's hypothesis that older adults may suffer from a syndrome of cardio-sarcopenia before they develop heart disease symptoms.

Explaining the study findings, Assoc Prof Koh said, "The discovery of this pattern within the heart muscle suggests early development or progression of cardiovascular disease that occur jointly in the heart and skeletal muscle. This provides a window of opportunity to detect this syndrome early on, before heart disease occurs among our aged population." She added that some skeletal muscle losses may translate to muscle loss in the heart — the way this happens may be similar but more research is required to confirm it.

In the meantime, Assoc Prof Koh shared that exercise is key in maintaining skeletal muscle and heart health. Older adults can incorporate regular resistance exercise in their daily lives as it is known to induce muscle growth. Additionally, they can consume more protein-rich food such as fish, eggs, poultry and dairy products to prevent sarcopenia.

Future research

Assoc Prof Koh and her team are following up with their study participants to better understand the cardio-sarcopenia condition. They are also working on preventive strategies to tackle complications of the ageing heart.

Given that studies have shown that exercising promotes healthy ageing of skeletal muscle, they conducted a 12-week specialised exercise programme with 30 participants to find out the effects of the exercise programme in slowing down heart ageing and its benefits to overall health. Assoc Prof Koh aims to publish a report on the findings in a few years' time.

Assoc Prof Koh shared that she and her team are also embarking on deeper studies of biomarkers to understand cardio-sarcopenia beyond clinical correlational studies. Biomarkers are molecules found in blood, body fluids and tissues that indicate whether biological processes are normal or there is disease. "One key biochemical pathway is 'inflammaging', a chronic low-grade inflammatory state that has been reported in multi-systemic ageing conditions," said Assoc Prof Koh. The team will spend the next few years measuring these inflammatory biomarkers in samples taken from older adults with heart ageing.

The *Cardiac Ageing Study* received support from National Medical Research Council of Singapore, Duke-NUS Medical School and various philanthropic partners.

"The discovery of this pattern within the heart muscle suggests early development or progression of cardiovascular disease that occur jointly in the heart and skeletal muscle. This provides a window of opportunity to detect this syndrome early on, before heart disease occurs among our aged population," says Assoc Prof Angela Koh.

PHOTOS: VERNON WONG

"One size doesn't fit all for therapeutic dosing as we enter the era of personalised medicine," says Dr Jasmine Chung. Dr Lim Tze Peng adds that this new device, which he co-developed, can monitor up to 10 antibiotics at a time.

A dose of personalised medicine

A new therapeutic drug-monitoring tool developed by an SGH team will be able to tailor drug regimens to patients with hard-to-treat infections or those who are critically ill.

by Vicki Yang

It is not enough to just prescribe the right antibiotics to fight disease. It is also necessary — and crucial — to know how patients, especially those with hard-to-treat infections, are responding to their medications.

With conditions that can fluctuate frequently — as often as hourly for those in intensive care — medication dosages have to be adjusted quickly to meet each patient's individual clinical needs for the best outcomes. "Standard antibiotic regimens may be inadequate for these infections, which usually require a larger antibiotic dose to overcome the bacterial infection," said Dr Lim Tze Peng, Senior Principal Pharmacist Researcher, Singapore General Hospital (SGH).

According to Dr Jasmine Chung, Senior Consultant, Department of Infectious Diseases, SGH, patient-related factors add to the complexity of determining antibiotic doses. These include genetic factors and underlying health issues such as obesity and poor kidney or liver functions that can affect the way these organs process antibiotics. At the same time, development of new antibiotics is slow, while antibiotic-resistant bacteria are rising. Thus, an individualised approach to antibiotic dosing can achieve better outcomes, particularly for intensive care patients, whose antibiotic levels are critical. "One size doesn't fit all for therapeutic dosing as we enter the era of personalised medicine, especially for patients who are critically ill or have difficult-to-treat infections," said Dr Chung.

As available tools can take too long or are cumbersome, especially when very sick patients are likely to be on several antibiotics at one time, a team of SGH Infectious Diseases and Pharmacy specialists worked together to develop a therapeutic drug-monitoring tool to measure the antibiotic concentration in patients' blood.

Procedures like dialysis, for instance, can remove antibiotics from the blood. This then results in suboptimal antibiotic concentrations and poorer outcomes, even though the correct dosage was given. Current available tools can measure a limited number and type of antibiotics, and also take days for the blood samples to be analysed. SGH's new device, however, can test for 10 commonly prescribed antibiotics used in hospitals at any one time and takes just five minutes for the results to be available.

The tool was co-developed by Dr Lim and Dr Kelvin Goh, Research Fellow, Department of Pharmacy, SGH. SGH Specialist Pharmacist Dr Nathalie Chua then led a three-year-long pilot study to examine the tool's reliability in identifying and measuring concentration levels of antibiotics in patients on antibiotics combination therapy. The tool is designed to measure commonly used antibiotics around the world, and thus can be implemented anywhere easily, said Dr Lim.

