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Virtual hospital care

Some patients can recover at home instead of in a hospital ward

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Before receiving either a phone or video call from the team, patients receive an SMS to take and submit their vital measurements, and to voice any concerns during the review.

Bringing hospital care to SGH@Home

Some patients requiring inpatient care can now receive it in the comfort and familiarity of their homes.

by Eveline Gan

A rapidly ageing population means more elderly will require hospital care with constant monitoring, but inpatient care brings its own challenges.

Prolonged inpatient care can lead to hospital-acquired infections and physical deconditioning. A greater demand for beds puts pressure on the healthcare system, which results in higher costs, and bed and healthcare staff shortage.

"SGH@Home offers an opportunity to address these issues by innovating an alternative healthcare model to complement current models of care," said Dr Michelle Tan, Consultant and Head, Department of Family Medicine and Continuing Care, Singapore General Hospital (SGH).

Some members of the virtual ward care team with the doctor's home visit medical bag and green bag containing items such as hypertension monitor and thermometer for patients to check their vitals at home.

The SGH@Home pilot service allows eligible patients to recover at home, usually after a surgical procedure. Launched in May 2022, the two-year project aims to enrol 600 patients to receive hospital-standard acute care at home.

Patients monitor their own symptoms and vital signs, and report the results to the SGH care team at stipulated intervals via a smart device app. Their progress is monitored by phone or video consultation.

Performing such tasks on their own, or with the help of their caregivers, "encourages an early return to independence for patients", said Dr Low Lian Leng, Director, SingHealth Office of Regional Health, SGH Campus; Director, Population Health and Integrated Care Office (PHICO), Regional Health System (RHS)-Community Integration, SGH; and SGH@Home project co-lead.

Unlike discharged inpatients who often experience a sharp change in their care situation — Dr Low describes this as "a cliff effect" — virtual ward patients face a more gradual transition from acute care to recovery outside the hospital.

At the same time, said Dr Tan, who is also the SGH@Home project co-lead, inpatients tend to remain in bed more. A period of prolonged inactivity can lead to deconditioning or a weakening in physical and mental functions. In contrast, patients tend to be more active when recovering at home. Inpatients, too, may catch infections from other patients, putting them at risk of having to stay longer in hospital.

While this service has benefits for patients, not all are eligible to recover at home, said Dr Tan.

Patients' home environment must be suitable for recovery, and they must have access to smart devices for communicating data with their care team. If they are living alone, patients must be independent, are able to perform basic daily activities and follow instructions, and have minimal fall risks.

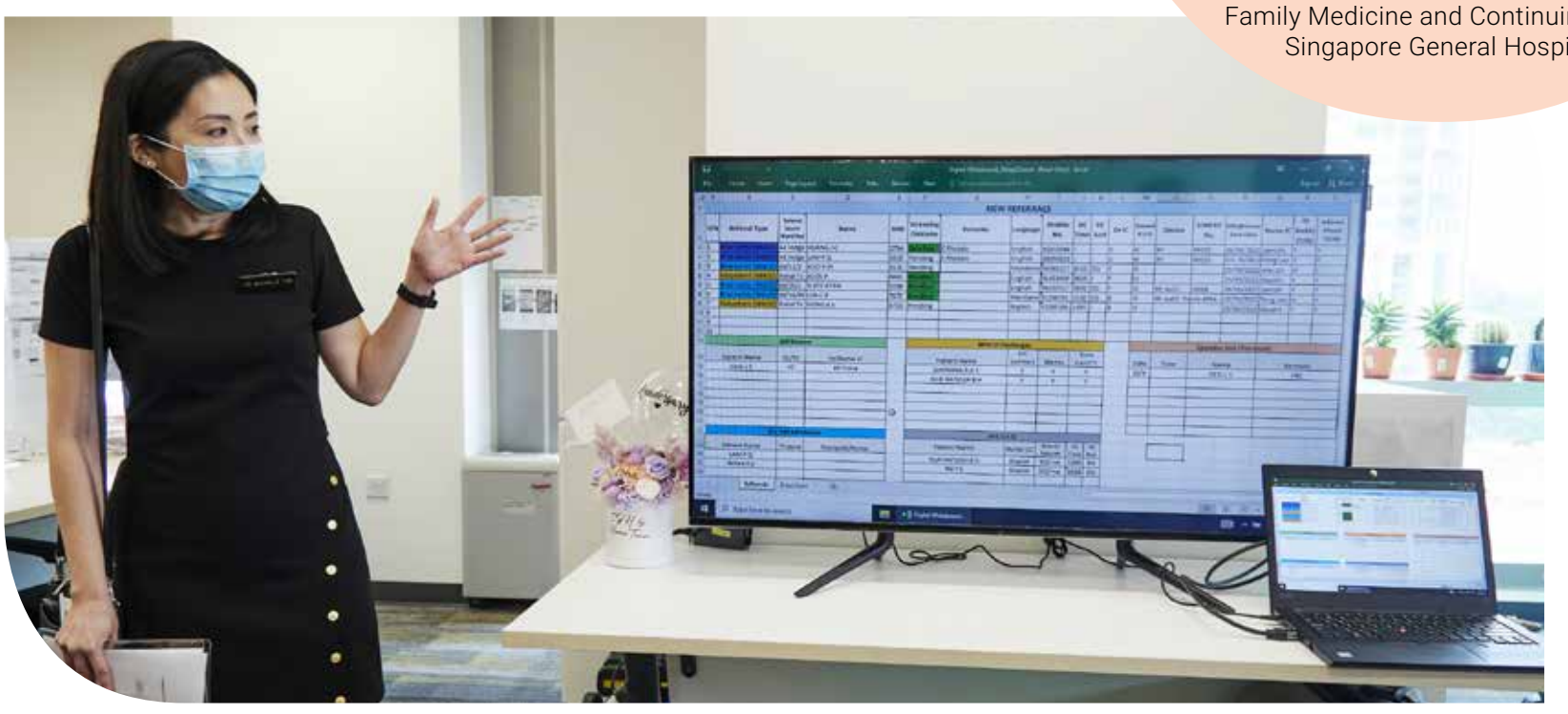
Above all, they have to be clinically stable, so those who undergo orthopaedic procedures like hip fractures and do not suffer from other acute conditions are likely to be suitable for home recovery. Those who had a heart attack or stroke, on the other hand, are unlikely to be suitable.

Patients with infections requiring antibiotic therapy are also often eligible,

International studies show that this hospital-at-home care model reduces costs, healthcare utilisation and readmissions, and provides greater caregiver satisfaction and lowers mental stress.

Dr Michelle Tan
Consultant and Head, Department of Family Medicine and Continuing Care, Singapore General Hospital

PHOTOS: VERNON WONG



Just like a hospital ward round, the care team contacts patients (like this sample list shown on a large monitor) to assess their recovery and address their concerns.

(Above) To check their vital signs at home, patients are loaned or given items like a hypertension monitor and a thermometer. Doctors carry the larger bag of medical essentials on home visits.

PHOTOS: VERNON WONG

A nurse reviews Mr KK Wong's recovery for a serious skin infection. He was put on intravenous antibiotics drip at home, allowing him to avoid a four-day hospital stay.

especially if the source and area of their infection is clear, and the patient is responding to treatment. "SGH@Home would be useful to enable the patient to complete the treatment," said Dr Tan, adding that antibiotic treatment usually needs a few days to complete.

As patients recovering at home will not have nurses to monitor their vital signs like blood pressure, oxygen level and temperature, they must do so themselves. They are given or loaned items such as hypertension monitors, pulse oximeters and thermometers if they do not have them, said Ms Tang Woon Hoe, Manager, PHICO-Integrated Continuing Care Services, SingHealth, and RHS-Office for Integrated Care, SGH.

"Patients need to download the app on their smart devices, which will regularly remind them to monitor their vital signs and to send the clinical team their readings. These will then be auto-calculated onto a dashboard for the team's review," said Ms Tang.

Although they are at home, patients will still have access to medical care round the clock, as the service works with private medical care service providers for out-of-office-hours care.

With close and regular monitoring, the team is usually able to tell when patients start to show signs of deterioration. "For example, if the patient has a fever that does not respond to antibiotics, the blood pressure starts to drift downwards, or the heart rate climbs very high, the team would arrange for transport to send the patient back to SGH," said Dr Tan.

"We also prepare the patient for the possibility that he may need to call 995 for an emergency such as a sudden heart attack, stroke or other medical emergency unrelated to the patient's condition," Dr Tan added.

The hospital-at-home care model is not a new concept, having been implemented in Australia, the United Kingdom, Europe and the United States since the 1990s. International studies show that this care model reduces cost, healthcare utilisation and readmissions, and provides greater caregiver satisfaction and lowers mental stress. In the elderly, it reduces functional decline and delirium associated with acute hospitalisations, Dr Tan said.

