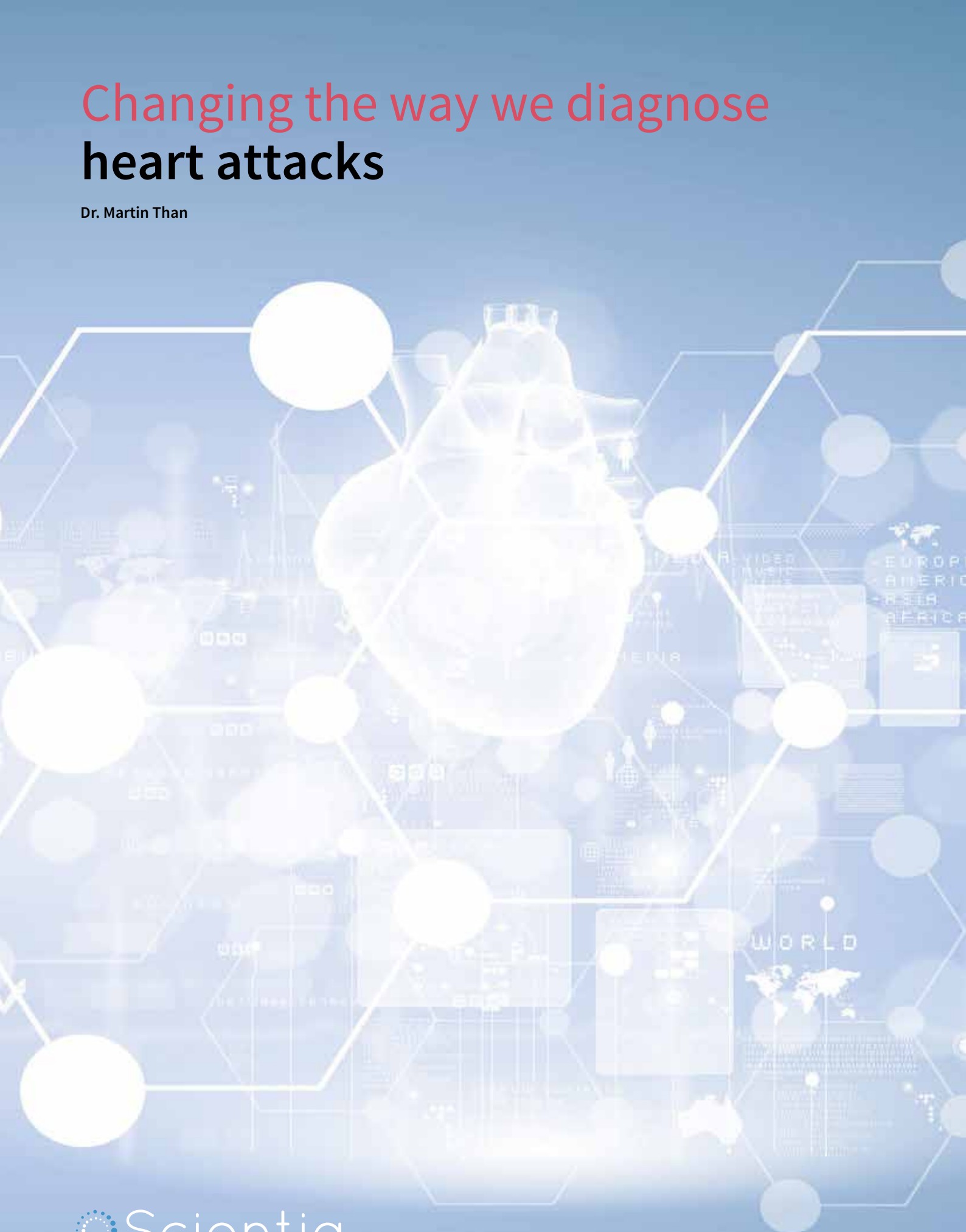
Changing the way we diagnose **heart attacks**

Dr. Martin Than



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Changing the way we diagnose heart attacks

Dr. Martin Than is the Director of Emergency Medicine research at Christchurch Hospital, Canterbury, New Zealand. Here he describes both his colourful history and the work begun at the Canterbury District Health Board in New Zealand and now being disseminated internationally on accelerated diagnoses for coronary failure, which promises to slash the time spent having investigation.

