

**VALUE FOR MONEY**

Nine new eateries on Bib Gourmand list | C5



# life

**HEART OF THE MATTER**

Why heart disease in women is under-treated | C3

**SISTERS MAKING WAVES**

Song sung by Cyndi Wang, Twins draws flak | C6



Madam Mariamah Ismail and Madam Lee Lim Song having a session with Pepper the robot, which can demonstrate simple movements for exercise, at Changi General Hospital. ST PHOTOS: LIM YAOHUI

## ROBOTS TO THE RESCUE

**They are changing the face of healthcare by interacting with patients, delivering medicine, helping with rehabilitation and visiting housebound patients**



**Akshita Nanda**  
Correspondent

At a ward in Changi General Hospital (CGH), a 120cm-tall robot calls out to patients: "Hello everyone, I am Pepper. Let's do an exercise together."

The embodiment of the smiley-face emoji, Pepper can respond to audio cues in English and is programmed to engage when patients are unresponsive too. The robot demonstrates simple movements for exercise and also gets patients to sing or recognise songs.

Robots like Pepper are changing the face of healthcare in Singapore by interacting with patients and complementing the work of nurses. CGH alone deploys about 50 robots, including telepresence

robots at the Intensive Care Unit and Covid-19 community treatment facilities. These robots help patients make teleconsultations with doctors and video calls to loved ones.

CGH also has cleaning robots and robots that move medication, medical specimens and patients' case notes, as well as heavy items such as patients' meals and beds.

The Pepper robot deployed in the wards is the creation of SoftBank Robotics. Pepper robots can be programmed for various functions. They have been deployed at Changi Airport to work in retail and can potentially teach preschoolers.

Pepper was first trialled in CGH in 2019 and has since been used in the wards and the Geriatric Day Hospital at CGH. CGH's nurses worked with programmers to develop physical activities and cognitive activities suitable for patients.

Patients and staff approve of Pepper, says CGH's senior nurse clinician Li Fuyin, who is also an advanced practice nurse. Advanced practice nurses are experts who work with doctors and other healthcare professionals to provide complex nursing care to patients.

Pepper conducts group activities for senior patients, including those with functional decline, dementia

or delirium. It can engage patients multiple times a day, freeing nurses to spend more time on clinical tasks and interaction with individual patients.

Between three and eight patients get to engage with Pepper in each session. A nurse monitors patients for breathlessness or signs of discomfort or disinterest.

In general, patients find Pepper endearing and some families ask where they can buy their own robot companion.

Madam Mariamah Ismail, 86, calls the robot "cantik" (Malay for beautiful) and "cute" after engaging in a session. Another participant, Madam Lee Lim Song, 76, also calls Pepper "cute".

Senior nurse clinician Li says that more than 200 patients in the ward and outpatient settings have engaged with Pepper and say that sessions are fun and easy to follow. The next stage is to programme Pepper to speak in local dialects.

Other hospitals around Singapore also deploy interactive robots. Alexandra Hospital has used a mobile robot made by multinational robotics company temi to visit housebound patients and provide medication. Tan Tock Seng Hospital (TTSH) deploys a temi robot as a pharmacy assistant (see related story on C2).

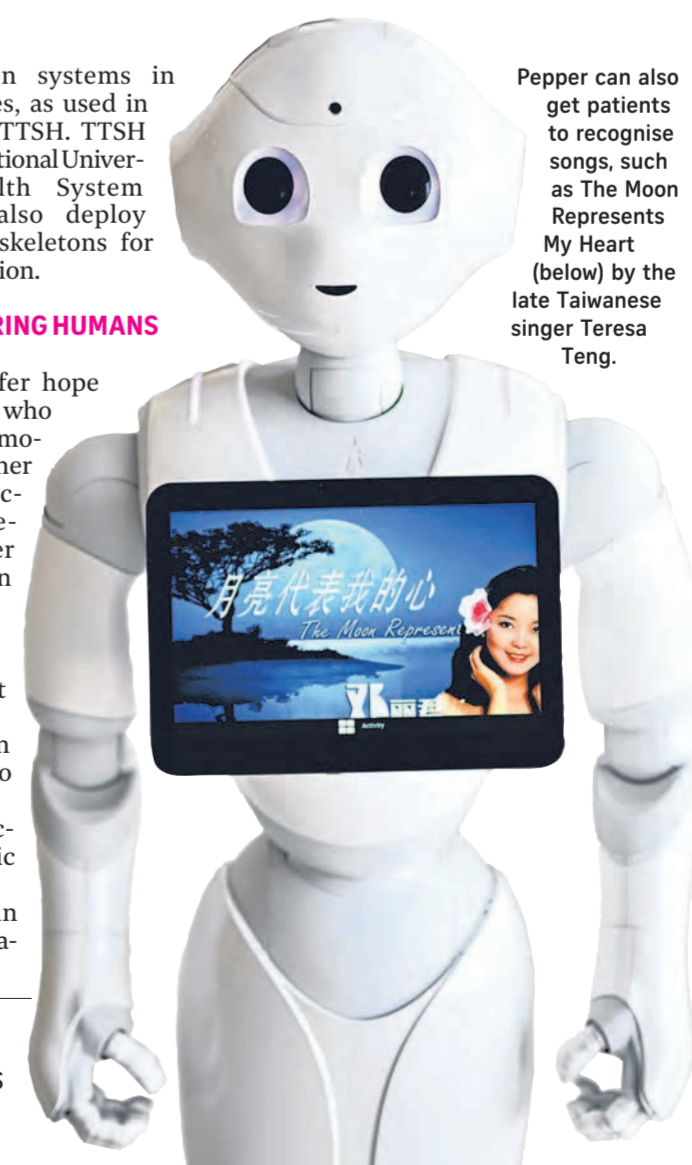
Other applications of robotic systems in healthcare here include