"We are moving to the next phase — feasibility studies for this test to be used in a clinical setting," said Dr Lim. The study aims to recruit more than 700 patients to assess if outcomes can be improved using the tool to monitor antibiotic concentrations. The team hopes to wrap up the study within three years. "We are also working closely with our colleagues in the Department of Pathology on implementing the tool and are concurrently developing a test kit for any laboratory that wants to start a clinical monitoring service. The long-term gain is to be able to commercialise this tool and enhance clinical options of this test in Singapore and the rest of the world," added Dr Lim.

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Creating space for comfort and care

PHOTOS: VERNON WONG

Experiencing the healthcare design through the eyes of patients and users is essential to the facilities development work of Ms Beatrice Low.

by Vicki Yang

As Senior Manager of Facilities Development at SingHealth, Ms Low plays a key part in building and optimising healthcare spaces and infrastructure to improve the experiences of users and patients.

Developing facilities that enhance users' comfort is not as easy as hoarding up a site and sequestering it away from public view. Part of Ms Low's role is also ensuring the smooth flow of clinical operations while upgrading works get underway. One memorable project for her is the renovation of the Neuroradiology Clinic at the National Neuroscience Institute (NNI) in Tan Tock Seng Hospital that was completed in 2021.

"We had to demarcate the clinic into half to keep clinical operations going while we created the isolation and MRI preparation room serving patients before their scan," said Ms Low. This meant that infection control measures had to be in place with daily checks by the infection control nurse so that patient visits and clinical care would not be disrupted.

"I usually try sitting in the space I created so that I can picture the healthcare experience through patients' eyes; every patient who goes into a clinical area to wait for a consultation, test or results is likely to be anxious," explained Ms Low of her design decisions at NNI. "But if the environment has the right interior furnishings and fittings to make it more comfortable and calming, the patient's mental weight is lightened."

Anticipating patients' evolving needs

The empathetic perspective Ms Low deems necessary in her line of work starts even before the patient arrives at the waiting room. To anticipate and serve patient needs from start to end, the Facilities Development team worked with Marketing Communications to produce a guidebook on healthcare infrastructure design.

The team mapped a patient's journey from the moment they stepped out of a public transport mode and transited across the SGH Campus, ending at the bus charter pick-up point. To ensure inclusivity and accessibility in the guide, the team gathered inputs from key stakeholders, including frontline operations, maintenance team and external groups such as accessibility consultants.

One area for improvement was the space allowance in accessible toilets, said Ms Low, who was part of the key work group that developed the guide. "Patient safety is one of the top priorities in our designs. We considered that patients in wheelchairs are often accompanied by a next-of-kin and a caregiver. Having one to two people trying to aid a patient in a wheelchair in the toilet requires more space than we take for granted, so we recommended a larger toilet space than the standard guidelines."

Published in 2015, the guidebook, *Singapore Healthcare — Age-Friendly Infrastructure Design Guide*, can be used today as a universal design reference for healthcare spaces in Singapore.

In service to the public

The results of Ms Low's work also benefit the public beyond the realm of healthcare.

Completed in 2018, the bridge that connects the Academia and Duke-NUS Medical School improves patient and user safety by increasing connectivity, thus discouraging jaywalking on the SGH Campus. The 98m-long link bridge has two 30m-long trusses. The most challenging part of the project was launching the truss over College Road, which usually has heavy vehicular traffic including ambulances. To work around this, the launch, which involved multiple parties, was scheduled from midnight till dawn.

"The team faced difficulties on site during the launch as the road was uneven and the equipment could not be levelled. The entire exercise overran. When foot traffic started again at dawn, I had to inform the Land Transport Authority to extend the road closure," recalled Ms Low, who watched the proceedings with her team throughout the night. "It was stressful but very enriching because we managed to overcome the challenges and resolved them as a team." The link bridge is also another project that symbolises close collaborations between SingHealth and Duke-NUS.

While bridges and waiting rooms are just a few of the concrete results of her 13-year career at SingHealth, Ms Low, a trained architect registered with Singapore's Board of Architects, said those results were due to her quest to enhance the patient and user experience. "We work very closely with the doctors and nurses, and you can hear the voice of the patients speaking through them. Being an in-house designer for a public healthcare group means I get to wear the hat of the users of the spaces — doctors, nurses and patients — and that is very fulfilling."

I usually try sitting in the space I created so that I can picture the healthcare experience through patients' eyes; every patient who goes into a clinical area to wait for a consultation, test or results is likely to be anxious.

Beatrice Low
Senior Manager,
Facilities Development,
SingHealth

"Being an in-house designer for a public healthcare group means I get to wear the hat of the users of the spaces — doctors, nurses and patients," says Beatrice Low.

A trusted figure for adolescents

For paediatrician Assoc Prof Oh Jean Yin, her work in the hospital and the community is driven by compassion and a desire to shape a better world for young people.

by Vicki Yang

Associate Professor Oh Jean Yin's journey in paediatrics, specialising in Adolescent Medicine, was sparked off more than two decades ago when she attended the Adolescent Health Conference in Melbourne, Australia. Then a registrar, Assoc Prof Oh was inspired by paediatricians and multidisciplinary staff she met. "I had attended medical conferences before, but the amount of passion and sense of advocacy for youth really resonated with me."

