

Targeted brain stimulation offered at NUH to treat depression, anxiety

Researchers also see promising trial results when treatment is applied to severe OCD

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A targeted psychiatric treatment to stimulate brain circuitry down to the millimetre – without surgery – is now offered at the National University Hospital (NUH), likely making it the first service of its kind in South-east Asia.

Known as personalised transcranial magnetic stimulation (pTMS), the treatment uses functional magnetic resonance imaging (fMRI) scans, which track blood flow and oxygen levels in the brain, with AI-powered algorithms to map brain circuits.

This allows magnetic pulses to be targeted at the networks driving mental health conditions.

It is currently offered as a clinical service at NUH and the private Alvernia Psychological Health Centre, and will be expanded to other public hospitals.

While pTMS is approved in Singapore for treatment-resistant depression and anxiety, researchers at NUH have also seen promising trial results when they applied the technology to severe obsessive-compulsive disorder (OCD).

So, it can also be offered, on a case-by-case basis, to patients who have exhausted standard OCD treatments.

Standard TMS, introduced in Singapore slightly more than a decade ago for treatment-resistant depression, is available at certain locations in Singapore. The Institute of Mental Health (IMH) extended the treatment to OCD in 2022.

There is no brain mapping in standard TMS, which uses approximate target locations, stimulating the same spot in every patient.

Even so, standard TMS has a promising 21% response rate and a 17% remission rate, based on an IMH study that evaluated 58 patients with treatment-resistant depression treated between 2018 and

2023.

Another report on standard TMS has since been published in *Frontiers In Psychiatry* on Oct 12, showing that the cohort at Khoo Teck Puat Hospital (KTPH) who were treated in an outpatient setting achieved a 68% response rate and a 57% remission rate.

Although patient complexity and treatment protocols differed between the IMH and KTPH studies, both demonstrated that standard TMS is effective.

As for pTMS, a study done at IMH showed that 70% of the 21 participants with treatment-resistant depression responded within a month of receiving treatment.

NUH launched pTMS in early 2026 for those with depression and anxiety. It is currently unsubsidised, so patients need to pay \$15,000 to undergo the sessions. So far, several patients have been treated, including one who flew in from Hong Kong and another from Bangladesh.

'WAKING UP FROM A DREAM'

A patient, identified only as Chen, had lived with debilitating OCD for around 20 years until pTMS brought her relief. Medications and cognitive behavioural therapy had done little to help her condition.

She was diagnosed with OCD in 2007 when she was studying in Britain. Her condition manifested not as repetitive physical habits, but as intense mental compulsions.

"I couldn't control my compulsion. I had to get things just right," said the 49-year-old. "I would perform the compulsion, get physically exhausted and then fall into depression."

Her OCD demanded so much of her that she often forgot to eat or sleep – she once spent 72 hours without sleep while working as an architect in Britain.

It led to her taking breaks from university and from work, with the



Known as personalised transcranial magnetic stimulation, the treatment uses functional magnetic resonance imaging scans with AI-powered algorithms to map brain circuits. This allows magnetic pulses to be targeted at the networks driving mental health conditions. PHOTO: NUH

longest lasting a few years.

By the time she returned to Singapore in 2019, she was far too familiar with the side effects of her medications, which included emotional blunting, brain fog and cold sweats, as well as muscle twitching that disrupted her sleep.

In early 2026, not long after going under the care of Tor Phern Chern, a senior consultant at NUH's psychological medicine department, she joined his pTMS trial for individuals with severe, treatment-resistant OCD, and saw a 35% symptom reduction a month after the treatment.

In the pTMS for OCD trial, Tor partnered with Thomas Yeo, deputy head of the Centre for Translational Magnetic Resonance Research at NUS Medicine, to identify the specific brain circuits linked to her condition.

"By combining brain imaging with computational modelling, we are able to better understand how each patient's symptoms are re-

flected in their brain circuitry, and translate that insight into targeted treatment," Yeo said.

Chen has so far completed 16 booster pTMS sessions, following 40 sessions over five days in the trial. Each pTMS session lasts around nine minutes.

When the impact came gradually, it was clear. "It was like a sense of regaining clarity, almost like waking up from a dream and not feeling groggy," Chen said.

"I became much more aware of my behavioural patterns. Sometimes, I can see triggers. I might not be able to stop the compulsion, but I can identify them."

It brought emotional clarity to her relationship with her husband.

"At least now I realised that I am not angry at him for trying to look after me. Now I understand that it was just a reaction to somebody who interrupted (my) compulsion," she said.

"It was very hard to get along with people when you're in the

middle of a cycle of compulsion because people would try to interrupt it, and they are usually met with my displeasure or ire."

Tor said it was clear that the treatment worked for her. "We did eight sessions a day... It took about a month to (see results), but it was just unbelievable. She could talk coherently... understand what the symptoms were for the first time."

The other participant in the pTMS trial saw even better results. Her symptom scores fell by 78% by the end of the treatment week and by 100% six weeks later.

"Being able to reach the circuits that deep brain stimulation targets, without surgery and in a single week of treatment, is what makes these early results so encouraging," said Tor.

Tor and Yeo will start a new study that aims to recruit 30 patients to look at how brain networks and symptoms change during pTMS in individuals with depression who also experience anxiety.

FUTURE EXPANSION

NUH and Alvernia Psychological Health Centre are partnering with BiNeuro to offer pTMS.

BiNeuro is a spin-off from NUS founded by Yeo and partners, including Tor, which focuses on fMRI-guided precision neuromodulation treatments and a neurotargeting service.

It handles the complex brain mapping before pTMS takes place.

Its breakthrough brain-mapping algorithm developed by Yeo and Ruby Kong, which powers pTMS, is already being used by researchers around the world.

BiNeuro is also exploring regional collaborations.

In Singapore, pTMS is set to expand to IMH, Sengkang General Hospital and KTPH through a National Healthcare Innovation Centre grant, said Tor, the grant's principal investigator.

KTPH plans to start pTMS for treatment-resistant depression in the coming months, said Tay Yi Hang, a consultant at the hospital's psychiatry department.

She said KTPH has used standard TMS to treat about 50 patients with depression since 2022, and five patients with OCD since 2025.

For these patients who have seen little relief from medications and therapy, pTMS gives hope. OCD, in particular, is one of the hardest mental health conditions to treat, as the only medicines approved for it belong to a single drug class, serotonin reuptake inhibitors, and 40% to 60% of patients do not respond adequately to them.

"If medications and therapy don't work, and counselling doesn't work, the next step is literally deep brain stimulation," Tor said. "It's the same treatment you use for Parkinson's disease, where you plant electrodes to stimulate deep parts of the brain... It turns out most people don't really want to have brain surgery."

With her trial completed and her symptoms lighter, Chen is now looking at long-term options to maintain her recovery.

"Very often, with mental health, people sort of expect you to get better or get cured. So initially, there was a huge struggle for me to explain to my parents that there's no real cure. It's only how well you can manage it."

"In the last three years or so, I think my parents have also tried not to push me to get better. So, that was a bit of a relief for me."

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