

says Yao Li, is an increased number of home-grown Chinese robotics companies that will stimulate competition and demand, and ultimately lower costs.

China does not make its own equivalent of the da Vinci system, but it is starting to catch up. In 2016, Beijing-based company Tinavi Medical Technologies received fast-tracked approval from the central government to sell the TiRobot, the first robot-assisted surgical product made in China. It has a single arm that can conduct spinal surgery.

Li hopes that his company, which was established in 2016, will soon launch its robotic surgical system. He plans to make an integrated robotic product that runs on a custom-built software platform, comprising robotic hardware – including dexterous multi-jointed arms – and electronics that work with conventional surgical instruments, such as endoscopes, giving them more movability, precision and stability. Unlike other robotic systems, such as the da Vinci, the Borns platform will also act as a data centre and record information about operations that have been performed, says Li.

“We will use the data we collect from surgical procedures to improve the performance of the platform,” he adds.

However, he says that the production process has been more challenging than he expected. Li is now working towards gaining the registration his company needs to start production, and predicts it could take a few more steps to bring his robot to the market.

He says developing a product that fully meets the needs of surgeons, hospital staff and patients, while being affordable and also satisfying government regulations and purchasing requirements, is a difficult and lengthy process.

Despite going through a rigorous, three-phase process that includes certification of the technology’s functionality, validation of its clinical use and obtaining a licence for its manufacture, Li says he hopes to have the whole process wrapped up within five years.

Li founded his company, which is funded entirely by private and venture-capital funds, with computer-systems engineer William Levine. They met when Li was a doctoral student at the University of Maryland in College Park.

“You have to think about surgeons, hospitals and patients as you’re developing your product. If you can keep all those things balanced then you can keep your technology alive,” says Li.

Sarah O’Meara is a freelance journalist based in London. Additional reporting by Kevin Schoenmakers.



A da Vinci surgical robot system performs heart surgery in 2017 at a hospital in Hefei, China.

MEDICAL ROBOTICS ON THE RISE

China’s push to get more robots into its hospitals is starting to bear fruit. **By Sarah O’Meara**

In 2006, China highlighted the importance of robotics in its 15-year plan for science and technology. In 2011, the central government fleshed out these ambitions in its 12th five-year plan, specifying that robots should be used to support society in a wide range of roles, from helping emergency services during natural disasters and firefighting, to performing complex surgery and aiding in medical rehabilitation.

Guang-Zhong Yang, head of the Institute of Medical Robotics at Shanghai Jiao Tong University, says that China’s robotics research

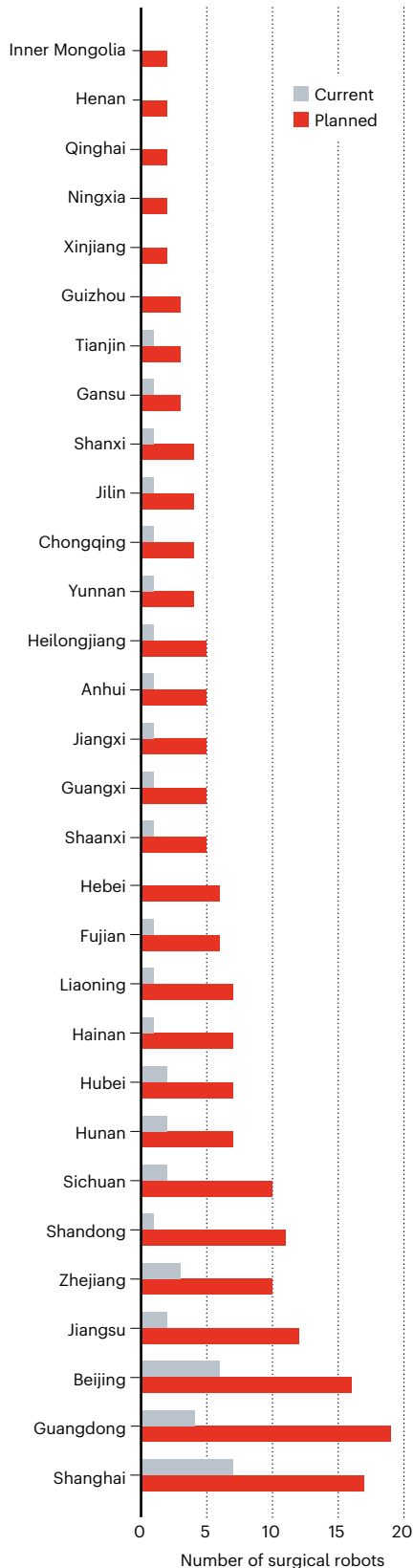
output has been growing steadily for two decades, driven by three major factors: “The clinical utilization of robotics; increased funding levels driven by national planning needs; and advances in engineering in areas such as precision mechatronics, medical imaging, artificial intelligence and new materials for making robots.”