SGH@Home is supported by the Ministry of Health (MOH) under its two-year MOH Office for Healthcare Transformation (MOHT) sandbox programme, which also includes virtual home pilots by the National University Hospital and Yishun Health Medical Home. Data from the programme, expected to end in March 2024, will help MOH decide if this virtual ward pilot should become a mainstream service and be offered to patients widely.

Virtual ward allows quick response

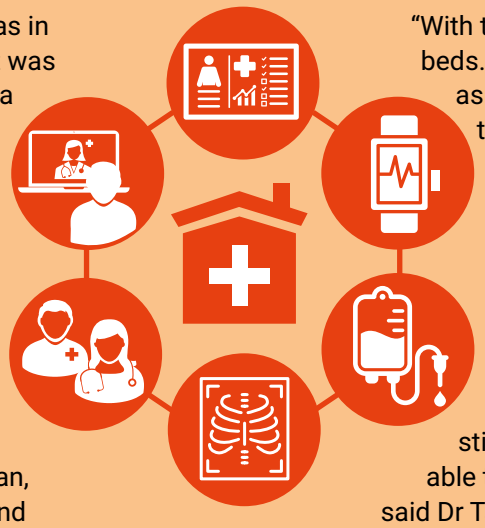
The idea for a virtual ward at SGH came about as early as in September 2021, but the hospital's plan for a small pilot was disrupted by the resurgence of the COVID-19 pandemic a few months later.

Undertaking the task of establishing a larger-scale virtual COVID-19 ward in February 2022 had its rewards, as SGH quickly found that with the blueprint for this model of care in place, the hospital has been able to respond quickly to other situations that may have unexpected developments.

"By providing medical treatment at the patients' home and leveraging telehealth technology and partnership with private care providers, SGH@Home allows for variable hospital capacity," said Dr Michelle Tan, Consultant and Head, Department of Family Medicine and Continuing Care, SGH.

"Access to hospital-level medical care will no longer need to be tied to a fixed capacity of physical inpatient beds, which increases the flexibility of acute hospital care capacity."

As the predecessor of the SGH@Home virtual ward, the COVID-19 ward required patients to monitor their vitals and report the results to their care team, and to check in daily with their care team via phone calls or video conferencing. They also had access to private healthcare partners in the community.



"With the Omicron wave, we expanded the programme to 100 beds. At the peak, the occupancy rate was over 80 per cent but, as the patient load went down in April and May, we contracted the bed numbers to 25. With the new wave (in July 2022), we re-expanded the programme," she said.

In May, SGH set up a virtual ward for rhabdomyolysis cases that had started increasing. The patients were mostly in their 20s and early 30s, and often did not need a prolonged hospital stay. This cohort of 12 patients stayed at SGH for one to two days, and were then sent home to recover for another three to four days.

"In a tight bed situation, the few days spent at home are still significant. Every bed that is available means that we are able to manage the tight emergency department situation better," said Dr Tan.

During their home recovery, doctors saw the patients at home intermittently, while video consultations to review patients were made every other day. Nurses visited the patients to help them with intravenous hydration and took their blood regularly. The patients were given hotlines to call in an emergency, and after-hours access to third-party care partners.

The virtual ward team foresees SGH@Home to be important in addressing dengue — a perennial and endemic condition. In the first half of 2022 alone, nearly 18,000 cases were recorded, compared to the 5,258 cases in 2021.

PHOTOS: SINGAPORE EYE RESEARCH INSTITUTE

The eyes tell a million stories

Two novel artificial intelligence tools offer non-invasive methods to detect and predict underlying health issues using retinal images.

by Dang Hui Ling

Changes detected in retinal images can provide clues to problems with the kidney's blood vessels.

The eyes are not only windows to one's soul, but also offer a glimpse into a person's biological age and overall health status.

The Singapore Eye Research Institute (SERI) has worked with collaborators to develop two new screening tools — RetiKid and RetiAge. RetiKid uses artificial intelligence-based deep learning algorithms to scan retinal images to detect chronic kidney disease (CKD), while RetiAge is able to predict one's biological age.

"The kidney and eye share a close biological relationship. While blood vessels in the kidneys cannot be examined readily, blood vessels in the retina can be visualised directly using digital retinal photography. Therefore, examining blood vessels in the retina can provide clues to problems with the kidney's blood vessels," said Associate Professor Charumathi Sabanayagam, Deputy Head, Ocular Epidemiology Research Group, SERI, and Principal Investigator of the RetiKid study.

Professor Cheng Ching-Yu and Associate Professor Charumathi Sabanayagam are the Principal Investigators of the RetiAge and RetiKid studies respectively.

Early detection of CKD is challenging, as the condition does not always present with obvious symptoms in its initial stages. Testing a blood sample to measure serum creatinine level is the recommended screening test to detect clinically significant CKD. Despite the wide availability of serum creatinine testing, screening adherence is generally poor among populations at risk.

With an ageing population and rising prevalence of diabetes and hypertension, prevalence of CKD is expected to grow even more. Therefore, scaling up serum creatinine testing is a concern in many countries where the burden of CKD or renal failure is high, which will be more challenging in terms of manpower and logistics. Since retinal images are acquired non-invasively, it can be used as a preliminary screening tool before testing blood for creatinine. In addition, those with a fear of needles may find the approach more bearable, potentially leading to a higher take-up rate.

"Drawing blood may not be practical in all settings. RetiKid has the potential to automate the screening process, thus enabling a larger number of patients to be screened at more sites. With results available within an hour, it can be an effective primary case-finding tool that complements existing screening strategies to detect CKD in general populations and high-risk groups, such as those with diabetes," Assoc Prof Charumathi added.

By introducing RetiKid as a preliminary screening tool, individuals who screen positive may be more convinced to undergo further tests to confirm the diagnosis. Timely detection allows for prompt intervention and helps delay disease progression. Those who test negative can be scheduled for a follow-up screening at an interval appropriate for their health condition and risk factors.

Developed by SERI and the National University of Singapore's School of Computing in 2019, RetiKid has been tested with more than 23,000 retinal images from close to 12,000 participants from Singapore and China. Results of the study, which showed that the RetiKid algorithm identified CKD with up to 91 per cent accuracy, were published in *The Lancet Digital Health* in May 2020.

Predicting lifespan

Chronological age is the age based on one's birthday, whereas biological age refers to the age of the body cells and reveals the physiological changes associated with the ageing process, which can be used to assess one's general health status.

"Blood vessels in the retina are indicative of the health of one's circulatory system and even the brain. By using digital technology on retinal images, we can predict a person's biological age, and in turn, their risk of systemic diseases and lifespan," said Professor Cheng Ching-Yu, Head, Ocular Epidemiology Research Group and Data Science Research Platform, SERI, and Principal Investigator of the RetiAge study.

Developed by SERI and South Korean healthcare start-up Medi Whale Inc. in 2021, the RetiAge algorithm was developed using more than 129,000 retina photos from over 40,000 participants from South Korea to predict the probability of a person having an 'older' retina. Its ability to predict a person's 10-year risk of systemic disease and death was further evaluated among some 56,000 participants in the UK Biobank.

Results showed that those with the 'oldest' retinas had twice the risk of 10-year all-cause mortality, triple the risk of cardiovascular disease mortality and 1.7 times the risk of cancer mortality than people with the 'youngest' retinas, even though the two groups have the same chronological age.

Compared to the standard method of measuring biological age via DNA examination, RetiAge is a non-invasive and relatively time-saving tool that can be easily adopted in clinics. Once a person is found to have 'older' retinas, he can take steps to improve his health, such as exercising regularly, maintaining a balanced diet and avoiding smoking.

Further potential

RetiKid has been licensed to local health tech start-up EyRIS for regulatory clearance and commercialisation to benefit more patients. With the advancement of imaging, cloud computing and mobile technologies, RetiKid has the potential to be integrated into smartphones in the future.

Meanwhile, RetiAge researchers are refining the algorithm to optimise its predictive performance in the local population. They are also studying whether the tool can be used to predict other age-related diseases.

Both RetiKid and RetiAge can be integrated with the Singapore Eye Lesion Analyser Plus (SELENA+), a retinal image-based deep learning system also developed by SERI and licensed to EyRIS, which is currently available at polyclinics for screening of diabetic eye diseases, glaucoma and age-related macular degeneration. This means that patients can be screened for more diseases with a single retinal image.

As part of RetiKid's validation phase, SERI and the National Kidney Foundation have partnered for a community outreach programme to recruit 1,200 participants at high risk of developing CKD. These include family members of patients who have been diagnosed with CKD or kidney failure, patients with diabetes and hypertension who do not go for regular follow-ups and Malay adults who are at high risk for CKD. The participants will be screened using RetiKid as one of the modalities. The project kicked off in February 2022 and will continue till January 2024.