At the conference, Assoc Prof Oh observed an initiative where medical students practised communication skills by role-playing with adolescent drama students. "The skills learnt were obvious to the medical students, but what was amazing were the benefits to the adolescent drama students, notably the empowerment and activation that the young person could take away from that interaction and how it could potentially increase their own health literacy," recalled Assoc Prof Oh.

Inspired by that pivotal scene to pursue Adolescent Medicine, Assoc Prof Oh is now Senior Consultant in the Adolescent Medicine Service and Head of Department of Paediatrics at KK Women's and Children's Hospital (KKH). She and her team are dedicated to addressing adolescent health issues while paving a way forward to improve the physical, psychological, emotional and social health and well-being of adolescents. The patients she sees may be adolescents with obesity, eating disorders or high-risk behaviours. Her team has also tried to incorporate that same medical student teaching session locally, with the same purpose to improve communication skills of doctors-in-training with adolescents and to empower our youth in Singapore.

PHOTOS: VERNON WONG

Practising in Adolescent Medicine has allowed me to appreciate that secure attachments and strong relationships are crucial aspects, especially in times of crisis and, in our context, in illness and disease.

Associate Professor Oh Jean Yin
Senior Consultant, Adolescent Medicine Service, and Head of Department, Paediatrics, KK Women's and Children's Hospital

This line of work was exceptionally introspective for Assoc Prof Oh during the COVID-19 pandemic. "I strongly believe in showing compassion and the positive effects of human connections," she said. "Practising in Adolescent Medicine has allowed me to appreciate that secure attachments and strong relationships are crucial aspects, especially in times of crisis and, in our context, in illness and disease."

Beyond medical interventions, the development of a connection is something significant in Assoc Prof Oh's practice. "Some of our patients have been through really tough situations and tragedies, ranging from adverse childhood experiences to mental health struggles. Yet they have remained resilient and are giving back to their communities," she shared. "I would like to believe that my team — whether it's the paediatrician, nurse, psychologist or medical social worker — has stayed the course and been that trusted adult for them."

Assoc Prof Oh has ventured beyond the hospital and into the community in the last decade. Her contributions to child and youth advocacy work caters particularly to those with adverse childhood experiences. "There has been more research around these experiences that shows that toxic stress — especially from physical, sexual and emotional abuse and neglect — can significantly impact a child's brain development and long-term physical health," she explained. As such, she and her peers also collaborate with government agencies and child abuse protection teams. This involves implementing safe interventions and managing cases to improve outcomes for these children and their families.

Assoc Prof Oh's sense of advocacy stems from a childhood filled with examples of family members displaying the spirit of giving back. "I used to follow my mother to a centre for the blind, where they created books in Braille. She would read to a blind volunteer, who would type in Braille using special typewriters," she recounted. In secondary school, Assoc Prof Oh joined a student club that had community service as one of its aims, and spent time tutoring beneficiaries from a children's home. "These are two vivid memories that have stuck with me," she shared. "The spirit of volunteering and its activities may not be for everyone and we must respect that without judgement. Nobody is lesser for that. It's good for those who can, for it's only when your own cup is full that you can do so," added Assoc Prof Oh, who enjoys family time and watching movies with her husband and two children outside of her professional and project commitments.

Yet, her trajectory through Adolescent Medicine and consistent engagement in the child protection community reflects her identity as well. "I think paediatricians are naturally strong advocates," said Assoc Prof Oh. "We want to protect children from suffering and harm, speak up for people who have no voice and make the world we live in a better one for our children."

RA, not OA

20 May is World Autoimmune Arthritis Day

Rheumatoid arthritis and osteoarthritis both cause inflammation in the joints. But the former, if not diagnosed correctly and managed early, can become debilitating and crippling.

by Puvanes Balakrishnan, with information provided by Dr Chew Li-Ching, Senior Consultant, Department of Rheumatology and Immunology, SGH

What is rheumatoid arthritis?

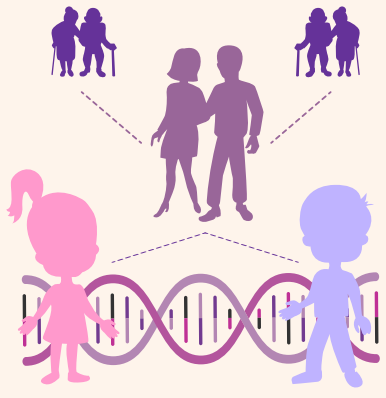
Rheumatoid arthritis (RA) is an autoimmune disorder where the body's immune system attacks joints and their surrounding tissues, causing inflammation, pain, stiffness and swelling. As the disease progresses, the symptoms will worsen, leading to deformity and a loss of function and mobility.

As it is a systemic disorder, RA can affect other organs in the body like the eye, skin, heart and lungs.