First a bit about yourself. How did your career path bring you to your current position?

Having attended medical school in the UK, I completed Emergency Medicine training in the UK, Australia and New Zealand. While I was in the UK I also worked with the Centre for Evidence-based Medicine in Oxford, acting as course tutor. Having returned to New Zealand in 2001, I have worked as Emergency Medicine Specialist at Christchurch Hospital ever since. In 2003-2006 I set up and co-directed the Centre for Evidence-based Medicine at the Christchurch School of Medicine. I am currently a Health Research Council of New Zealand Fellow for "Assessment of cardiovascular disease in the Emergency Department".

You have had a very international career in NZ, the UK, and Australia. What do you feel was the best experience during that time?

This is not really linked to our current research themes in any way, but the best experience was working for two years on the rescue helicopter in Sydney. I really enjoyed the comradery and teamwork, and was awarded a citation for bravery by the commonwealth of Australia for a rescue that we carried out in 2006.

How else do you think the ADP method can be improved for speedier diagnosis? Are there other biomarkers you would be interested in examining?

Our accelerated decision-making pathway is comprised of a structured risk assessment, electrocardiographic findings and biomarkers combined together. I expect there will be some refinements that will occur in the way that we use such risk assessments and improvements of the other parameters used. At the moment we use 12-lead electrocardiography. Promising research has taken place on multi vector ECG analysis and if there are advances in the versatility of such devices such that they become economical and easier to use, then they may provide useful extra diagnostic information.

There is of course a constant search for improvements in biomarker analysis. High sensitivity cardiac troponin assays are now extremely advanced and I cannot see them being replaced in the short term. Increasingly patients who would previously have been diagnosed as having unstable angina are now categorised as having had an acute myocardial infarction (AMI) because of raised troponin levels. However I still believe there is a need for a biomarker that can reliably identify patients with either myocardial ischaemia prior to, or in the absence, of myocardial cell death occurring. If after ruling out AMI using cardiac troponins there was a biomarker that could reliably predict which patients did or did not require further investigation then that would be a major step forward.

Adherence to 'best practice' is often tricky in the stressful situation of the ED. How easy do you believe it will be to successfully implement the ADP within hospitals?

In Canterbury we have managed to increase the number of people discharged within 6 hours from 5.4% in 2008 to approximately 33% in 2014. The median length of stay has changed from 51 hours to 8 hours.

Thus in Canterbury it has been relatively easy to implement the ADP into clinical practice because the Canterbury District Health Board is very good at supporting integrated clinical pathways; both by releasing clinicians' time to work on them and by providing appropriate funds when necessary to facilitate project development. This sort of support from the Canterbury District Health Board was instrumental in allowing us to make this a truly translational project which was rapidly implemented into clinical care rather than stand-alone research. It would have been impossible without their help.

The new protocol is based on proven results from research – including a large randomised controlled trial, and the subsequent accelerated diagnostic pathway was trialled within Christchurch Hospital and hospitals in Australia and Hong Kong. The next logical next step is to integrate this research into clinical practice, which is directly aligned with a Ministry of Health (MOH) plan to introduce 'accelerated chest pain pathways' for suspected acute ischaemic heart disease (IHD) into every District Health Board.

Change is not always 'easy', but the long term benefits of implementing a pathway that facilitates safe early discharge are clear. We have strong clinical support and are finding that the process of adopting the new standards of best practice is, on the whole, very successful across the country. Additionally the pathway has been rolled out across Queensland, and other locations in Australia and we are collaborating with researchers at several other international sites.

Is there a desire from physicians to hold patients in the department, 'just in case', despite the ADP identifying them as low risk?

That has certainly been our experience at the time of initial research and early implementation. I think the best way to overcome this problem is repeated education and positive data feedback demonstrating good outcomes. In general the biggest barrier is familiarity but we have found this is not too difficult to overcome. I believe that the pathway we are implementing will offer a safe, consistent and reliable way to most effectively manage chest pain patients to offer better outcomes for patients and healthcare systems.

Spotting an unhappy heart

The Emergency Care Foundation is a local charity which supports research into the care of patients in the hospital Emergency Departments.

The Canterbury District Health Board is the health funding and healthcare provider organisation for the city of Christchurch and its surrounding region which is strongly engaged in the process of creating effective cross-system healthcare pathways.

