SINGAPORE

AI tool delivers better outcomes in complex spinal surgery at TTSH

It aids pre-surgery planning, provides greater accuracy in implantation of screws and rods

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Dr Wayne Yap (far left), a consultant at Tan Tock Seng Hospital's orthopaedic surgery department, and Adjunct Associate Professor Jacob Oh, head of spine surgery and a senior consultant in the department, demonstrating how an AI tool developed by medtech company Medtronic assists the planning and execution of complex spinal surgery. PHOTOS: LIANHE ZAOBAO

Complex spinal surgery at Tan Tock Seng Hospital (TTSH) has been made faster, safer and more precise with the use of artificial intelligence (AI).

As Singapore's population ages rapidly, more seniors are likely to suffer from spinal conditions, including complex deformities such as degenerative scoliosis with nerve compression.

Hospitals here have been riding the wave of adopting AI in healthcare for better outcomes, such as analysing a cardiac scan for a faster diagnosis of coronary artery disease, and analysing medical lab reports with a comprehensible summary and explanation of the results.

Similarly, in TTSH, its department of orthopaedic surgery has successfully performed more than 250 AI-assisted spinal surgical operations since 2021. These were mostly complex surgical operations for elderly patients.

Complex spinal surgery used to be done with surgeons deciding on surgical details only in the operating theatre, such as the exact positions in the spine and the ideal angles to implant the screws and rods, as well as the contour of the rods.

Rods and screws are implanted to hold the spine at its corrected position and keep the spine aligned properly.

This process relied heavily on the surgeon's experience and could result in variable accuracy rates, given that the patient would be lying flat and presenting the spine differently compared with when standing straight, said Dr Wayne Yap, a consultant at TTSH's orthopaedic surgery department.

With AI aiding pre-surgery planning and providing greater accuracy in the implantation of the screws and rods, TTSH surgeons can now concentrate on aspects of the surgery that require their professional expertise and skills.

An example is a surgeon adjusting the angle of implantation for patients with osteoporosis, as their spinal bones would have softened, said Dr Yap.

The AI tool developed in Europe by medtech company Medtronic allows for auto-analysis of the patient's X-ray to assess the state of the spine, as well as predictive modelling of the potential outcomes of the surgery, including if the spine can be straightened to a normal and functioning state.

This pre-surgical planning can now be completed outside the operating theatre.

In addition, "there is no more guesswork" with the AI tool, which allows for visualisation and simulation. This allows surgeons to determine the optimal positions for implants and customise the size and bends of each rod used to correct the spine, said Adjunct Associate Professor Jacob Oh, head of spine surgery and a senior consultant at TTSH's orthopaedic surgery department.

With the deployment of this AI tool, patients who underwent complex surgery saw a reduction of their hospitalisation by up to 50 per cent, from an average of about seven to 14 days post-surgery, to about three to six days, said Dr Yap.

The surgery time saw a decrease of up to 20 per cent, as the planning work could be completed ahead of the surgery.

The use of the AI-assisted robotic arm helped to navigate and ensure the precise insertion of the implants. This also reduced the surgical time needed and the likelihood of major complications due to damage to other nerves or organs near the surgery site, which could potentially lead to paralysis or even death.

Of all TTSH patients who had AI-assisted spinal surgery, none died or was paralysed.

Prof Oh said none of the patients had to undergo revision surgery to tighten any loose or misaligned screws, or had to be admitted to the intensive care unit after surgery.

The use of advanced technologies comes at a price, for now.

Patients who benefited from AI-assisted robotic spinal surgery at TTSH received, on average, a 5 per cent to 10 per cent higher pre-subsidy bill, mainly due to the costlier custom-made rods to be implanted.

The rods used in traditional spinal surgery would have cost around $1,000 each, but the custom-made rods flown in from France cost 50 per cent more.

Nevertheless, the slightly higher price tag for such AI-assisted surgery did not turn patients away.

Madam Jenny Ee, 74, used to be an avid jogger and visited the gym five times a week.

When she first experienced pain several years ago, which went from her lower back down to her left calf, she depended on oral painkillers.

Soon, the painkillers did not have much effect, and spinal injections of steroids could give her only one to two pain-free days.