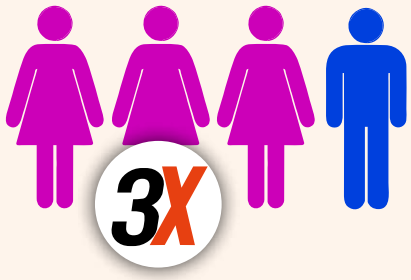
Risk factors

RA can be triggered by a disorder of the body's immune system or an overreaction to a virus infection. Once the immune system is mobilised, it starts to target the body's own cells.

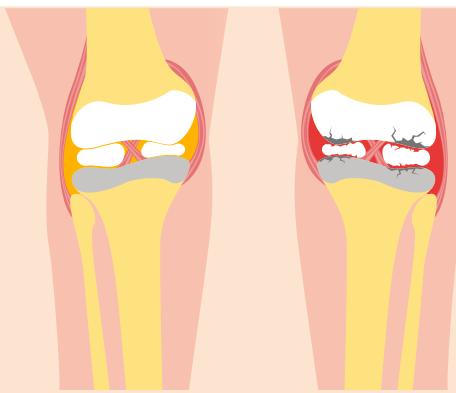
In RA, the target is the synovial membrane that covers the joints, which then becomes tender and swollen as fluid builds up in the joint cavity. The exact cause of the trigger is unclear, but some factors can increase the risk of developing the disease:



- Family history of RA
- Smoking, hormonal changes during pregnancy
- Anyone, even children, can get RA



- Women, who are three times more likely than men to get RA



Osteoarthritis

RA can be mistaken for osteoarthritis (OA), as they both cause inflammation. However, OA is due to wear and tear of the joints as people age. The symptoms, long-term effects and treatments for the two conditions are also very different. Hence, it is important that symptoms be assessed by rheumatology specialists to receive a correct diagnosis.

Early symptoms

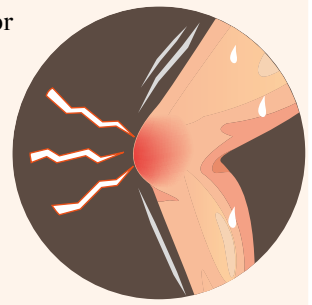
- Pain, swelling in finger and wrist joints that last for hours
- Joint stiffness, especially in the mornings
- Joints on both sides of the body are affected

Advanced symptoms

- Joints are warm, tender and painful throughout the day
- Body stiffness
- Low-grade fever, fatigue, weight loss and poor appetite
- Deformity in the advanced stage as bone and cartilage are destroyed

Diagnosis

- Blood tests to detect the rheumatoid factor (RF) and anti-CCP (cyclic citrullinated peptide) antibodies



- Analysis of fluids in swollen joints, especially the knees

- Ultrasound scans if other tests are inconclusive
- X-rays, detailed medical history, physical examination for signs of joint inflammation

Treatment

RA has no cure and treatment is given to ease symptoms, prevent further joint destruction, complications from developing and to regain lost muscle strength and mobility.

- Medications to slow, stop RA advance
- Follow a balanced diet
- Exercise moderately, regularly
- Stop smoking and lose weight
- Surgery for deformed, destroyed joints

ARC for one-stop care

Treatments at specialised and dedicated RA clinics like Singapore General Hospital's Autoimmunity and Rheumatology Centre (ARC) can have better outcomes.

The ARC offers specialised physical and occupational therapy services, drug management and patient education, on-site and virtual monitoring by specialist advanced practice nurses and pharmacists.

Under its musculoskeletal system ultrasound service (MSUS), the ARC's rheumatologists use the advanced imaging tool to monitor and guide treatment, such as in titrating medication levels.

Healthier SG

Menu for better surgery outcomes

Eating right prior to surgery is also part of the preparation process.

by Sol E Solomon

Good nutrition is essential to help prepare the body for surgery. The nutritional status of a patient can have a significant impact on the outcome in any type of surgery.

"Optimising one's nutritional status before a surgery can potentially improve wound healing, reduce surgical complications and shorten hospital stays. Therefore, this process should start as early as possible once a surgical procedure has been planned," said Ms Gladys Lim, Senior Dietitian, Changi General Hospital (CGH). "Screening for malnutrition risk is the first and crucial step in identifying patients who could benefit from nutritional therapy."

Pre-operative nutritional optimisation should start as early as possible once a surgical procedure has been planned, says Ms Gladys Lim.

Malnutrition is characterised as under-nutrition due to an insufficient, excessive or imbalanced intake of nutrients. Its signs include lack of appetite, fatigue, difficulty staying focused, losing weight unintentionally or having a Body Mass Index (BMI) below 18.5. Malnutrition can be exacerbated by medical conditions that impair nutrient absorption, increase nutrient loss or increase nutrient requirements. It has been linked to immunosuppression, higher risk of surgical complications, impaired wound healing and increased mortality.