automation systems in pharmacies, as used in CGH and TTSH. TTSH and the National University Health System (NUHS) also deploy robot exoskeletons for rehabilitation.

**EMPOWERING HUMANS**

Robots offer hope to patients who find their mobility or other daily functions reduced after illness. In 2019, NUHS launched the largest clinical study in Asia to examine how effective bionic exoskeletons are in patient rehabilitation.

**HELPING HUMANS IN MANY WAYS**  
continued on C2



Pepper can also get patients to recognise songs, such as The Moon Represents My Heart (below) by the late Taiwanese singer Teresa Teng.



# Helping humans in many ways

FROM C1

The Improving Mobility Via Exoskeletons programme is supported by Temasek Foundation and local charity Trailblazer Foundation.

The pilot run, which ended in March, involved 317 patients. They received physiotherapy and sessions of wearing the Ekso robotic device, a bionic exoskeleton. Powered assistance at the hip and knee allows patients using Ekso to stand, walk and turn.

Sensors provide real-time feedback on patient performance and the physiotherapist can adjust the level of assistance required.

Dr Effie Chew, head of rehabilitation medicine at Alexandra Hospital, says the results of the pilot have been promising, especially for patients whose mobility and coordination were affected by stroke.

Patients using exoskeletons can achieve, on average, more than 500 steps in a 20-minute gait training session, compared with 50 to 100 steps in conventional rehabilitation.

Robotic technology can assist human users in various ways, including as augmentative and alternative communication (AAC) devices.

Mr Mohammad Asri Sunawan, 43, uses such a device. He is paralysed from the neck down and requires mechanical assistance to breathe. He was diagnosed with amyotrophic lateral sclerosis – a motor neurone disease – in 2018. As the disease progressed, affecting his limbs and voice, he had to give up his job in public relations and communications.

Thanks to an eye-tracking device, Tobii, built by a multinational company of the same name, Mr Asri can surf the Internet, check and reply e-mails, and type up documents. He sits on committees including the Malay Language Council of Singapore and Malay Language Month.

He replies to questions by typing answers. "Tobii is more than a robot; it breathes life to me," he types. "Tobii acts as my hands, legs, eyes, voice, as my speech is now slurry, and so much more. I rely a lot on Tobii for my activities of daily living. This Tobii is my friend."

Speech therapist Tan Xuet Ying says AAC devices like Tobii can empower a range of people, including those recovering from strokes and those who have Parkinson's disease.

She is part of a chat group with people who have motor neurone disease and says AAC devices allow them to type faster than she can.

"I have trouble keeping track of the conversation," she says with a laugh. "Technology is revolutionary in their lives. It gives them independence. It's heart-warming to see."

akshitan@sph.com.sg



Mr Mohammad Asri Sunawan, who has a motor neurone disease affecting his ability to control his muscles, uses Tobii, an eye tracker, to surf the Internet, check and reply e-mails, and type up documents. ST PHOTO: EUGENE GOH

SCAN TO WATCH  
Watch Pepper in action  
str.sg/wbkj



## Robots delivering medicine and making therapy fun

At Tan Tock Seng Hospital's (TTSH) Emergency Department Pharmacy, a robot helper dispenses medicine to patients without direct contact. Over at the hospital's Clinic for Advanced Rehabilitation Therapeutics (Cart), robots make therapy less boring for patients recovering from strokes.

