Cardiovascular disease (CVD) is still the leading cause of death in New Zealand, accounting for 35 per cent of deaths annually. One in twenty adults have been diagnosed with CVD – that’s about 280,000 people.

The basis for over 80 per cent of CVD events can be explained, and so many of these deaths are not only premature, but preventable.

Drug-based management of CVD risk has previously been initiated when blood pressure or cholesterol exceeded specific levels. Clinical guidelines now focus on the absolute CVD risk, which is determined by the cumulative effect of multiple risk factors, such as age, gender, smoking, blood pressure, cholesterol, diabetes and previous CVD history, rather than high levels of one or two risk factors.

Professor Rod Jackson and his colleagues at The University of Auckland developed colour coded paper-based risk charts for clinicians to estimate their patients’ absolute CVD risk based on combined risk factors. Later, as clinics became more computerised, they developed a computer version, resulting in the PREDICT software – which combines a clinical decision support system and a research tool.

PREDICT is a web-based decision support system, used mainly to assist primary care practitioners to assess and manage cardiovascular disease risk. It has been developed by a research team at The University of Auckland, led by Professor Rod Jackson from the School of Population Health, and software company Enigma Publishing Limited.

The software is based on the colour risk charts developed by Professor Jackson’s team in the early 1990s. The charts were well received and used not only locally but internationally. However, their subsequent research revealed that clinicians were not using the risk charts frequently enough. Jackson’s team concluded that a computerised system would be more effective as the use of a computer during consultations was becoming more commonplace for GPs.
The computerisation of CVD risk prediction started simply as a PDF version of the colour chart but rapidly developed into a sophisticated, evidence-based, clinical decision support programme.

Partnering with a software developer, Professor Jackson’s team provided the academic and evidence rigour, and Enigma, the commercial skills and services. They designed and built PREDICT’s first product in 2002, a CVD risk assessment and management module. The programme is currently used by about 80 per cent of Auckland and Northland PHOs, and has generated a cohort of around 150,000 patients so far, becoming one of the world’s largest CVD cohort studies. The research component of PREDICT has been supported mainly by two consecutive HRC project grants and multiple National Heart Foundation research fellowships.

PREDICT automatically extracts CVD risk factors in a patient’s medical record, loads them into the prediction template and within seconds estimates the level of CVD risk. It then applies this risk profile to current CVD risk management guidelines and provides personalised management recommendations. PREDICT simultaneously captures the risk factors in an external database as an anonymised record of the data generated. This data can then be anonymously linked to hospitalisations, deaths, laboratory results and drug dispensing, and is used to develop new risk prediction tools for multiple New Zealand population groups.

The rapid growth of the PREDICT dataset is now enabling the research to move from a primary focus on risk prediction to a broader focus on addressing disparities in CVD burden and quality improvement. In the next few years, PREDICT will be able to develop a comprehensive CVD risk profile on over one-third of adult New Zealanders as well as up-to-date information on their management.

The next step for Professor Jackson and his team is to see PREDICT used more frequently in hospitals nationwide, primarily for people with acute CVD. Later this year they will produce new CVD and diabetes risk prediction tools specifically designed for Māori and Pacific, and other high risk groups, resulting in more tailored information which will help provide better targeting of interventions.

The PREDICT model could also be applied to other common conditions such as mental health and respiratory disease, but as Professor Jackson explains, it is not for the faint-hearted. He would like to see groups with expertise in several other common conditions develop PREDICT equivalents. However only very common conditions where there is good evidence for effective interventions can justify the huge amount of on-going effort required to develop and maintain electronic decision support systems like PREDICT.

Professor Jackson has a long term commitment to epidemiology and population health research but he continues to be driven by a focus on embedding research into practice.

“The easiest way to make research relevant to practice is to generate research from within everyday practice. That’s what I have been doing for the last 10 years and is what makes PREDICT unique – it all happens from practice.”

How a ‘population bomb’ forged a career path

Reading the book *The Population Bomb* at the age of 15, had a significant impact on Professor Jackson. The work by Paul Ehrlich warned of mass starvation of humans in the 1970s and 1980s due to overpopulation and suggested we would never improve our health unless we slowed the world’s population growth. The concept of a population bomb and the impact this would have on health influenced and guided Professor Jackson’s career step into medicine – without realising it, he has always linked health and populations.