For malnourished patients and those at risk of malnourishment, pre-surgery nutrition optimisation entails a referral to a dietitian, who provides nutritional recommendations after conducting a detailed assessment of the patient's dietary intake and nutritional status. Additionally, blood tests for nutritional markers may be performed to screen for vitamin and mineral deficiencies before the surgery.

Prioritise your protein intake

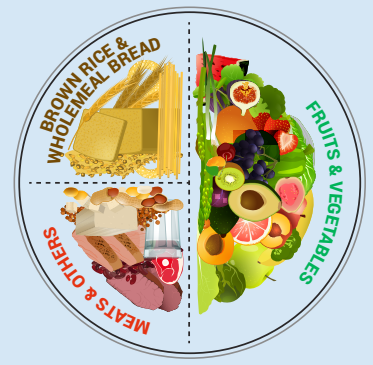
Protein strengthens the body's immune functions as well as builds, repairs and maintains muscles, which are vital to heal wounds. Optimising protein intake before surgery helps build reserves, counter surgical stress and minimise infections, especially for malnourished patients.

When a patient undergoes surgery, the process induces stress on the body that results in the breakdown of muscle, affecting the body's ability to heal and recover.

After surgery, protein needs remain high for all patients, though the exact amount to be consumed daily is highly individualised and dependent on their weight trend, nutritional status, severity of medical condition and type of surgery.

Despite the local belief that seafood and chicken can worsen wound healing, there is hardly such evidence. "On the contrary, both seafood and chicken are excellent sources of protein, and are therefore beneficial, especially during the recovery phase, to ensure there is adequate protein intake to speed up recovery," said Ms Lim. She added that should the patient choose to avoid seafood and chicken, it is essential that he or she includes other proteins such as fish, lean pork, red meat, eggs, tofu and beans in the diet.

A well-balanced diet provides essential nutrients to build up body stores and immune system. For more information, check out the My Healthy Plate page on HealthHub: **https://for.sg/eatmore**



How much protein should I be consuming daily?

average healthy adult, 18–49 years
to consume
0.8g protein x body weight (kg)

average healthy adult, >50 years
to consume
1.2g protein x body weight (kg)

malnourished or at risk of malnutrition
to consume
1.2–1.5g protein x body weight (kg)

Check with your Dietitian if you have any existing health conditions requiring protein restrictions.

Healthy protein can be sourced from examples below, each of which provides approximately 20g of protein

1 palm-sized piece of lean meat, fish or poultry (90–100g)

5–6 medium prawns (90g)

3 eggs (150g)

4 pieces of *tempeh* or ¾ small bowl of chopped *tempeh* (120g)

2 glasses* of low fat milk/soy milk (500ml)

2 small blocks of tofu (150g)***

Small bowl of edamame (200g)

1 cup** of mixed nuts trail (150g)

All weights listed are for edible portions only.
* 250ml glass ** 250ml cup *** Firm tofu

Good news for coffee, black tea drinkers

Drinking coffee and black tea regularly may help prevent some skin cancers.

by Sol E Solomon

Drinking coffee and black tea regularly may reduce the risk of basal cell carcinoma and squamous cell carcinoma, two of the most common non-melanoma skin cancers worldwide.

However, caffeinated drinks are not a treatment for the condition. Rather, regular drinking of such beverages provides a protective effect against these common cancers, said Dr Oh Choon Chiat, Senior Consultant, Department of Dermatology, Singapore General Hospital (SGH).

"Three or more cups of coffee a day had the best protective effect against basal cell carcinoma and squamous cell carcinoma," says Dr Oh Choon Chiat.

Early experimental studies have indicated that caffeine can kill keratinocytes — the most common type of cells on the top layer of the skin — damaged by ultra-violet (UV) light. Other studies have shown that caffeine can prevent UV-induced carcinogenesis or cancers in animals. While such findings are preliminary, they are important as a proof of concept or feasibility for further studies to examine whether the results can be duplicated in humans, said Dr Oh.

"Three or more cups of coffee a day had the best protective effect against basal cell carcinoma and squamous cell carcinoma. Daily drinkers of black tea also had a reduced risk of non-melanoma cancer compared to non-drinkers," said Dr Oh. "However, green tea and cola consumption did not demonstrate any protection."

Non-melanoma skin cancer develops slowly in the upper layers of the skin, unlike the less common but more aggressive melanoma cancer. According to the Singapore Cancer Registry's 2019 report, non-melanoma skin cancer is the sixth most common cancer among men and the seventh most common cancer among women from 2015 to 2019. The Chinese have the highest incidence of such cancers compared with their Malay and Indian counterparts, who have darker skin tones.

The incidence of non-melanoma skin cancer increases with age, and it is the highest among people with so-called Fitzpatrick skin types I and II, or those whose skin burns, but does not tan, easily in the sun.

