A steerable guidewire to improve the treatment of heart disease

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Dr Geoff Rogers received the $50,000 Prize for New Innovators for creating and commercialising his pioneering biomedical engineering. He invented a robotic guidewire that cardiologists can steer with a joystick through the body to reach a damaged artery.

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The use of guidewires has replaced open heart surgery for many cardiac patients. However, about 20 per cent of cardiac patients can't be treated using current guidewire technology, which the cardiologist has to twist and turn by hand to guide it through the arteries. The guidewires can't always get through.

As an undergraduate engineering student Rogers heard a clinician express his frustration with the technology. So, for his undergraduate project and PhD he invented a steerable guidewire with a diameter of just two human hairs. Following his PhD, he co-founded a company and worked with cardiologists at the Epworth and Melbourne Private Hospitals to develop the IntelliWire.

In 2017 the guidewire and the company were purchased by Merit Medical Systems, a global leader in surgical devices, which is now working to bring the guidewire to market.

Now he is leading two new initiatives: the first as CEO of a biomedical start-up company developing new solutions to antibiotic resistance; the second is a real-time system to adjust car wheel alignment. He's also mentoring future biomedical entrepreneurs.

Roger’s passion for engineering was sparked by his mechanic father, and his interest in fast cars. It was not until his final undergraduate year, following a talk by a visiting surgeon, he realised that engineering could save lives. To explore the limits of engineering and solve problems which hadn’t been solved through traditional large-scale engineering, he set off on his PhD in micro-and-nanotechnology.

Guidewires have transformed cardiac surgery, replacing major surgery with a day procedure. The cardiologist puts a bend in the guidewire, inserts it via your groin, and tries to guide it through your blood vessels by pushing, while watching progress on an X-ray machine. If the clinician can’t manage to push and rotate the guidewire to the right location, they can try with a new wire. In about 20 per cent of patients the wire can’t be manoeuvred through, and the patient is referred for either open-heart surgery or pharmaceuticals—which “aren’t ideal at all,” he says.

His guidewires, however, are complex devices that can be steered through the blood vessel system by remote control.

“They’re the thickness of two human hairs, and they contain 15 components—all of which are custom-manufactured, and assembled by hand,” he says.

“At that small scale, materials behave differently. For example, everything’s sticky. So it was quite a challenge, spanning four years of intensive research followed by five years of further refinement and preclinical trials.”

He and his team made about 100 wires. But they realised they needed a partner to scale up: to make hundreds of thousands of wires, and to get them in the hands of cardiologists around the world in the fastest possible way.

“We went to Merit Medical Systems in Utah, the leading manufacturer of guidewires,” he says.

“Presenting to their board, and seeing their reaction to this device we’d been quietly developing back in Australia, was just amazing. They, too, see it as the future of minimally-invasive medicine.”

In 2017 Merit acquired the technology and the company.

“I’m not one to sit still. My next challenge is antibiotic resistance,” he says.

“I’ve joined Wintermute Biomedical in the US who have a novel antibiotic formulation. We’re establishing labs here in Melbourne."