Chronic kidney disease (CKD) in Singapore

In Singapore, 5.5 per cent of adults aged above 24 years and 12.5 per cent of adults aged 40 to 80 years have CKD. Globally, Singapore ranks fourth for prevalence of CKD, and first for diabetes-induced kidney failure — two in three cases of kidney failure are caused by diabetes. Many patients are medically unfit to go through a transplant surgery and rely on dialysis for survival.

PHOTO: VERNON WONG

A new lifeline for dialysis patients

Fistula created by new keyhole procedure lasts longer, needs less maintenance.

by Annie Tan

Patient Chong Yit Lin (showing his scarless fistula), with (from left) Professor Tay Kiang Hiong, Associate Professor Chong Tze Tec and Associate Professor Tan Chieh Suai, started haemodialysis in October 2021. He procrastinated getting a fistula after he was diagnosed with kidney failure earlier that year, but found he could not delay it further in August. While waiting for his fistula to mature, he had a life-saving emergency catheter inserted into his chest for dialysis.

Patients with end-stage kidney failure typically undergo surgery to create a fistula in the arm before haemodialysis can start. They face scarring, a potential failure of the vascular access to mature, and frequent narrowing of the veins, which then requires balloon angioplasty.

Under a Singapore General Hospital (SGH)-led pilot, however, patients can undergo a keyhole procedure to create the fistula — the connection between a vein and an artery. During haemodialysis, two needles are inserted into the fistula to allow blood to flow through the dialysis machine and clean the blood of wastes and toxins.

With endoAVF, very tiny cuts are made, so bleeding and scarring are minimal. Ultrasound is used to guide surgeons in manipulating the needles inserted into the arm.

"The endovascular arteriovenous (endoAVF) fistula has no scar, has a very high success rate of 90 per cent, and requires little maintenance," said Associate Professor Tan Chieh Suai, Senior Consultant and Head, Department of Renal Medicine, SGH.

The ability of the fistula vein to grow and thicken enough for blood to flow properly with the conventional method is 50 to 70 per cent worldwide, and 90 per cent with endoAVF. Still, some 60 per cent of patients will require balloon angioplasty to enlarge the blood vessel to keep the fistula working over time. Previously, patients may undergo angioplasty twice or thrice a year. With endoAVF, it is likely that this will be reduced to once in two years.

"We see endoAVF benefits, not just to the patients, but also the system, in that it may reduce the cost of recurrent angioplastry procedures. A minimally invasive procedure is always attractive to patients, as it leaves no scar, has less downtime and less complications," said Associate Professor Chong Tze Tec, Senior Consultant and Head, Department of Vascular Surgery, SGH.

SGH's team of renal medicine, vascular surgery, and interventional and vascular radiology experts began using the new method on a select group of renal patients in late 2021.

EndoAVF, which was approved for use in the United States in 2019, will be offered to 200 patients, including those who already have a fistula but are encountering problems. Creating the fistula can be an outpatient procedure, using local anaesthesia to numb the nerves and takes about 15 minutes. It can be done in two ways, with needles inserted under the skin and under ultrasound guidance.

In the first method, a needle is inserted into a vein, which is then guided into an artery and joined together with a specially designed catheter with a clip. In the other, catheters with magnets inserted into a vein and artery will pull the two together. An electrical current is passed through the catheters to burn a hole to form the fistula. Thus, while larger veins are preferable, their proximity to arteries is also a criterion.

"In contrast, conventional surgery under local anaesthesia takes between 45 and 90 minutes, as we have to find the vein, cut it and join it to the artery," said Assoc Prof Chong, adding that the act of moving the vein disrupts blood flow to that vein and so, in many instances, even if the fistula was created successfully, the vein starts to narrow.

Regardless of the method, the time taken for the fistula to mature is about the same — two months.

Creating a fistula is not easy, but patients who have been advised to get a fistula should not delay this unnecessarily. Otherwise, they may later need an emergency catheter, which risks bleeding and infection. Moreover, they will still need a fistula as the catheter is temporary, said Professor Tay Kiang Hiong, Senior Consultant and Head, Department of Interventional and Vascular Radiology, SGH.

The number of people needing dialysis is steadily increasing amid an ageing population and prevalence of lifestyle diseases such as diabetes and hypertension. In 2020, 7,125 patients were on haemodialysis, up from 4,270 in 2011, and three in four patients per day chose haemodialysis as treatment. Other options include peritoneal dialysis and conservative treatment.

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A step forward for paediatric cancer patients

Collaborative effort led to the success of this radiation treatment administered on children for the first time in Singapore.

by Eveline Gan

During the COVID-19 pandemic, a multidisciplinary team across SingHealth turned despair into hope for two young patients and their families.

Both patients had a rare type of cancer (rhabdomyosarcoma) that affects muscle tissue, mostly in children and adolescents, and had their tumours in uncommon, delicate locations. Eleven-month-old Nguyen Hai Dang had embryonal rhabdomyosarcoma of the prostate. The other patient, Kristal Yong, 11, had an orbital rhabdomyosarcoma in the right eye socket.

Conventional treatments, such as surgically removing the tumour and the surrounding tissues, and conventional external beam radiotherapy, were not the patients' and their parents' treatments of choice.

"Surgery would be very invasive and may possibly result in loss of function and affect the patients' quality of life," said Clinical Assistant Professor Jeffrey Tuan, Head and Senior Consultant, Department of Gastrointestinal, Hepato-Pancreato-Biliary and Urology, Division of Radiation Oncology, National Cancer Centre Singapore (NCCS).

Similarly, conventional external beam radiotherapy, which delivers radiation to the tumour from external sources, comes with its set of trade-offs. "Radiation energy delivered to the tumour scatters into regions beyond, which in these cases contained sensitive and delicate structures of the eye (for Kristal) and urinary tract (for Hai Dang)," explained Dr Enrica Tan, Senior Consultant,

Clinical Assistant Professor Jeffrey Tuan, Head and Senior Consultant, Department of Gastrointestinal, Hepato-Pancreato-Biliary and Urology, Division of Radiation Oncology, National Cancer Centre Singapore (NCCS)

Clinical Associate Professor Sunny Shen, Head and Senior Consultant, Department of Oculoplastic, Singapore National Eye Centre

Associate Professor John Yuen Shyi Peng, Head and Senior Consultant, Urology Department, Singapore General Hospital

Clinical Assistant Professor Kiattisa A/P Sommat, Senior Consultant, Department of Breast and Gynaecology, Division of Radiation Oncology, NCCS

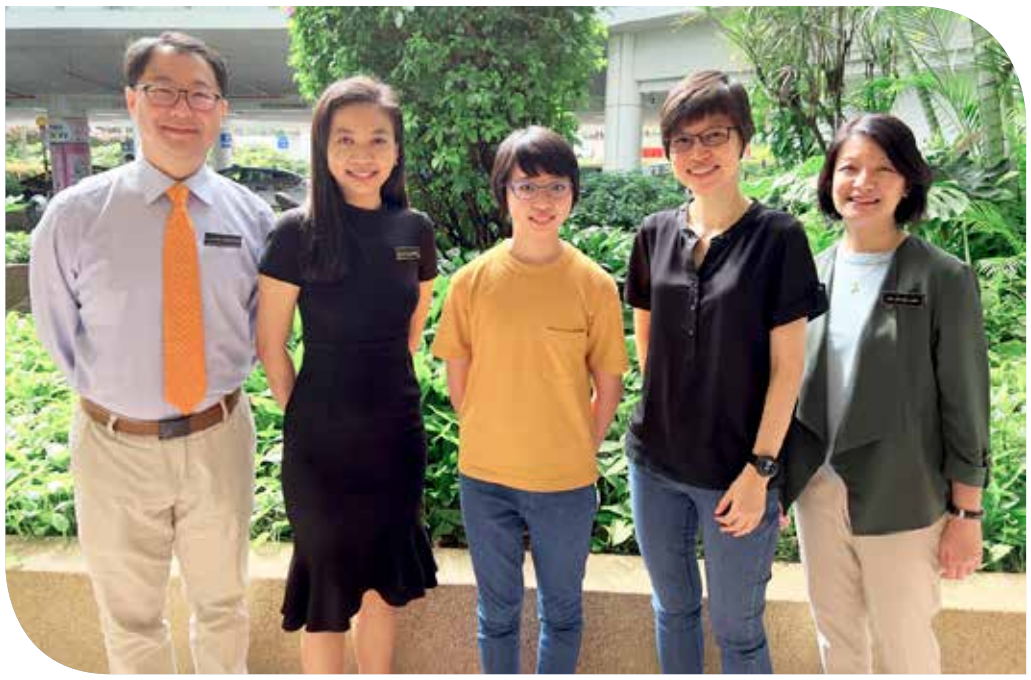


PHOTO: KK WOMEN'S AND CHILDREN'S HOSPITAL

Ms Kristal Yong (middle) and her mother, Mdm Lim Hwee Ping, with her care team (from left) Clinical Associate Professor Sunny Shen, Clinical Associate Professor Kiatissa Sommat and Associate Professor Joyce Lam.