Dr Oh had examined the relationship between coffee, tea and caffeine consumption and the risk of non-melanoma skin cancers among the Chinese in Singapore in a study, "Coffee, tea, caffeine, and risk of non-melanoma skin cancer in a Chinese population — The Singapore Chinese Health Study". Published in 2019 in the *Journal of the American Academy of Dermatology*, the study used data from the "Singapore Chinese Health Study", a prospective cohort of 63,257 men and women between the ages of 45 and 74 years at recruitment from 1993 to 1998. About 70 per cent of the participants drank coffee daily, 11 per cent drank black tea daily and 12 per cent drank green tea daily. Soda was less frequently consumed, with just 4.3 per cent reported drinking soda three or more times a week.

An eventual 61,321 participants were followed up for an average of 18 years, and the incidence of basal cell carcinoma cancer and squamous cell carcinoma was 427 and 182 respectively. The mean age that skin cancer was diagnosed was 74 years, with men accounting for 48 per cent of all skin cancers, the study found.

The study was prompted by the wide consumption of coffee and tea. "Because of high global consumption of both of these caffeinated drinks, there is much interest in their effects on human health and diseases, including skin diseases with a generally poor prognosis such as melanoma," Dr Oh said. Other types of skin cancers were not included as the numbers were too small.

"If an individual is a regular coffee drinker, this study and other studies worldwide show that continuing this dietary habit may have protective effect against skin cancers," said Dr Oh. He added that more studies need to be done to determine which component of coffee and tea — it may not necessarily be the caffeine — is responsible for the protective effect.

Uncontrollable hunger

Patients with Prader-Willi Syndrome suffer from both mental and physical issues, including a tendency towards obesity.

by Puvanes Balakrishnan

Irrepressible hunger that often leads to overeating and consequently an early onset of childhood obesity — this is the key characteristic of Prader-Willi Syndrome (PWS), a genetic disorder caused by a defect in chromosome number 15.

PWS, which can affect the physical and mental development of a child, is uncommon, occurring in one out of 10,000 to 30,000 people worldwide.

"PWS is characterised by severe hypotonia (decreased muscle tone) and feeding difficulties in early infancy, followed by excessive eating and gradual development of morbid obesity into late infancy or early childhood. Patients with PWS often have delayed motor milestones and language development," said Dr Nikki Fong Wen Yan, Consultant, Genetics Service, KK Women's and Children's Hospital (KKH). Other issues caused by the syndrome include behavioural issues, such as temper tantrums, stubbornness, compulsiveness and difficulty with changes in routines. The main health hazards of PWS are obesity and its resultant complications, which include sleep apnoea, diabetes and cardiovascular problems.

Often, PWS does not present with symptoms during a pregnancy. However, some expectant mothers may show abnormal antenatal findings such as decreased foetal movements, intrauterine growth retardation and excessive amniotic fluid in the amniotic sac (polyhydramnios). If there is suspicion for PWS, genetic tests can be done on foetal cells to confirm it.

"Inheritance risks for PWS vary and depend on the genetic change involved," said Dr Fong. As such, recommendations for genetic testing of parents with an affected child depend on the genetic change that led to PWS in the child.

PWS can be managed effectively using a multidisciplinary approach. The care team usually comprises a geneticist, endocrinologist, respiratory physician and developmental paediatrician. Allied Health Professionals such as a dietitian, speech and language therapist, physiotherapist and occupational therapist may also be involved. "Many patients benefit from the use of growth hormone therapy and will need long-term follow-up for management of their feeding, growth and development. They also need to be assessed for complications such as short stature, obesity, scoliosis and obstructive sleep apnoea," she said.

With clinical features varying by age, strategies for management would thus differ with the child's age, added Dr Fong. For example, during infancy and early childhood, patients with PWS have hypotonia and poor sucking reflex, often leading to failure to thrive. As such, they may require enteral tube feeding with regular speech therapy and a dietitian's support for feeding. Patients with PWS often also have delayed development, thus needing early-intervention support. In late childhood, they develop hyperphagia (extreme hunger), which requires careful nutritional support with a well-balanced, low-calorie diet and regular exercise. This is vital in preventing obesity and related problems.

As with any health condition, adequate family support is essential when it comes to caring for patients with PWS, as they will need regular follow-ups to manage their medical and developmental needs. Being a lifelong condition, the financial cost of the syndrome can be considerable, with a high risk of caregiver fatigue. Therefore, Dr Fong emphasised the importance of caring for the patient and family as a whole, supporting not only the patient's needs but the caregivers' as well.

However, it is often a lonely journey for the patients and their caregivers. Dr Fong attributed this to the rarity of the disease and its accompanying lack of awareness in Singapore. "If there is increased awareness, then hopefully people will take time to find out more about the condition and learn about the struggles that these patients and their families face. For the healthcare team caring for the patient and family, the challenge is in ensuring regular and easy access for all patients with PWS to medical care and therapies. With good support, therapy and medical care, the complications for patients with PWS can be minimised, allowing them to lead fulfilling lives."

"Patients with Prader-Willi Syndrome require long-term follow-up for management of their feeding, growth and development. They also need to be assessed for complications, such as short stature, obesity, scoliosis and obstructive sleep apnoea," says Dr Nikki Fong Wen Yan.

