Improving diagnosis and care for cardiac patients

Cardiovascular disease is a major cause of hospitalisation in New Zealand and death whilst in critical care, yet is very difficult to accurately detect, diagnose and properly treat.

University of Canterbury researcher and HRC Sir Charles Hercus Health Research Fellow, Dr Christopher Hann, is creating patient-specific heart modelling methodologies to improve diagnosis and treatment of cardiac patients in critical care.

Cardiac assessment in critical care commonly involves the analysis of changes in aortic pressure, cardiac output, ECG and gas exchange measurements relative to a normal or "average" patient. However, data obtained can be poorly utilised through a lack of understanding of the dynamic changes and interactions of the measurements as a result of cardiac disturbances.

Dr Hann's research will help reduce the number of deaths in critical care by improving the management of cardiovascular disease. The computer model being designed and a patient specific parameter identification system will be used to better aggregate measurements and create an accurate picture for diagnosis.

According to Dr Hann, clinicians are often faced with having to make quick decisions while faced with a lot of patient data.

"What we are doing is taking readily available data and simplifying diagnosis for the clinician," he says.

This means that potential treatments can be trialled on the model before being administered to the patient, allowing the clinician to get closer to the optimal treatment rather than working through a "trial and error" process on the patient.

Dr Hann says the technology uses mathematical techniques to describe what is happening with a patient's heart.

For example, it can take details such as the patient's aorta pressure and then reproduce this data on the model. Dr Hann envisions that the technology would eventually work similar to a bedside monitor.

Dr Hann is working on the project with colleagues Dr Geoffrey Shaw from Christchurch Hospital, Professor Geoff Chase from the Mechanical Engineering department at the University and Ms Christina Starfinger, a PhD student at the University's Centre for Bio-Engineering.

The team are focusing on critical care patients (intensive care) because it is an excellent environment to trial the technology in as the variables needed are already being measured. The goal is to have the technology available for use in intensive care units and eventually in general wards as well.

The four year fellowship will involve trials on animal models and retrospective studies on humans. The team have already obtained some animal data generously donated by colleagues at the University of Liege in Belgium and the University of Aalborg in Denmark.

Dr Hann says the collaborative approach with these Universities has been key to the project's success to date. He says the combination of disciplines used to create the methodologies, including engineering, clinical medicine, mathematics and physiological modelling, has been very important in creating the technology.

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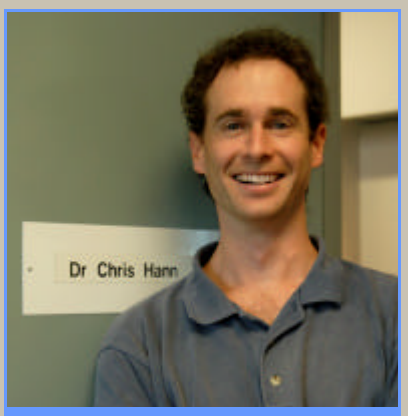

Dr Chris Hann

Key words:
- Cardiovascular disease, heart modelling methodologies

Key facts:
- Cardiovascular disease is a major cause of hospitalisation and death whilst in critical care
- In New Zealand, 40 per cent of all deaths are due to heart disease and Maori and Pacific people are over-represented in these statistics.

Aims of this research:
- To create patient-specific heart modelling methodologies to diagnose and optimise treatment of cardiac condition for individual ICU patients
- Improved cardiac and circulatory management and decreased mortality in critical care.

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