Haematology/Oncology Service, Department of Paediatrics, KK Women's and Children's Hospital (KKH).

Eventually, the care team decided to use a radiation treatment known as 'interstitial brachytherapy'. Unlike conventional external beam radiotherapy, interstitial brachytherapy delivers a more targeted and precise dose of radiation into the tumour through delivery devices, such as plastic needles or catheters.

According to Clin Asst Prof Tuan, this treatment results in less radiation dose to the surrounding tissues and potentially fewer side effects in the long term. "Interstitial brachytherapy achieves organ preservation, retains quality of life and reduces the possibility of late radiation effects," he said.

It would be the first time that interstitial brachytherapy on paediatric patients was performed in Singapore, so naturally there were many concerns. One priority, Dr Tan shared, was building rapport with the patients and their parents, and gaining their trust to carry out the treatment.

The planning process was extensive with consultations across the many departments and specialities involved. Various considerations were taken into account, such as the availability of specialised skills, good workflow and standard operating procedures among the teams from Singapore General Hospital (SGH), NCCS and KKH, Clin Asst Prof Tuan said.

SGH and NCCS have jointly performed interstitial brachytherapy in more than 40 adult patients with prostate cancer before, and each patient case was unique and posed various challenges.

Associate Professor John Yuen Shyi Peng, Head and Senior Consultant, Urology Department, SGH, said that a key challenge when planning Hai Dang's treatment was the uncertainty over how the technique and instruments used for adult prostate cancer patients could be applied on an 11-month-old boy.

"We had to modify the technique used. We also did a tabletop exercise and a virtual walkthrough to ensure maximum precision and accuracy," he said.

The teams also sought expert opinion from overseas centres with experience in interstitial brachytherapy.

Although Kristal and Hai Dang were seeking treatment at KKH, Dr Tan said they were transported to NCCS daily for their treatments. All of this took place during the peak of the pandemic and additional approvals from the authorities were required for the patients to be treated across hospitals.

Teamwork makes the dream work

Assoc Prof Yuen said that teamwork and clear communication among the various departments were instrumental in delivering the complex treatment plans. The teams met virtually on a regular basis to discuss the management options. "We also had a group chat, where we updated one another on the patients' condition every day. Those updates were vital," he added.

The main care team also comprised Dr Wong Ru Xin, Consultant, Department of Lymphoma, Sarcoma, Neurology and Paediatrics, Division of Radiation Oncology, NCCS; Clinical Assistant Professor Kiattisa A/P Sommat, Senior Consultant, Department of Breast and Gynaecology, Division of Radiation Oncology, NCCS; Dr Amos Loh Hong Pheng, Senior Consultant, Department of Paediatric Surgery, KKH; Associate Professor Joyce Lam Ching Mei, Senior Consultant, Haematology/Oncology Service, Department of Paediatrics, KKH; and Clinical Associate Professor Sunny Shen, Head and Senior Consultant, Department of Oculoplastic, Singapore National Eye Centre.

Both Kristal and Hai Dang are currently well, with no active cancer cells detected, and are regularly monitored by their care teams.

"Everyone in the team shared the success and joy. We are happy that the two young patients, who have a long life ahead of them, experienced such good outcomes," Dr Tan said.

Dr Wong Ru Xin, Consultant, Department of Lymphoma, Sarcoma, Neurology and Paediatrics, Division of Radiation Oncology, NCCS

Dr Amos Loh Hong Pheng, Senior Consultant, Department of Paediatric Surgery, KK Women's and Children's Hospital (KKH)

Associate Professor Joyce Lam, Senior Consultant, Haematology/Oncology Service, Department of Paediatrics, KKH

Dr Enrica Tan, Senior Consultant, Haematology/Oncology Service, Department of Paediatrics, KKH

Radiation safety champion

Senior Medical Physicist Laurentcia Arlany uses her knowledge of physics to keep her patients and colleagues safe.

by Elena Owyong

For 30-year-old Senior Medical Physicist Ms Laurentcia Arlany, physics is an intriguing subject. In fact, she earned a bachelor's and master's degree in Physics before joining Sengkang General Hospital's (SKH) Department of Radiology.

"Physics has always interested me. I was especially amazed to see the application of physics in medicine. Many lives were saved through non-invasive diagnosis and treatment, as radiation has prevented the need for more invasive procedures that often carry higher risk. Observing the rapid technological advances in this field and how they have helped doctors in patient diagnosis and management sparked my curiosity in medical physics," she said. Medical physics refers to the application of physics in the healthcare sector.

After graduating with a master's degree in Physics from the National University of Singapore, Ms Arlany started her training at Singapore General Hospital's Department of Nuclear Medicine and Molecular Imaging.

"During the training, I learnt so much from my mentor about physics application in the medical field, which motivated me to explore more. The medical physics world is boundless, as there are many more things to discover," she said, adding that her work allows her to stay on top of new developments in this area and to learn continuously.

"I was inspired by medical physicists and safety radiation officers who have helped fellow hospital staff and patients by addressing concerns about radiation exposure through effective communication, and explaining the benefits and risks of radiation used in medicine. Particularly, my mentor displayed the importance of instilling knowledge to help create a safe work environment."

Over the past six years, Ms Arlany has been working at SKH. A typical work day for her involves investigating staff and patients' radiation exposure, and making sure that the hospital's radiological imaging equipment perform optimally.

She is also involved in many ongoing Quality Improvement projects, and acts as advisor for radiation-related matters in the hospital.

According to Ms Arlany, monitoring staff radiation exposure is important because it will help better evaluate the hospital's radiation safety practices and the radiation levels of their work areas.

"We also want to be sure that the radiation risk does not outweigh its benefits to the patient when they go through any radiological examination or procedure," she said. Common medical imaging tests such as mammography, x-rays and computed tomography (CT) produce radiation, and ensuring justified and optimised radiation exposure to the patient during the diagnosis and procedure is crucial.

Sharing is caring

One of the things Ms Arlany loves about her job is how she can use her knowledge to help others at work. "I am a knowledge-sharing advocate, and it gives me a lot of satisfaction when my colleagues appreciate and apply this radiation knowledge in their daily work," she said.

During her free time, Ms Arlany enjoys singing. Sometimes, she teams up with her colleagues to perform as a band at the hospital's town halls, award ceremonies, and Dinner and Dance. She is also actively involved in the SKH Healthy Living Committee as the karaoke interest group champion.

> *I was inspired by medical physicists and safety radiation officers who have helped fellow hospital staff and patients by addressing concerns about radiation exposure through effective communication, and explaining the benefits and risks of radiation used in medicine.*
>
> Ms Laurentcia Arlany
> Senior Medical Physicist,
> Department of Radiology,
> Sengkang General Hospital

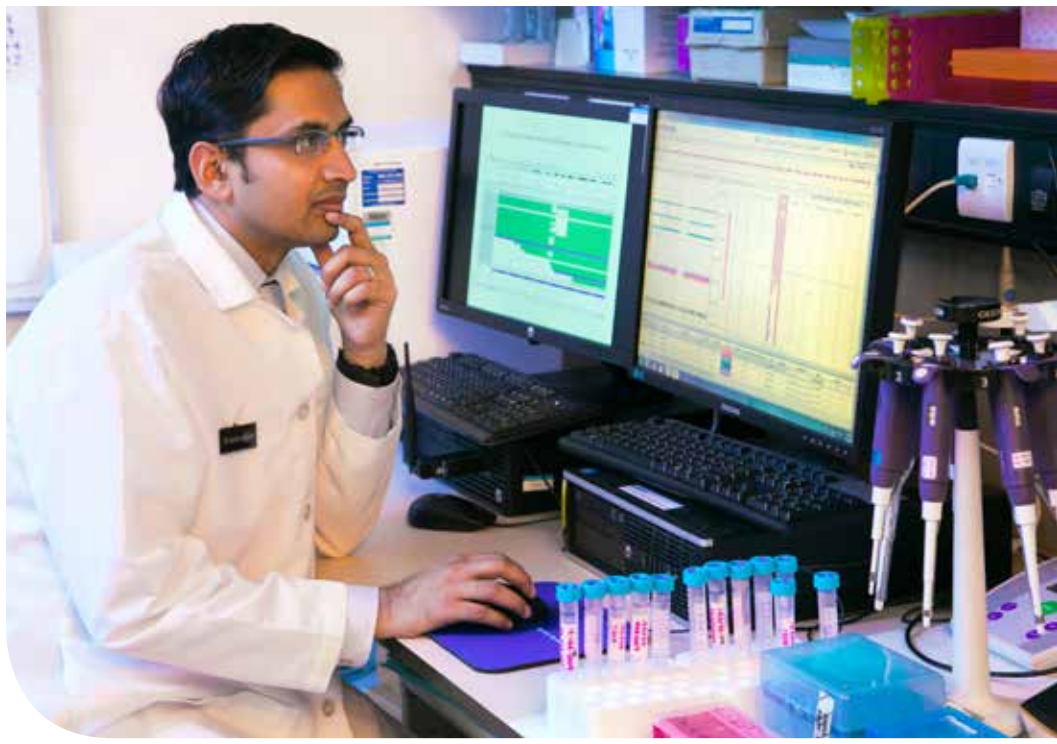
It gives Ms Arlany satisfaction when her colleagues apply in their daily work the radiation knowledge that she has shared.