As a young clinician/house surgeon he became interested in smoking as a major population health problem, and the main adverse smoking outcome, CVD, became his focus. Supported by the opportunity to work with Professor Robert Beaglehole, then a CVD epidemiologist in the Department of Community Health, at The University of Auckland, Professor Jackson spent ten years working in public health epidemiology which focused on CVD in whole populations.
Following the completion of a postdoctoral fellowship in the United States in 1989-90, Professor Jackson returned to The University of Auckland as Senior Lecturer in Epidemiology. He was required to teach medical students and soon realised that to keep them awake he had to make his teaching more clinically relevant. This led him to explore the clinical epidemiology of CVD and he developed an increasing interest in the clinical management of CVD risk.

At about the same time he was invited by the Ministry of Health to lead the development of clinical guidelines for managing high blood pressure and he has subsequently been involved with every CVD risk management guideline developed in New Zealand. Together with his clinical epidemiology teaching, his involvement in clinical guideline development has had a major influence on Professor Jackson’s subsequent career. However, he still maintains a strong interest in public health epidemiology and believes that his role is to apply epidemiology across the clinical – public health spectrum.

A passionate and popular lecturer, Professor Jackson and his research focus has been immortalised by his students with a special YouTube tribute, I’m Sorry Rod Jackson. And, as a renowned cardiovascular health expert, Professor Jackson appeared on Test the Nation – Just how healthy is New Zealand? in 2006, and was responsible for developing with the production team, the Southern Cross Health online test, which provided the format for the show.
Globally 50,000 people will die from heart failure in the next 12 months and 3,000 will be saved by a heart transplant. However, donor numbers will continue to fall short of demand.

The artificial heart pump was designed to keep patients with congestive heart failure alive while they wait for a donor heart transplant, or to give the patient a chance to recover by allowing their heart to rest and heal. Current heart pump technology requires a bulky wire cable to pass through a patient’s skin to power the heart pump. These wires cause serious infections, sometimes leading to death, in about 40 per cent of patients. The wires are also prone to breaking and restrict a patient’s activity, and if a pump stops, the patient has only about a minute to live.

Recent research however, initiated by an HRC-funded Project, has been instrumental in addressing these challenges in the form of a wireless heart pump and the commercialisation of the technology.

Associate Professor Simon Malpas of the Department of Physiology, School of Medical Sciences, and the Auckland Bioengineering Institute at The University of Auckland, did not envisage his research career would emerge into the commercial realms of a start-up R&D company, with himself at the helm driving the research team and pursuing business relationships.

It was a Wellcome Trust Major Equipment grant and then an HRC grant in 1998 that were the impetus for the technology that ultimately grew to the formation of Telemetry Research Limited.

The pioneering research project that initiated this path required recording a variety of physiological signals in laboratory animals and studying interventions and disease states in a more natural environment, in contrast to collecting data from an anaesthetised animal. This was the genesis of the technology - Associate Professor Malpas found he was unable to buy the instrumentation to create the implantable monitoring devices needed for this research.

Recognising the opportunity to enter the market, he teamed up with Dr David Budgett of the Bioengineering Institute, and in 2005 they founded Telemetry Research to commercialise their technology.

Telemetry’s ‘break through’ product was the ability to transfer power to implantable pumps, in particular a heart pump. Currently infection caused by a cable entering the skin is the largest problem for the industry.
“Broadly speaking we are looking at how wireless power can be adapted for a range of medical devices that need lots of power. It’s the ‘chicken and egg’ concept. Because implantable device companies haven’t had wireless power, they haven’t developed these technologies, but now we can offer the power.”

“We don’t want to provide the whole device but to partner with another company to get their device with our power to clinical trial and on the market. I think this is a good model for a New Zealand company, as implantable clinical devices have probably the highest level of difficulty with residual requirements such as safety.”

Telemetry’s aim is to be the preferred supplier of wireless power and they are currently developing a broad platform of technology that can be tailored to meet the specific needs of devices being powered. They are also working on another concept that uses conductive wireless power to monitor pressure, which could be used to measure arterial or intracranial pressure.

Associate Professor Malpas appears to be thriving in his dual researcher/Chief Executive role, and enjoying the demands of academic research, coupled with the formation and development of a R&D biotech company.

He says: “It is very much about the team that is the key part of the success of research groups. Much credit for the R&D team goes to fellow founder Dr David Budgett whose instrumentation experience has created a unique platform for new devices to be developed.”

He is conscious though of the challenges for emerging researchers to grow and fund their careers, and find a research team, and says that while you may be in a position to do a PhD, you have to be particularly proactive to find a Postdoctoral Fellowship, a laboratory to work in and also the funding. This is not dissimilar to where he is today, still seeking funding: “That’s always a challenge,” he says.