Yang points out that funding levels for medical robotics from the National Natural Science Foundation of China and the Ministry of Science and Technology began to increase more sharply in 2011 compared to the previous decade.

spotlight

SURGICAL ROBOTS ACROSS CHINA

Hospitals in mainland China's administrative areas have big plans for installing more surgical robotics systems.



The accompanying rises in research output are closely related to the introduction of specialized robotics equipment in medical-research facilities, says Yao Li, a research scientist at Stanford Robotics Laboratory in California and founder of the company Borns Medical Robotics, based in both Chengdu, China, and Silicon Valley, California.

“Robots should be used to support society in a wide range of roles from firefighting to surgery.”

Between 1999 and 2019, the number of papers published by at least one Chinese author in the combined fields of biomedical engineering and robotics increased from 142 to 4,507, and spiked twice during that period (see ‘Published papers’), according to data from the Web of Science. One peak was

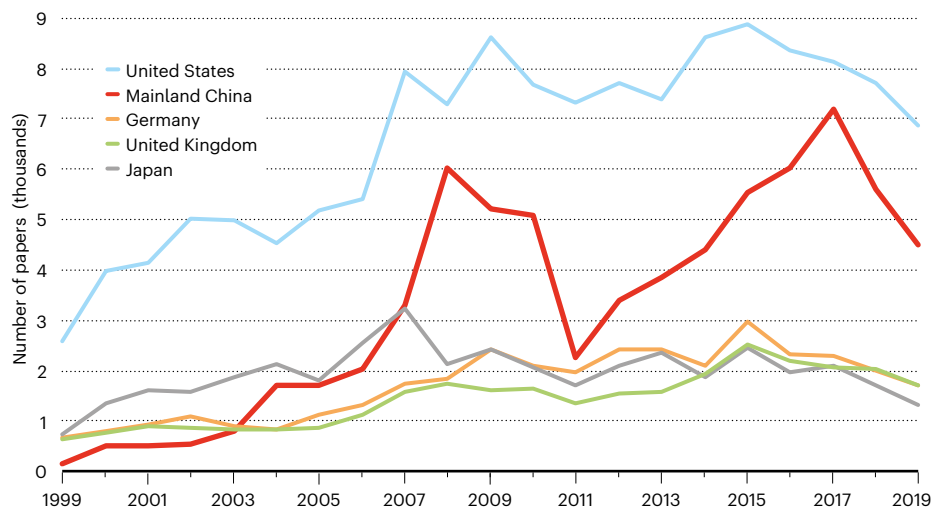
in 2008, two years after a robotic system for minimally invasive operations called da Vinci was first deployed to hospitals in China. The second was in 2017, a year after the first Chinese-designed robot for minimally invasive spinal surgery was approved for sale.

In 2019, the number of da Vinci systems installed in Chinese hospitals that year leapt to 59, up from only 8 installations in 2018 (see ‘Spike in hospital robotics’). This surge followed a 2018 government push to encourage research on robotics technology and its clinical application, according to Jian-Kun Hu, director of the department of gastrointestinal surgery at West China Hospital in Chengdu. The central government’s plan included an intention to purchase 154 new surgical robot systems by the end of 2020, and a breakdown of how the systems would be allocated nationwide (see ‘Surgical robots across China’).

Sarah O’Meara is freelance journalist based in London.

PUBLISHED PAPERS

China has stepped up research efforts into medical robotics systems in the past two decades, as shown by the number of papers it published in biomedical robotics. Papers in this field from the United States have also risen, whereas those from other countries have remained steady.



SPIKE IN HOSPITAL ROBOTICS

Last year saw a large jump in the number of da Vinci robotics systems installed in Chinese hospitals.