Madam Jenny Ee, who experienced debilitating pain that affected her quality of life, underwent open spinal surgery in July 2024 that lasted eight hours and was performed by Prof Oh. She can now brisk-walk a few kilometres each day.

It came to a point when she could barely walk for 10 minutes without resting. When she suddenly experienced excruciating pain while she was on the gym's treadmill, she finally considered surgery.

She underwent open spinal surgery in July 2024 that lasted eight hours and was performed by Prof Oh. Twenty screws were implanted into her spine to fix the scoliosis.

Post-surgery, she spent two days in a high dependency ward and five days in a general ward before transferring to the TTSH Integrated Care Hub for three weeks to complete her inpatient physiotherapy.

Madam Ee can now brisk-walk a few kilometres each day, and has travelled to Taiwan and Malaysia.

"From the debilitating pain, which resulted in me not having a good quality of life and a complete standstill for all my normal activities, it was a huge relief that just one day after the surgery, I no longer feel the same pain down the nerve," she said.

Before her surgery, she received an estimate of $70,000 to $80,000 for her total bill, with the consumables – the screws and rods – costing more than $30,000.

She paid about $10,000 after receiving government subsidies.

"As I wanted my life back, this was worth it," said Madam Ee.

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CDAC gives $400 e-vouchers to needy families for school expenses

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About 8,500 low-income families will receive $400 worth of e-vouchers each from the Chinese Development Assistance Council (CDAC) to help defray expenses for their school-going children and prepare for the new school year.

Announced at the 22nd annual Ready for School event organised by CDAC on Dec 7, these vouchers help to cover the cost of transport, essential school supplies and other educational needs.

More than $3 million in vouchers will be disbursed to CDAC beneficiaries, said the non-profit, self-help group for the Chinese community. In 2024, CDAC disbursed more than $3 million in vouchers, benefiting 8,300 families.

CDAC said it is also setting aside $47 million to expand its education programmes and support families in 2026, with more details to be announced in the new year.

CDAC is one of four ethnic-based self-help groups in Singapore, along with the Singapore Indian Development Association, the Eurasian Association and Yayasan Mendaki.

Among those receiving the e-vouchers is Madam Suo Sivcheng, 44, who has two children – a daughter aged 11 and a son aged seven.

"I am hoping to get new bags and shoes for my children for the new school year," said Madam Suo, a part-time waitress who has been the sole breadwinner for the family of four after her husband fell sick in June.

"My son has been eyeing a new pair of shoes but my income is not enough, so these vouchers help... The vouchers are a lot to us."

Another beneficiary is 43-year-old part-time hawker Tang Huey Ling. She hopes to use the vouchers to help defray transport costs for her two six-year-old children when they start primary school in 2026.

Madam Suo Sivcheng watching her son get a haircut during the Ready for School event organised by CDAC on Dec 7. She is one of the beneficiaries of the e-vouchers disbursed by the non-profit, self-help group. ST PHOTO: KELVIN CHNG

To qualify for the vouchers, families must have at least one child going to school full-time in 2026, and must be a beneficiary of one of CDAC's assistance schemes and programmes. The child may be at any education level from kindergarten to university.

The digital vouchers can be redeemed at SimplyGo ticket offices and kiosks. The funds will be topped up to families' EZ-Link cards or Nets FlashPay cards, and can be used to pay for transport and purchases at any of SimplyGo's more than 760 participating merchants.

On the increase in funds for its education and support programmes, CDAC executive director Tan Yap Kin said that more funds would be allocated for things such as long-term mentoring programmes, as well as helping children pursue their interests, such as playing badminton and learning musical instruments.

"Based on a survey we did, many of the children (would) like to have a hobby, but some of their parents have reflected that reasons like costs, as well as distance and time, may not allow them to afford (it), so this is where CDAC can come in," he said.

Pursuing hobbies is very important in helping children develop their thinking and regulate their emotions, as well as build friendships, he added.

About 1,500 families attended the Ready for School event at Nanyang Junior College on Dec 7. Acting Minister for Culture, Community and Youth David Neo was also present.

The event saw families bonding over activities such as arts and crafts, as well as virtual reality and arcade games. There were also free haircuts for students and health screenings for adults.

New assessment books and educational materials were also distributed to CDAC beneficiaries at the event.

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