Patients and hospital staff tend to find robot helpers endearing.

Senior pharmacist Freddy Tang says that when patients see the robot coming with their medicine, they are surprised at first, but "take it to very well".

"Even the elderly are pleased with it," he adds.

His department nicknamed their robot assistant Pillbot.

"We call it our little helper," he says. "It's part of the family."

Pillbot moves between pre-programmed stations around the hospital. It has a monitor that allows a pharmacist to perform telecon-



Mr Fabian Yeo suffered three strokes last year. As part of his rehabilitation therapy, he uses the robot H-Man, which exercises his arm and hand through gameplay. ST PHOTO: NG SOR LUAN

sultations or ask a nurse to find a patient.

Mr Tang says Pillbot has been in use almost daily since October last year. The robot helped dispense medicine to patients in high-risk wards, including those suffering from Covid-19.

Previously, pharmacists might have to change in and out of personal protective equipment (PPE) 10 times a day while visiting such wards. Using Pillbot saves time and reduces the use of PPE.

Pillbot is a robot designed by multinational firm temi, which also has a Singapore distributor. Robots by temi have been used by Alexandra Hospital to visit housebound patients and provide teleconsultations. Another

Pillbot, which is used to dispense medicine at Tan Tock Seng Hospital's Emergency Department Pharmacy, also allows pharmacists to communicate with patients via video call. ST PHOTO: EUGENE GOH

temi robot plays tour guide at the National Gallery Singapore.

Pillbot is programmed via a cellphone app. "It's very user-friendly," says Mr Tang.

Another user-friendly robot is making therapy less boring for patients at TTSH.

H-Man is manufactured by Articares following a collaborative research project between Nanyang Technological University and TTSH's Cart.

The robot has a computer screen, joysticks of various shapes and a resting pad. The joystick and resting pad are shaped like the letter H, hence the robot's name.

The user manipulates the joystick to play games like shooting down a drone or netting fish. All are actions that exercise the muscles of the arm and hand.

Ms Tegan Plunkett, principal occupational therapist at TTSH, says H-Man is versatile and can provide guiding force or resistance as needed, depending on the user's ability and therapy goals.

It also allows users to complete rehabilitation sessions in their own time, without needing to travel to the centre.

Mr Fabian Yeo, 55, who works in the legal department of an accounting firm, had three strokes last year which affected his right side. Once he returned to work, he found it difficult to visit the clinic regularly for rehabilitation sessions because of his schedule.

He was loaned an H-Man robot to take home. This allowed him to complete several hundred movements on the robot daily, says Ms Plunkett.

Mr Yeo says the gameplay is a more interesting way of performing repetitive movements such as extension and stretching.

His son, 21, and daughter, 19, were interested in H-Man as a game console.

"They would say they wanted to play with it and I would say: 'No, it's daddy's, go back to your Xbox,'" says Mr Yeo with a laugh. **Akshita Nanda**

## Get a tuina massage from a robot



Traditional Chinese medicine physician Lim Tze Chao programming treatment to be performed by robot tuina masseuse Emma. It stops automatically if the person being massaged fidgets in discomfort. ST PHOTO: GIN TAY

helper Emma. Emma stands for Expert Manipulative Massage Automation and is developed by Singapore start-up AiTreat.

The Parkway Shenton Medical Clinic in Toh Yi Drive launched the robotic tuina massage service to support the work of TCM practitioners.

The TCM physician programmes the necessary massage treatment, which Emma performs with a silicone "thumb". The physician remains in the room to monitor the treatment.

Mr Lim says patients were surprised when he introduced the robot. "Some were quite fearful, but after treatment they were pleasantly surprised," he adds.

Emma is programmed to exert a safe amount of force. The robot also has an auto-stop feature which kicks in if the person being massaged fidgets in discomfort.

While one patient gets robotic tuina treatment, the TCM physician can attend to another who may need acupuncture or consultation. The TCM physician steps in at the end of the Emma massage to target deep muscle tissue areas the robot cannot reach.

"The main idea behind using this robot is to share the burden with the TCM physician," says Mr Lim. "If one physician is going to do tuina for 10 or 20 patients, fatigue sets in."

**Akshita Nanda**

Can a robot perform therapeutic tuina massage as well as a human? Since the robot does not tire of

performing repetitive motions, some patients might find a robot masseuse more consistent and comfortable.

Since April last year, traditional Chinese medicine (TCM) physician Lim Tze Chao has been attending to patients with robot

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