CHEF'S TIP

Keep bottles of sesame oil in a cool, dark place to prevent loss of flavour and aroma.

Baked Vegetable Cutlets

4 servings

Ingredients

- 80g mixed vegetables
- 1 dried Chinese mushroom, soaked to soften and chopped
- pinch of coriander leaves
- 200g potatoes, cooked and mashed
- 1/2 tsp oil
- 1tsp sesame oil
- 1 slice ginger
- pinch of pepper
- 1/4 tsp salt
- 1tsp cornflour

Method

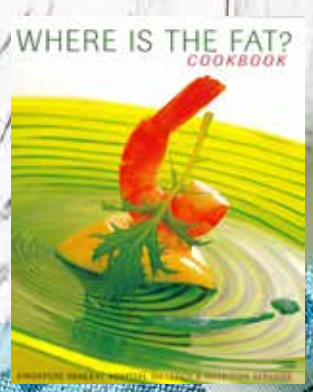
1. Heat oil in a pan. Add sesame oil and ginger and fry until fragrant. Discard the ginger.
2. Add mixed vegetables, mushroom and coriander leaves, and fry well.
3. Add this mixture to mashed potato.
4. Season with pepper and salt.
5. Cool to room temperature.
6. Divide potato mixture into 8 portions.
7. Shape each portion into a cutlet.
8. Sprinkle cornflour on the cutlets.
9. Grill cutlets in oven until golden.
10. Remove cutlets from oven and serve.

Estimated nutrient content *(per serving)*

Energy	76kcal
Carbohydrate	14g
Protein	2g
Fat	2g
Sodium	157mg
Cholesterol	0mg

The fifth taste

You must be familiar with the four classifications of taste — sweet, sour, salty and bitter — but perhaps not so much the fifth. The taste classification of umami (meaning 'delicious flavour') was discovered in 1907 by Kikunae Ikeda of Japan. He had successfully extracted crystals of glutamic acid (also known as glutamate) from broth made with Japanese kombu seaweed. Glutamate is an amino acid, a building block of protein, and 100g of kombu contains about 1g of glutamate. Glutamate — in the form of monosodium glutamate (MSG) — was later marketed as a flavouring agent.



Adapted from *Where is the fat?* cookbook, a publication by Singapore General Hospital

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Why is it important to use alcohol-based hand rub to prevent infections?

Alcohol in the hand rub remains the main active ingredient to eliminate the microorganisms. Besides its rapid killing action, the fast-drying time is also a main plus when it comes to hand sanitizing. Many non-alcohol hand rubs contain water, they dry more slowly on the hands. Without alcohol as the main antimicrobial agent, alcohol-free hand rub will need other active(s) as a substitute. Most substitutes (e.g., chlorhexidine, benzalkonium chloride etc.) are antimicrobial but with a much slower efficacy compared to alcohol. Alcohol-based hand rubs remain the much-preferred option for the majority in COVID-19 unless the user is allergic to alcohol, which is very rare. For this cohort maybe the best option is to wash their hands with a gentle soap to maintain hand hygiene.

What should I look for when buying alcohol-based hand rub (ABHR)?

The formulation of ABHR is considered critical as both antimicrobial agents and other critical components (e.g., moisturiser) must work in tandem without compromising the chemistry within. ABHR from schülke have undergone a series of stringent tests to make sure the final product is performing as what it should be doing - to eliminate microbes on the hands. An important advantage is that they are formulated with skin caring ingredients (and dermatologically tested) to protect and care for the hands when used at high frequency, especially in this pandemic period.

MICROSHIELD® ANGEL BLUE, a hospital-grade alcohol-based handrub that contains 70% v/v absolute ethanol and undergo antimicrobial tests governed by the Eurporean Norm (EN): EN1500. It has proven efficacy against virucidal activity and at the same time, keeps your hands feeling soft, smooth and hydrated without leaving a sticky residual.

Schulke & Mayr (Asia) Pte Ltd

This product is available at Singhealth Pharmacare and selected polyclinics at: Bukit Merah, Tampines, Pasir Ris and Punggol.
Advertising License: MAHP1900238

These shoes were made for walking

Q I'm in my early 70s, on the heavy side, and want to start walking. What is a good pair of walking shoes? Are more expensive shoes necessarily better?

A Shoes are made up of different parts and each plays a role in the overall function of the shoe. For instance, the outersole, which is the part of the shoe that comes into contact with the ground, protects the feet from objects like sharp stones and glass. It also protects the softer midsole from excessive wear and tear, and provides grip to reduce the risk of slips and falls. Other parts like the midsole and innersole provide protection, comfort and cushioning. Shoes not meant for walking or exercising can sometimes pose safety or injury issues, like an increased risk of slips or sprains. More expensive shoes are not necessarily better, although they are more likely to meet the criteria for a good pair of shoes such as providing a good fit, adequate support and comfort. The best shoes are also lightweight and give sufficient — but not excessive — grip to allow comfortable and safe walking. The more expensive brands usually use better-quality materials and have better workmanship, and thus tend to last longer.