One of Ms Arlany's duties is to ensure that the radiation levels at the radiology areas are safe for staff and patients.

The disease detective

In uncovering a diagnosis, Dr Saumya Jamuar hopes that it will also lead to more effective ways of managing and treating these patients.

by Eveline Gan



Growing up, Dr Saumya Shekhar Jamuar loved the satisfaction of putting together seemingly unrelated puzzle pieces to form a complete picture.

Now a clinical geneticist, Dr Jamuar, Senior Consultant, Genetics Service, KK Women's and Children's Hospital (KKH), solves puzzles of another form, providing answers and closure for many children and families with rare genetic disorders.

As a paediatrician, Dr Jamuar witnesses the anguish that parents of children with undiagnosed genetic disorders face.

"Specialising in genetics gives me the opportunity to provide parents with a more complete picture of their child's condition. Trying to find answers for the patient and their family is a source of tremendous joy and satisfaction," he said.

Beyond that, uncovering and identifying a rare disease also help clinical teams gain a deeper understanding of their patient's condition. They can then target the most appropriate treatment for the patient, although Dr Jamuar also acknowledged that therapeutic options for this group are limited at the moment. "This is another area of research that I am focusing on," he added.

Among his successful attempts at genetic sleuthing is the discovery of the world's first known case of a rare genetic syndrome, now called 'Jamuar Syndrome'. It is named after the doctor due to his role in identifying the condition.

Dr Jamuar, who first encountered the disease in a pair of siblings at his clinic in 2015, said that due to a genetic variation, the patients had a missing 'scaffold' that is critical for the growth of brain cells.

"This variation caused brain cells to become disorganised and dysfunctional, which in turn led to developmental delays, epilepsy and speech impairment. We have since identified many more patients with the syndrome, he said.

While having the discovery named after him is "an honour", Dr Jamuar pointed out that what is more important is that an answer to the patients' symptoms was found, which then allowed the team to consider the next steps in better managing the patients.

In another case, a one-year-old child, who had repeated infections and stayed in the hospital since she was seven days old, was found to have a rare genetic defect called ectodermal dysplasia with immune deficiency, which is caused by a gene mutation.

"The parents were relieved to hear about the diagnosis because we did not have to perform further diagnostic tests and stem cell transplant became a treatment option for the child. Indeed, after the transplant, she managed to go home after more than a year," Dr Jamuar said.

"The parents felt a lot of guilt thinking that it could be something they did or did not do during pregnancy that caused the disease. Identifying the rare genetic defect assured them that the disease is not their fault."

Although the child eventually passed away when the immune dysregulation recurred, the silver lining is that the diagnosis allowed the team to learn about and inform the parents about the low risk of a similar defect. They went on to have a healthy child.

Making waves in the field

Currently, a day at work for Dr Jamuar revolves around clinical, research and administrative duties. In the clinic, he reviews and manages patients with genetic disorders.

Since receiving the National Medical Research Council Clinician Scientist Award in March 2022, Dr Jamuar has spent around 70 per cent of his time on research activities. His research focuses on using cutting-edge genomic technologies to find the genetic basis of patients whose rare diseases have remained unsolved despite going through advanced genomic tests, such as whole exome or genome sequencing.

He explained, "It includes not only looking at the genetic code using long-read sequencing, but also looking at the 'message' that is produced by the genetic code to identify aberrations in the message. In patients where we do find novel variations, we explore the effect of these variations in the laboratory to confirm the relationship between the variation and the patient's medical history."

Dr Jamuar is also looking at the genomic data of healthy Singaporeans, under the PRECISE (Precision Health Research, Singapore) initiative, to understand the prevalence of genetic diseases among Singaporeans. He is also collaborating with researchers from Duke-NUS Medical School, A*STAR (Agency for Science, Technology and Research) and Nanyang Technological University to explore developing therapeutics for patients who have received a diagnosis.

He believes that the field of genomics will continue to grow, with Singapore being well-positioned following the launch of the National Precision Medicine Initiative. "In the past, we had knowledge of around 200 disorders, but over the last decade we have discovered more than 7,000 genetic disorders. There are still 13,000 genes that we do not fully understand, which we will continue to learn and research about," Dr Jamuar said.

Outside of work, the father of three girls is much like any other doting parent. He spends quality time with his family by engaging in outdoor activities, and catches up with the extended family and friends over meals. The former hockey player has also recently restarted a running regime in the hopes of playing the sport again in the near future.

A rare genetic disease called 'Jamuar Syndrome' is named after Dr Saumya Jamuar due to his role in identifying the world's first known case of the condition.

Specialising in genetics gives me the opportunity to provide parents with a more complete picture of their child's condition. Trying to find answers for the patient and their family is a source of tremendous joy and satisfaction.

Dr Saumya Jamuar
Senior Consultant, Genetics Service,
KK Women's and
Children's Hospital

Blocked tubes

On World Diabetes Day on 14 November, the spotlight falls on peripheral arterial disease, which often affects people with type 2 diabetes.

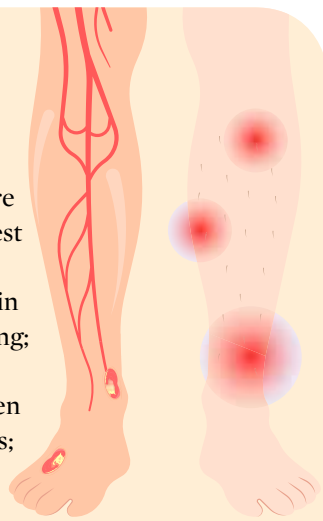
By Goh Bee Lian, with information provided by
Dr Nick Ng, Consultant, Department of Vascular Surgery, Singapore General Hospital

For many people with peripheral artery disease (PAD), the condition has few warning signs.

However, the sobering reality is that it can lead to gangrene, limb amputation and even death. Indeed, patients may not realise they have PAD until they find that a simple wound is taking a long time to heal or it develops complications.

PAD tends to affect people living with type 2 diabetes because, when it is poorly controlled, the condition can damage nerve endings, weaken the immune system and speed up atherosclerosis, or the buildup of fatty deposits on the walls of blood vessels.

Diabetes and PAD

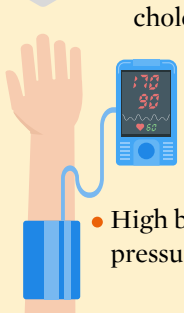


- PAD occurs most commonly in the legs as the blood vessels are the longest and furthest from the heart
- Symptoms include pain in the legs after walking; severe pain at night that disrupts sleep even with strong painkillers; wounds that develop at pressure points or from ill-fitting shoes; wounds that do not heal, become infected or turn gangrenous
- In severe cases, loss of blood circulation can lead to gangrene and even amputation

Causes of blocked arteries

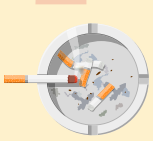

- High cholesterol


- Medicines


- High blood pressure

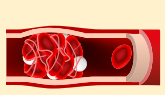

- Injury


- Genetics


- Smoking


- Infections


- Diabetes


- Blood clots

Impact of blocked arteries in other parts of the body


- **Ischaemic heart disease, chest pain, heart attack** — if the coronary or heart arteries are blocked


- **Stroke** — if the carotid arteries supplying blood to the brain, neck and face are blocked


- **Renal failure** — if the renal arteries are diseased


- **Stomach pain** — if the mesenteric arteries that supply blood to the intestines are blocked


- **Finger pain or ulcers that cannot heal** — when the vessels to the hands are diseased

Stay in control

- Take medications as prescribed
- Exercise regularly
- Maintain a healthy diet
- Quit smoking
- Put on appropriate footwear and carry out proper foot care
- Protect against injuries or wounds
- Check daily for cuts, redness, swelling, sores, blisters, corns and calluses, or other changes to the nails or skin around the feet

Type 1 vs type 2

In patients with type 2 diabetes, the pancreas makes insulin but the body's cells are unresponsive to the hormone. In type 1 diabetes, the pancreas does not make the hormone that helps the body convert glucose and sugar into energy. With both types of diabetes, blood sugar levels and fats build up as a result.

