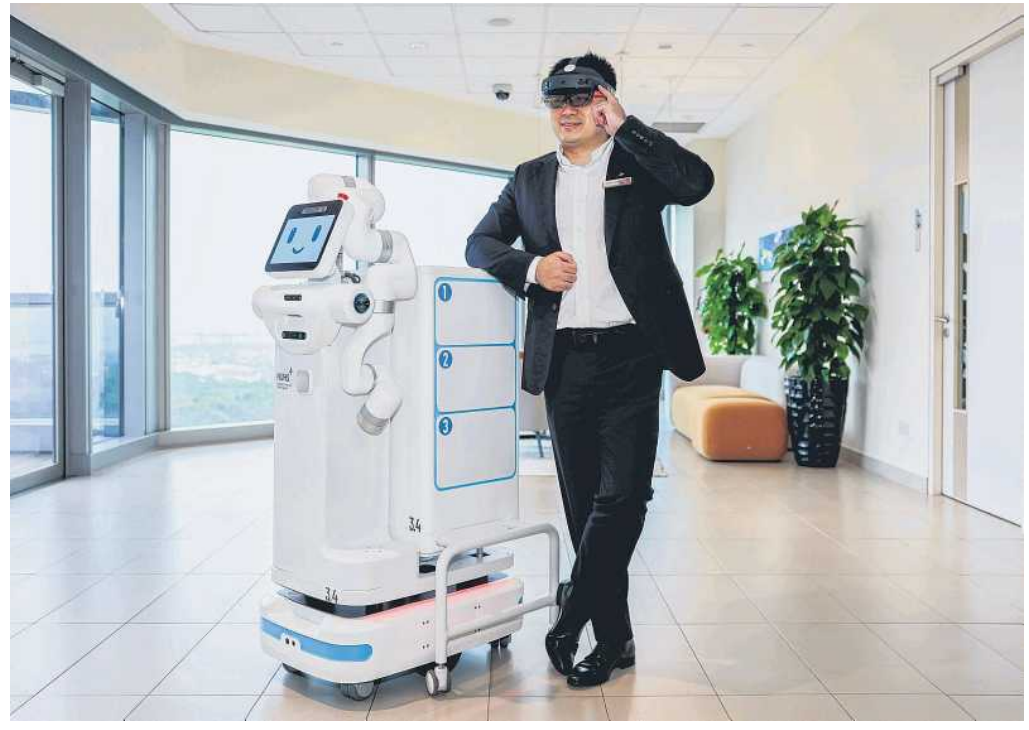
Home-based patient care among uses of AI being tested at new 5G, 6G research centre

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Gao Yujia, director of the new National University XG AI Centre, wearing an augmented reality headset beside a nursing robot at the NUHS Tower Block on Nov 3. ST PHOTO: BRIAN TEO

Wearable medical equipment powered by artificial intelligence picks up and assesses the seriousness of a sudden spike in blood pressure or heart rate anomaly in a hospital patient recovering at home.

If the readings signal an emergency, hospital staff caring for the patient remotely and emergency services are alerted in real time to respond and help the patient.

This future, where hospital wards have no walls and the beds are in the patients' own homes, is a step closer with the signing of a memorandum of understanding between the National University Health System (NUHS), telco Singtel and telecommunications equipment maker Ericsson on Nov 3.

Together, they are advancing research into improving hospital healthcare services using AI, an upgraded form of 5G networks called 5G-Advanced, and future 6G networks with the launch of a new research centre by NUHS, Singtel and Ericsson.

"By bringing together clinical and industry expertise, we hope to harness future generations of telecommunications technology into practical healthcare applications," said NUHS chief executive Yeoh Khay Guan.

NUHS runs hospitals such as National University Hospital (NUH), Ng Teng Fong General Hospital and Alexandra Hospital.

Yeoh added that the healthcare applications include autonomous mobile robots that help the hospital with logistics and caring for patients, internet-connected mobile devices that allow patients to be cared for at home, and helping surgeons with surgical operations.

Current 5G mobile networks can support efforts like hospital staff remotely monitoring patients at home to some extent. But 5G may not be able to cope with the surge in data expected in the future as even more patients are forecast to recover at home, more complex patient data is expected to be collected, and online AI tools generate more data.

5G-Advanced networks launched in 2025, as well as 6G networks slated to be commercially launched in 2030, are expected to be able to handle the greater volumes of data anticipated.

These networks, which the new centre is focusing on, are forecast to be faster than current 5G mobile networks, according to Singtel.

The newer networks also have significantly less lag or latency – a measure of how quickly a network can respond – compared with 5G.

And for 6G networks, they are predicted to support a much larger number of connected devices than 5G, according to Chau Yuen, an associate professor from Nanyang Technological University's School of Electrical and Electronic Engineering.

Taken together, this means that more data processing can be done in the cloud with the new networks. Consequently, devices like augmented reality headsets can also become smaller and less bulky since they do not need more powerful chips and larger batteries.

NUHS is already planning to replace its existing Microsoft HoloLens augmented reality headsets, used by surgeons for some surgical operations, with slimmer augmented reality glasses.

For example, the headset displays a hologram of a patient's heart, recreated from CT scans, superimposed on a patient's chest to help the surgeon see a 3D "X-ray" image of where the patient's heart is. This allows the surgeon to plan where to make cuts during a heart operation.

"In the future, with more capable AI and a more capable mobile network that can also support higher-resolution camera feeds from smart glasses sent to the AI, the hologram can be superimposed on a patient with higher accuracy than doing so manually now," said Gao Yujia, who is the director of the new National University XG AI Centre.

Another potential use of 5G-Advanced and 6G networks relies on a "radar" function of these networks to track patient location and vital signs using low-powered wearables such as tags and smartwatches.

The wearables do not have to broadcast any signals to be detected, so they do not need that much power. This means the devices can be less bulky for patients since they can work with smaller batteries.

In contrast, while current 5G networks support similar data tracking, they require smartwatches and tags to have more power to actively broadcast and send information.

Built-in support for AI data processing on 5G-Advanced and 6G networks also allows robots used in hospitals to be centrally controlled in the cloud.

For instance, a nursing robot delivering medicine and moving along a ward corridor might detect a spill on the floor and send the information to the online AI, which then instructs a cleaning robot to clean up the spill.

The new mobile networks could also support more complex patient conversations with the robots during counselling. NUH is currently testing these nursing robots. These robots are meant to help nurses handle an expected rise in patient numbers, not to replace them.

Another benefit of the new networks is that they can allow hospitals to use online AI tools to analyse hospital-wide data in real time and compare it with historical data to, for instance, simulate and anticipate surges in patient admissions more quickly.

The AI could also recommend steps a hospital could take to address the higher patient load across the hospital, such as where it could free up bed space for incoming patients.

With current 5G networks, this online AI layer cannot be supported well.

"There isn't a deployed AI on 5G that we have seen so far that can give you recommendations on what to do at the scale of the whole hospital. They can do so only at a small scale, such as at the ward level," said Gao.

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