Exercise shoes are usually made for a specific activity, with features and materials that cater to the unique movement patterns of that activity. Running or jogging shoes generally have a thicker midsole and a different outersole design for running. Cross-training shoes often have a more supportive upper and additional stitching and leather components for increased support and durability. Racquet sports shoes have strong, supportive uppers, especially in the toe box area. However, they might use outersoles made of gum rubber, which are not as durable if worn for walking outdoors.

Older people who are overweight are at greater risk of developing foot pain and injury. They can benefit from wearing shoes wide enough to accommodate their bigger feet, and shoes with protective features like a well-cushioned midsole and a stiffening shank over the centre of the midsole to protect the arch of the foot. Laces and velcro straps can make it easier to put on and take off the shoes while allowing for a more comfortable fit.

Seniors commonly experience bunions, hammer toes and arthritis, so consider footwear that can accommodate these conditions and not cause irritation, which can result in calluses, corns, blisters and wounds.

Mr Gordon Ian Williams, Principal Podiatrist, Podiatry Department, SGH

Question & Answer
HealthXchange.sg

Snoring and constantly tired?

Q I snore and experience constant tiredness. I want to check if I suffer from sleep apnoea, but don't know where to start.

A Snoring may mean there is not enough airflow with reduced blood oxygen levels while you are asleep. There are many causes of snoring: narrowing of the nose and upper airway due to nasal allergy, swellings in the nose, deviated nasal septum, enlarged tonsils and/or adenoids, long and thick soft palate, big tongue, loose airway and tongue muscles, and small jaws. This can be determined by examination of your nose, mouth, throat and jaws.

A sleep study will confirm if the snoring and fatigue are associated with sleep apnoea. Sleep apnoea is a disorder that is treatable, but not curable except in very mild cases. There are three different types of sleep apnoea: Obstructive Sleep Apnoea (OSA), Central Sleep Apnoea (CSA) and Mixed OSA and CSA. Diagnosis is important as it determines the type of treatment for you. One in three Singaporeans have moderately severe to severe OSA, and more than 90% do not know they have it.

You can see your family doctor or a polyclinic doctor for a referral and a sleep study should you need one. An appointment can be made through Health Buddy for the Otolaryngology (ENT) Service of Singapore General Hospital, Changi General Hospital or Sengkang General Hospital.

Dr Mimi Yow, Senior Consultant, Department of Orthodontics, National Dental Centre Singapore, and Director, Clinical Services, SingHealth Duke-NUS Sleep Centre

••• that as more Singaporeans return to work onsite, it may be more convenient for Singapore General Hospital (SGH) patients to pick up their prescriptions from selected Guardian pharmacies instead of waiting at home for their medications to be delivered?

Delivery reservation slots are made in four-hour periods, meaning patients will need to be at their preferred pick-up location like their home or office during that period. Deliveries may be early or delayed depending on road and weather conditions. If the medications are unable to be delivered because the recipient gave the wrong address or is not available during the appointed time, a re-delivery fee will be charged.

For patients' convenience, those who ask for their medications to be delivered or those who order their medications online via the SingHealth Health Buddy or the government's Health Hub app will be offered the option to collect them at a Guardian pharmacy. A Guardian pharmacist will call to inform patients that their medications are ready for collection at their preferred branch.

Patients have up to three working days to collect their medications. At the pharmacies, patients can seek advice from the pharmacists on their medications, use of medical devices like asthma inhalers, their conditions and other medicine-related concerns.

Payment for their medications can also be done online, when they receive notifications via SMS that their bill is ready, so patients do not need to return to SGH. They can then proceed to pay their bill online via the SGH website, SingHealth's Health Buddy app, or in person at any 7-Eleven shop and Singapore Post branch.

PHOTO: VERNON WONG

Besides retail pharmacies, patients can also collect their medications from secured parcel lockers (PILBOXes). Located at SingHealth Polyclinics in Bedok, Marine Parade, Sengkang, Tampines and Punggol, the PILBOXes are accessible round the clock.

For more information about collecting medications from Guardian or PILBOXes, visit **https://www.sgh.com.sg/MDSGuardian**

••• that National Neuroscience Institute (NNI) has a donor appreciation wall that would look right at home in an art gallery? Titled *Connections for Life*, the installation celebrates a connection that brings life and a connection for a lifetime.

The installation of 20 different precision-cut circle designs with varying rims and gaps make up 140 circles on the donor wall. Each circle was individually placed at varying depths to complete the installation.

Each acrylic plate is precision-trimmed to fit each circle rim perfectly, with a thoughtfully selected complementary colour palette to reflect the NNI Fund's brand colours.

The vibrant discs form an artistic expression of synapses. A synapse is where nerve impulses are transmitted from one neuron to another, and stems from the Greek words 'syn' (together) and 'haptein' (to clasp).

Synapses play a critical role in processing messages and executing desired responses in the brain, spinal cord and throughout the body. Just as synapses are essential to a well-functioning body, so is the partnership between NNI and each of its distinguished donors in advancing neuroscience care for their patients.

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