Numbers of concern

9.5% of Singapore residents have type 2 diabetes*

1 in 3 expected to develop diabetes in their lifetime**

1 MILLION Singapore residents expected to have diabetes by 2050**

26% of diabetics who attended health examination had poor glucose control*

36% of Singapore residents have hypertension*

39% of Singapore residents have hyperlipidaemia (high blood cholesterol)*

537 MILLION adults globally aged 20-79 are living with diabetes***

643 MILLION – forecast number of diabetics worlwide in 2030**

783 MILLION – forecast number of diabetics worldwide in 2045***

* *Ministry of Health's Health Population Survey 2020 surveyed Singapore residents aged 18-74 years between 2019 and 2020*

** *Health Minister Ong Ye Kung's speech on World Diabetes Day 2021*

*** *The IDF (International Diabetes Federation) Diabetes Atlas 10th Edition 2021*

Get more of this vitamin

Despite Singapore's sunny weather, most pregnant women have inadequate vitamin D, increasing the risk of birth complications.

by Annie Tan

Getting an adequate amount of vitamin D is proven to reduce the risk of complications in pregnancies, says Professor Jerry Chan.

While mothers-to-be are generally mindful of their nutritional intake, one commonly neglected nutrient is vitamin D. In Singapore and around the world, there is a high prevalence of vitamin D deficiency in pregnant women, and this is increasing their risk of birth complications.

A study by KK Women's and Children's Hospital (KKH) in 2021 found that during the COVID-19 pandemic, up to 90 per cent of pregnant women had insufficient vitamin D. "Getting an adequate amount of vitamin D is proven to reduce the risk of complications in pregnancies, such as preterm birth and low birth weight in infants," said Professor Jerry Chan, Senior Consultant, Department of Reproductive Medicine, KKH, and Director, SingHealth Duke-NUS Maternal and Child Health Research Institute (MCHRI).

Vitamin D is available in two main forms — vitamin D2 and D3. While these can be obtained from food sources, vitamin D3, commonly known as the 'sunshine vitamin', is also produced in the skin upon sun exposure.

Given that Singapore is sunny all year round, it may seem odd that so many people lack vitamin D. Prof Chan pointed out that this may be because sun protection awareness in Singapore is very high. People frequently wear hats and cover up with clothing for extra sun protection, spend more time indoors, or lead sedentary lifestyles.

This is especially true for expectant mothers, who tend to stay indoors and use sun protection when outdoors. The pandemic has also kept more people indoors, he added.

Since vitamin D deficiency is common, Prof Chan recommends that pregnant women take a daily vitamin D supplement at doses of 800 to 1,000 IU as soon as they know they are expectant. Even women planning for a baby will benefit from vitamin D supplements. Proven to be safe, this dosage will ensure an adequate supply of vitamin D to the foetus. Vitamin D toxicity is a very rare condition, and can occur when taken at 10 to 25 times the recommended upper limit for the supplements in repeated doses.

In October 2021, the MCHRI launched a series of Healthy Early Life Moments in Singapore (HELMS) initiatives. One of the key interventions for women during preconception involves supplementing nutrition with vitamin D to improve overall health and reduce the risk of complications.

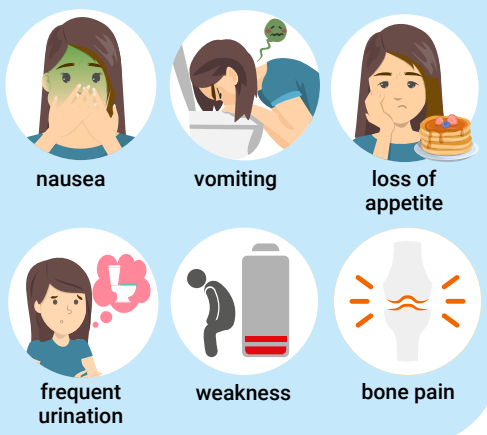
"Vitamin D plays a key role in supporting the immune system and muscle function, and together with calcium, helps keep bones strong and healthy. The Endocrine Society states that at least 1,500 to 2,000 IU of vitamin D per day from all sources, including supplements, diet and sunshine, may be needed to maintain a healthy level of vitamin D in the body to maximise its effect on calcium, bone and muscle metabolism," Prof Chan said.

He also recommended spending 10 to 15 minutes in the sun daily to obtain adequate vitamin D, while preventing sunburn by avoiding excessive sun exposure and using sun protection such as sunscreen. Pregnant women should also eat foods rich in vitamin D, including oily fish like salmon and mackerel, egg yolk, or foods fortified with vitamin D, such as breakfast cereals and dairy products.

An all-rounded approach to holistic health and nutrition will reduce the risk of birth complications, and ensure that both mother and baby are healthy during pregnancy and beyond.

According to the Health Sciences Authority, the maximum daily limit for vitamin D is 1,000 IU.

Vitamin D is a nutrient that helps the body absorb and regulate calcium in the blood. Vitamin D toxicity is rare; however, when a person consumes too much, it can lead to dangerously high levels of blood calcium, a condition called hypercalcemia. Symptoms of vitamin D toxicity are directly related to excess calcium in the blood, which can cause nausea, vomiting, loss of appetite, frequent urination, weakness, and bone pain.



No more counters? Go contactless!

With new online technologies, Singapore General Hospital is providing greater convenience to patients visiting its Specialist Outpatient Clinics.

by Sol E Solomon

To reduce waiting time and queues at its clinics and pharmacies, Singapore General Hospital (SGH) has made changes to the process for appointments, consultations and medication collection at its Specialist Outpatient Clinics (SOCs).

Patients at selected clinics no longer have to wait to register for their appointments when they arrive for their consultations, or to pay and collect their medications after. Almost all prescriptions will be paperless by the end of 2022. Patients can easily keep track of what they have collected and the balance amount of medications via their mobile apps — SingHealth's Health Buddy or the national HealthHub.

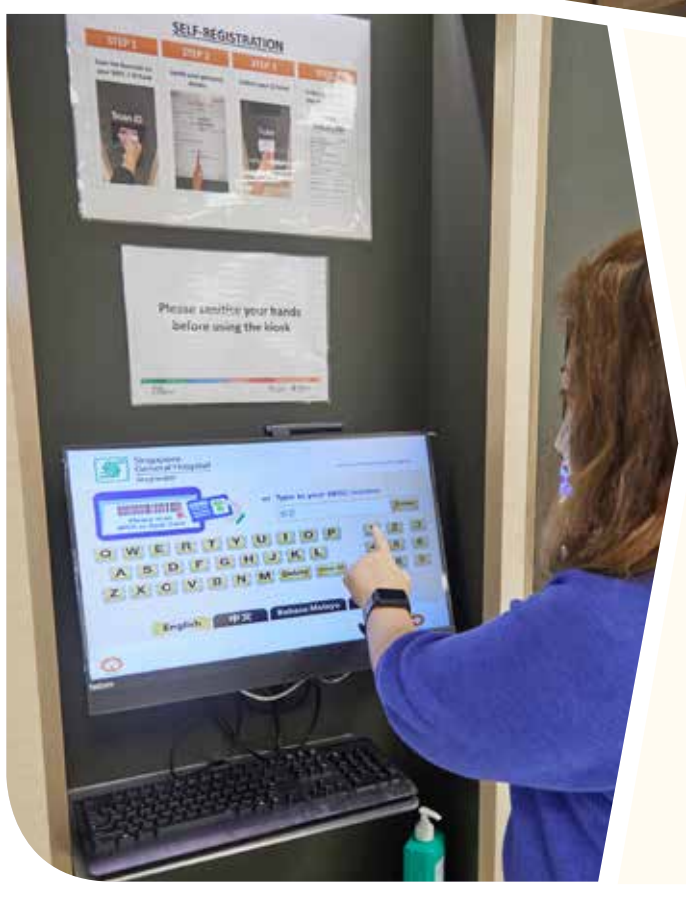
The aim is to enhance a patient's journey to the SOC to be as contactless as possible to reduce the potential risk of infections.

For the less tech-savvy, SGH staff and Infocomm Media Development Authority officers will be onsite to help. The Patient Financial Services' 24-hour self-service lobby at Block 4 is also available for bill payment and other online services.

Self-service kiosks for bill payment, similar to registration machines, will be set up around SGH in the coming months, to enable greater payment flexibility following feedback from patients.

1 Getting an SOC appointment

Appointments to SOCs are by referral from a general practitioner (GP), polyclinic or other public hospitals. This is to ensure patients are given appropriate care by the right specialist.



