

Engineering wizards push the limits of device design for diabetes patient care

◆ Virginia McMillan

Lifestyle modifications to prevent diabetes have not been easy to implement, writes University of Chicago medical professor Kenneth Polonsky in a master stroke of understatement.

It's a fact that Christchurch academic Geoff Chase can see a mile off as he supplies a copy of the professor's paper for *New Zealand Doctor* to peruse.

All power to public health interventionists, Professor Chase says. "It would be nice to wipe out poor eating, obesity and the things that go with it, but...I am a bit cynical, I would rather try and get peace in the Middle East."

Instead, he has his eye on technological and medical fixes for the world's prediabetes and diabetes problem.

Professor Chase juggles a teaching and research career with leading a strand of the National Science Challenges. He is a distinguished professor in mechanical engineering at Canterbury University, where

he is also director of mechatronics (see 'Pumped up about mechatronics', right).

Within the Science for Technical Innovation Challenge, he leads a portfolio named Medical Technology – the home and community care.

Among his objectives is to improve the uptake and quality of diabetes self-care with insulin, and reduce the cost.

One device emerging from the portfolio is a needle-free insulin injector that makes a tiny puncture in the skin. When compared with the usual needle, it will barely create any discomfort.

A prototype is being trialled on healthy volunteers. The device will be enhanced, adding the ability to draw fluid and sense the user's glucose level.

"That has never been done before," Professor Chase says.

It means no need for a finger-prick test or for the newer-wave and costly continuous glucose monitoring patches.

The device will also incorporate dosing decision-making soft-



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ware. This is being tested with partners including St George's Hospital in Christchurch.

Each of the three features – injector, sensor and dosing technology – has commercial potential. But of more interest to the diabetes team is combining them into one easy-to-use device that's safe and effective.

This new device should encourage patients to adhere to

Geoff Chase's challenge is to develop medical technology for home and community care

treatment and lead to better outcomes, and reduce specialist visits.

Visits are costly in the private system and subject to appointment delays in the public system, not to mention the \$10,000 to \$15,000 a year many patients

Pumped up about mechatronics

"Everything is mechatronics," Canterbury University distinguished professor Geoff Chase says. It's in our cars, our whiteware, our medical devices.

Mechatronics sits at the intersection of mechanical, electrical and computer engineering, and combines sensors, software and motors, the university website explains.

Mechatronics students are working with Professor Chase and Martin de Bock, paediatric endocrinologist at Christchurch Hospital, to develop a cheap insulin pump.

They're refining the designs

that are the basis for current devices, and intend to make their version open access – ie, offer it free online so others can make pumps from their instructions.

A typical insulin pump costs \$10,000 before the Pharmac subsidy, Professor Chase says. Running the project like a business start-up, he says he's challenging the team to make a pump for between \$500 and \$2000.

Mechatronics is attracting more students, and it's hoped up to 200 will be graduating annually in a couple of years. ■

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spend on diabetes consumables. That's unaffordable for most, Professor Chase says.

The new technologies would also allow many more type 2 diabetes patients to start insulin as a first-line treatment.

The portfolio's diabetes team consists of academics, undergraduates, postdoctoral and

doctoral students, totalling about a dozen in all.

Professor Chase is an adjunct professor at the University of Otago's Christchurch Medical School, and deputy director of New Zealand's collaborative MedTech Centre of Research Excellence. ■

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