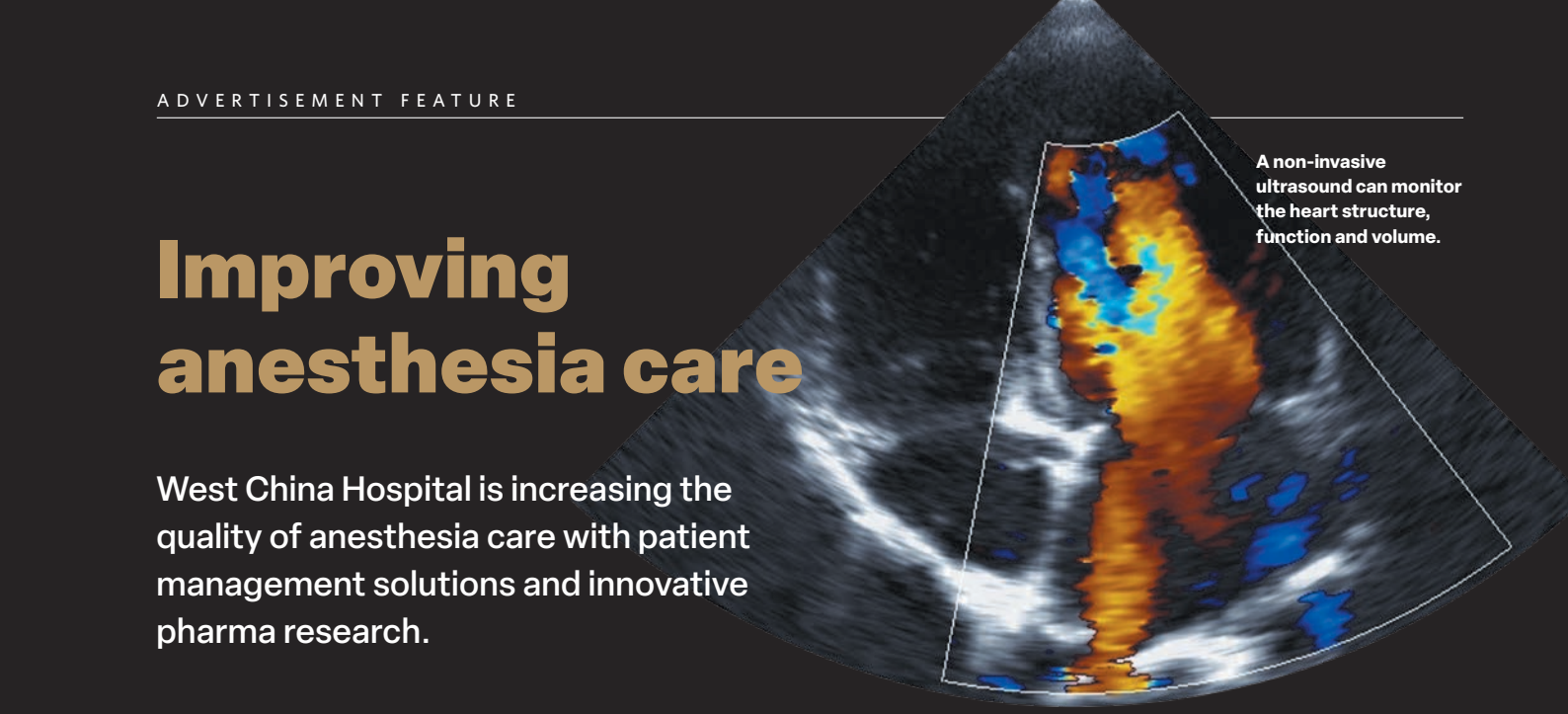

A non-invasive ultrasound can monitor the heart structure, function and volume.

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Improving anesthesia care

West China Hospital is increasing the quality of anesthesia care with patient management solutions and innovative pharma research.

Jin Liu still recalls how he spearheaded the purchase of China's first large medical ultrasound machine for an anesthesiology department back in 1997. Today, the Department of Anesthesiology at West China Hospital that he leads conducts about 250,000 anesthesia procedures per year with fewer than 1 death per 500,000 cases over the past 15 years.

This record can be partly attributed to perianesthesia-operative bedside ultrasound — an ultrasound examination performed at a patient's bedside for rapid assessment around anesthetic procedures — which the hospital was the first in China to use.

When measuring outcomes, Liu likens the adoption of perioperative ultrasound in anesthesia care to the development of stethoscope nearly 200 years ago, and the implementation of electrocardiography in China 60 years ago.

"Only 10% of the centre's work is about relieving pain," Liu says. "For the other 90%, we monitor and manage basic life functions of the patients to protect their key organs and prevent and diagnose critical conditions."

Using ultrasound on the heart can help anesthesiologists spot errors in diagnosis before surgery, monitor heart functions and also adjust anesthesia management, and allows for the assessment of a heart surgery immediately after an operation, Liu says.

Jin Liu (at left) performs an ultrasound examination at a patient's bedside.

His team has developed the world's first superficial ultrasonic echocardiography probe to scan the heart through body surface. While traditional handheld devices require manual recording, the latest can just be pasted to an 'acoustic window', placed on the body, through which the ultrasound waves can be transmitted, for continuous monitoring of the heart structure, function and volume. It has been successfully used on more than 200 critically ill patients experiencing shock and heart failure.

> ***"Using ultrasound on the heart can help anesthesiologists spot errors in diagnosis before surgery."***

With the use of ultrasound, West China Hospital has led the development of China's first expert consensus statement on perioperative transthoracic echocardiography monitoring — a non-invasive ultrasound around the time of surgery. The team has trained more than 300 anesthesiologists in Asia to use this technology.

Smart anaesthesia

The hospital is now exploring the use of AI and deep learning for the care and monitoring of patients who have been under anesthetic. His team is investigating the potential of AI to read cardiac ultrasound to detect the pattern of heart contractions. AI could help understand a patient's course of disease and aid with diagnosis, and it could help anesthetists spot problems early and improve treatment outcomes.

West China Hospital has been conducting anesthetic drug research and development for more than 20 years. In a recent study[1], Liu's team has identified the expression of ion channel Hv1 in sensory neurons as a key mechanism behind neuroinflammation-induced pain. "Pharmaceutical inhibition of Hv1 might be a promising pain-relieving strategy and a way to reduce opioid use and opioid-related side effects," Liu says.

His lab has recently recruited computational biologists, hoping to tap into AI to assist in new drug design. Going forward, Liu hopes the centre's drug discovery engine will yield not only new pain killers, but also drugs for many neurological and psychiatric disorders. ■

Reference

1. Zhang, Q., Ren, Y., Mo, Y. *et al. Cell Res* **32**, 461–476 (2022).