2 Before an SOC visit

- When the SGH call centre staff receive a referral or appointment request, they will call the patient within two working days to arrange an appointment, and send an SMS or Push Notification (PN) for Health Buddy users to confirm the appointment details. They will also send SMS or PN reminders seven days and one day before the appointment.
- Patients must bring their identification documents such as Singapore NRIC or birth certificate and health booklet (for those under 15 years old), passport and employment papers for foreigners, Civil Service card for civil servants and their dependants, and other benefits cards or documents.
- For first consultations, patients should bring the polyclinic or GP referral letter, medication list, and x-ray and other investigation records taken less than six months ago, if any. If required, patients should also fast before coming for a test or scan.

PHOTOS: VERNON WONG

4 After an SOC consultation

- Patients can leave the SOC immediately.
- They will receive their bills and details of their next appointment via SMS or PN after 8pm the following day.
- They can pay their bills online, or via the HealthHub or Health Buddy mobile apps.
- They can opt for delivery of their medications or choose to collect their medications at the SGH pharmacy.

3 On the SOC appointment day

- Arrive 10 minutes before appointment time.
- Register at the self-service station or pre-register online. For clinics that offer the mobile registration option, patients will receive an SMS or PN to pre-register on the Health Buddy app 90 minutes before the appointment time, as well as real-time updates of the queue situation via their devices.

Visit **www.sgh.com.sg/patient-care/visiting-specialist** for more information.

SOC information provided by Mr Zhuo Weichao, Manager, and Mr Yang Hui, Assistant Manager, Specialist Outpatient Clinics-Operations; Ms Nge Kar Noi, Senior Manager, Call Centre and Telecommunications, Singapore General Hospital

Medication delivery

Instead of waiting at the SGH pharmacy, patients can opt to have their medications delivered on a preferred date, at least three working days after their SOC appointment. The service is free, but there is a fee for urgent or bulky item delivery, or re-delivery if no one is around to receive it.

Collection can also be made from PILBOX (Prescription In Locker Box) or selected bluPORT lockers. PILBOX is available at SingHealth's Bedok, Marine Parade, Sengkang, Punggol and Tampines polyclinics. Medications can also be collected at selected Guardian Health and Beauty pharmacies at the patient's preferred time, date and outlet.

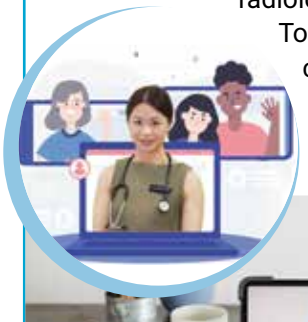
Patients using the medication collection and delivery services can pay via:

- online at **https://eservices.healthhub.sg/public/payments/singhealth** and the Health Buddy app
- AXS and SAM self-service machines, 7-Eleven shops, and Singapore Post Office branches
- Self-service kiosks around SGH in the near future.

Video consultations

Patients may be offered video consultations. This reduces the number of SOC visits to once or twice a year, with a couple of video consultations in between. Patients only need to visit the hospital to undergo periodic lab tests or radiological scans.

To date, video consultation is available at 34 departments in SGH.



Ask BILLie

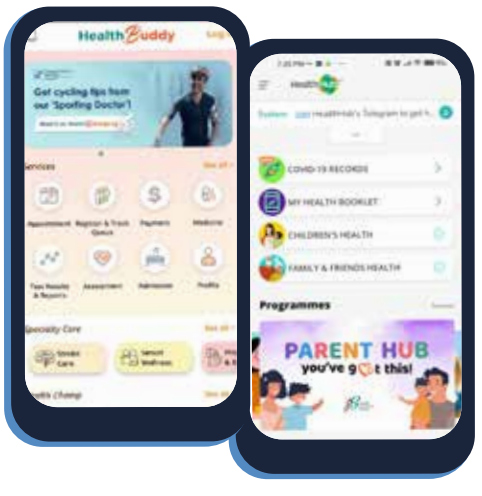
At SGH's one-stop Patient Financial Services Portal (**www.sgh.com.sg/PFS**), patients can pay their bills, submit their MediSave Maternity Claim, find information on MediSave and insurance claims, and other money or bill-related tasks online.

Patients can also 'Ask BILLie', an interactive chatbot, for help with general bill enquiries and requests.

For complex requests, SGH staff will respond within two working days.

Use HEALTH BUDDY or HEALTH HUB apps

- To check, change or cancel appointments
- To order medications
- To pay bills
- To find out the costs and subsidies of upcoming ward admission with the Admissions Buddy feature
- For health-related information



Call 6321 4377 during office hours

- To make, change or cancel an SOC appointment
- For help or clarification on instructions such as fasting

PREPARATION TIME
25 minutes

Pink Dragonfruit Pudding

by Ceph Koh
Global Brand Manager, Pearlie White

Ingredients

- 250ml full cream milk
- 100ml coconut cream
- 20g brown sugar
- 50g pink dragonfruit, pureed
- 2 whole egg white
- 20ml rose syrup

Toppings (optional)

Mashed strawberries, raspberries, blueberries

Method

1. Prepare a steamer with water and bring to a boil.
2. Add full cream milk, coconut cream, brown sugar and pink dragonfruit to a small saucepan and simmer over low heat until the sugar is completely dissolved. Set aside to cool.
3. In a large mixing bowl, beat egg whites thoroughly and slowly mix in milk mixture and rose syrup.
4. Strain the liquid through a fine mesh strainer, and pour into 6 heatproof bowls (3 inches in diameter).
5. Cover each serving bowl with foil and place them in the steamer. Steam for 10 to 15 minutes before removing from heat.
6. Top puddings with strawberries, raspberries, blueberries before serving. It can be served warm or chilled.

Useful Tip

Straining the liquid through a fine mesh strainer will ensure smooth and silky puddings.

Adapted from *Meals to Smile About*, National Dental Centre Singapore's (NDCS) first recipe book for patients requiring soft foods after dental treatment, and who may have chewing and eating difficulties. It features over 30 nutritious recipes, with contributions from staff, patients, caregivers, and friends of NDCS including renowned chefs like Eric Teo and Malcolm Lee. *Meals to Smile About* is also available in Chinese and Malay.
Visit **www.ndcs.com.sg/giving/Pages/Meals-to-Smile-About.aspx** to find out more.

schülke

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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.
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Wine not?

Q Sometimes, I find it difficult to fall asleep after a stressful work day. Drinking a small glass of red wine seems to help me relax and sleep. Is this advisable? If I rely on wine to help me sleep, will I start needing more alcohol to help me sleep? Are there problems associated with regular drinking, such as poor sleep and alcoholism? I find myself waking during the night at times.

A Alcohol does have sedating effects and is probably the most common sleeping aid taken by people in the world, with some studies suggesting that as much as 20 per cent of the US population needed an alcoholic drink to help them fall asleep.

Drinking alcohol can shorten the time it takes to fall asleep, and it can also increase the amount of sleep in the first half of the night. During the second half of the night, when most of the alcohol in the blood has metabolised, the body can shift to light sleep and cause you to wake up repeatedly, or to have unsettling dreams.

Sleep is a very important time for the brain to consolidate the memories and skills acquired during the day. Also, many important processes for the entire body happen during sleep. These include healing, growth, getting rid of body waste, and replenishing stores of energy and chemicals for the next day's use. Most people need between seven and eight hours of sleep every night.

Alcohol should only be drunk in moderation — not more than one drink per day for women and not more than two drinks per day for men, and not exceeding two or three times per week.

Needing an alcoholic drink to fall asleep every night may suggest early signs of alcohol dependency. The body can become so accustomed to the sedating effects of alcohol that more and more needs to be consumed for the person to feel drowsy. Increased alcohol intake can lead to alcoholism and other medical problems in the long term.

It is better to improve your sleep hygiene by avoiding stimulants and having a regular bedtime routine, such as:

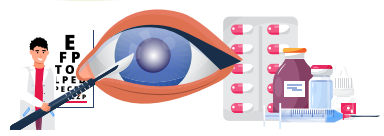
- maintaining a fixed bedtime and wake-up time, even on weekends
- keeping the bedroom quiet and dark
- maintaining a comfortable bedroom temperature
- avoiding watching TV or using the computer or handphone in bed
- limiting caffeinated drinks to two per day and not drinking them after 4pm
- relaxing before bed by taking a warm bath, listening to soft music or reading a lighthearted book.

Dr Leow Leong Chai, Senior Consultant, Department of Respiratory and Critical Care Medicine, and Director, Sleep Disorders Unit, Singapore General Hospital

Question & Answer

HealthXchange.sg

Glaucoma in the family

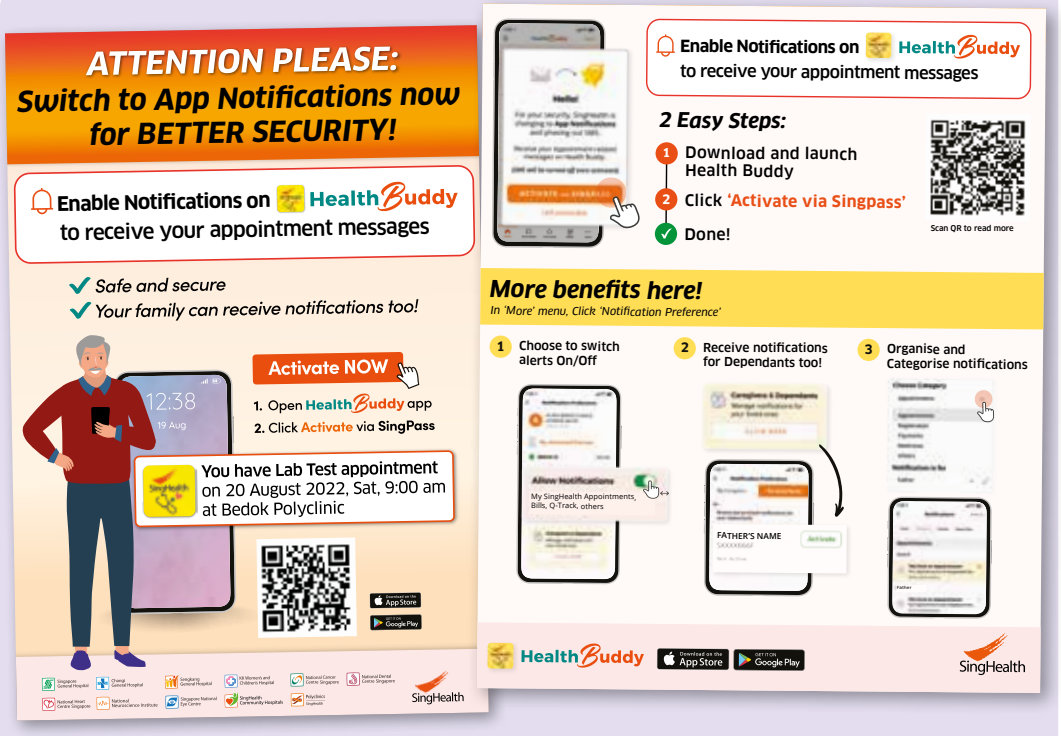


Q I have glaucoma and have been prescribed eye drops over the past five years. My condition is likely hereditary, as my dad suffers from glaucoma, too. Considering my family's medical history, what are the chances that my children, who are in their 20s, will also suffer from glaucoma as they age; if the risk is high, when will the first signs show up? Aside from eye drops, what else can be done to slow the progression of the disease, and what would exacerbate the condition?

A Having a family history increases the risk of glaucoma, and this risk increases with age. Hence, your children should be screened for glaucoma, although the disease may not manifest so early in life. Usually, open-angle glaucoma, which is the most common form of the disease, is asymptomatic in the early stages.

Besides eye drops, controlling the intraocular pressure (the measurement of fluid pressure inside the eye) with laser procedure or surgery can help with the deterioration of the condition. It is important to note that taking steroids — oral, topical or inhaled — can cause increased intraocular pressure and worsen glaucoma.

Dr Fiona Lim, Consultant, Glaucoma Department, Singapore National Eye Centre



••• that by enabling the personal push notifications on SingHealth Health Buddy app, you can better protect yourself from SMS scams?

The Heath Buddy push-notification function replaces the SMS, and allows multiple caregivers to receive notifications related to your dependants. This is unlike SMS notifications, where only one person or caregiver can receive SMS reminders.

Handy push notifications include appointment, bill and payment, and queue (mobile registration) reminders.

Make the switch to push notifications on SingHealth Health Buddy for greater security and convenience!

••• that patients with walking difficulties can drive their personal mobility aids (PMAs) to Singapore General Hospital (SGH) for their clinic appointments?

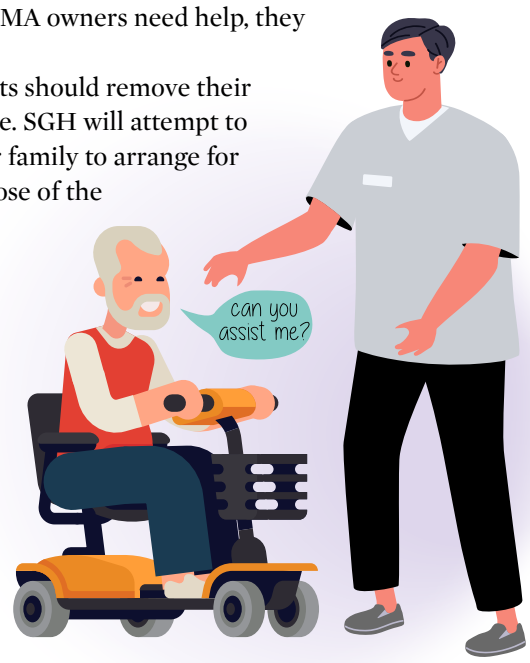
Users should not ride their PMAs at a speed of more than 5 km/h, and should exercise care when approaching other people and buildings. In 2019, a PMA rider crashed into an automated sliding glass door at SGH Block 5 lobby.

Inpatients coming to SGH for surgical procedures would have been advised during their pre-admission counselling not to bring their PMAs. If, despite the advice, they still do, they will have to hand their vehicles to SGH Admissions Office staff at admission. A porter will help transfer the patient to the ward or operating theatre, and the PMA to SGH Block 5 to be parked.

As the PMA holding area is not within the Block 5 building, PMAs and other personal vehicles are left there at their owners' discretion. The hospital will not be responsible for damage or loss of these vehicles. Should PMA owners need help, they can approach SGH staff.

On discharge, patients should remove their PMAs as soon as possible. SGH will attempt to contact patients or their family to arrange for collection, and will dispose of the PMAs after 30 days.

Unlike PMAs and electric wheelchairs, bicycles and personal mobility devices (PMDs), such as scooters and hoverboards — regardless of whether they are manual- or power-operated — are not allowed to be used on SGH Campus.



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PROSPAN

GLUCOSAMINE: Not effective or not the right BRAND of glucosamine?

Before buying a glucosamine brand, ask yourself these questions:

1. How many clinical studies have proven that the brand works for painful joint conditions?
2. How many clinical studies have shown that the brand does not work?
3. How many long term, large-scale studies were conducted using the brand to prove its safety for long-term use?

For Viartril-S:

1. There are more than **100** clinical studies and all the studies have proven that Viartril-S works for painful joint condition.
2. No clinical studies have shown that Viartril-S does not work.
3. There are long-term studies using Viartril-S involving over 7000 patients proving its safety for long-term use. These include one 2-year, one 2.5-year & two 3-year studies with an 8-year follow-up study which has also shown that **Viartril-S reduces the risk of Total Knee Replacement surgery by 57%.**

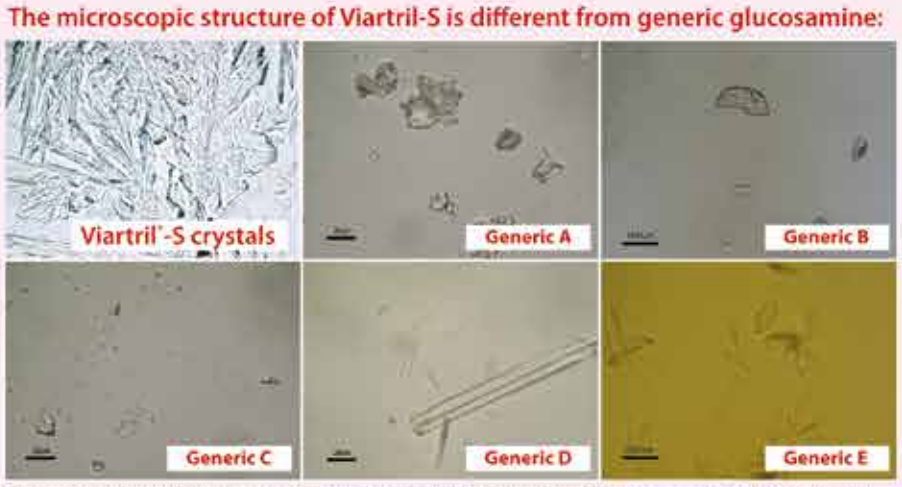
What about the glucosamine brand that you are taking?

Viartril®-S

The *Patented Prescription-Grade* Crystalline Glucosamine Sulphate for Joint Health[1,2]

In Singapore, glucosamine products are sold to public without the need for registration & approval by HSA. This means that even simple checks on purity are not required. So, the safety and efficacy of a brand can only be confirmed by lab & clinical studies.

The microscopic structure of Viartril-S is different from generic glucosamine:



CLINICALLY 90% ABSORPTION PROVEN

The glucosamine brand used in *all successful clinical trials*[3]

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