You wake up one morning, far earlier than you would like, with an unpleasant pain in your chest. Although the pain is manageable, it slowly appears to be spreading into your arm. This is a classic symptom of acute coronary syndrome, or ACS, and so you naturally do the right thing and get yourself to hospital. So far, so good. However now the physicians at the hospital have a problem – many patients turn up every day with these symptoms, up to 10% of the people that come into the emergency room. Not everyone has cardiovascular problems, not everyone needs urgent attention, and indeed almost 80% will eventually be diagnosed as not having ACS. For the hospital doctor, the real problem lies in distinguishing emergency cases from low-risk patients.

Unfortunately this is very difficult. The medical profession sets a very high standard for ruling out ACS – in fact the benchmark is 100% accuracy – therefore a prolonged observation period is often required and it can take from 6-12 hours to properly diagnose a case of coronary distress. During this time the patient needs to wait in the ER, their families must sit around getting more and more worried, and the emergency department itself becomes more and more crowded. Even worse, the number of patients who can be safely sent home early distracts clinicians from tending to those who urgently need their help. There is thus a strong requirement for a faster diagnostic method, one which allows doctors to identify the high-risk patients, focusing their scarce time on those who are in the most danger.

In Christchurch a group of physicians facilitated by Martin Than and strongly supported by resources and funding from the local Canterbury District Health Board, have been

leading the way in solving this problem.Bringing the same focus to this task which he has applied to each of his preceding 15 years of research experience, his work has focused on improving the sensitivity and speed of current ACS diagnostics. Thanks to their work developing an accelerated diagnostics program they have managed to slash the time required to identify low-risk patients. This process utilises a combination of factors to identify patients in minimal danger, allowing them to be safely sent home far earlier than previously possible.

Diagnosing acute coronary syndrome can take over 6 hours, a long time for patients. Newly developed methods can cut this down to only 2 hours.

HEARTBEATS AND BIOMARKERS

A major facet of this system is the use of a biomarker called Cardiac Troponin which is a biological indicator of heart damage. These proteins are present within the muscle cells of the heart and are released into the bloodstream when heart cells die – as often occurs during a heart attack. Comparing Troponin levels between the time of admission and two hours afterwards allows for accurate identification of high/low risk patients. This method is quick, simple and very sensitive.

Despite these advantages, diagnostics can

be improved by the addition of other tests. The results from Cardiac Troponin tests can be enhanced by these additional diagnostic methods. These include further tests, such as electrocardiography (ECG – a recording of the heart's electrical activity), but also statistically modelled decision aids for disease risk to predict these risks and help clinical decision-making. Examples of such decision aids are the Thrombolytis in Myocardial Infarction score (TIMI), the HEART score and the Emergency Department Assessment of Chest Pain Score (EDACS) which take numerous factors into account in assigning risks. A combination of these decision aids with the results from biomarkers and ECGs can facilitate accelerated diagnostic pathways in safely identifying which patients do not have an acute coronary syndrome using results from tests ordered within two hours of arriving in hospital. This is a significant improvement in terms of speed and reliability.

After an initial trial of the accelerated diagnostic pathway - funded by the Health Research Council of New Zealand at a single hospital in Christchurch, the team has expanded their testing to numerous locations throughout the Asia-Pacific region. Dr. Than emphasises that the local research was made possible through the Health Research Council having a research funding stream focussed on service delivery, which has enabled this sort of research to take place not on a supernumerary basis but integrated into clinical practice. He adds, "We were also fortunate to have strong support from the Canterbury District Health Board who facilitated the integration of the research into clinical practice by assisting with funding and making key personnel available to make internal arrangements and modify processes as needed."

These international and local trials have been able to successfully show identification of 'low risk' groups from as little as 2 to 4 hours after arrival at the ED, a significant improvement when compared to the 6-12 hours commonly needed. The next logical next step is to integrate this research into clinical practice nationally, which is directly aligned with a Ministry of Health (MOH) plan to introduce 'accelerated chest pain pathways' for suspected acute ischaemic heart disease (IHD) into every District Health Board.

"We are also currently working with a number of collaborators in Singapore, the UK and USA regarding possible trials" comments Dr. Than, who is looking forward to spreading these improved practices around the world.

SPREADING THE WORD

Implementation of new research findings can often be a difficult challenge – many doctors continue with the processes they are familiar with, and there is a natural desire not to send patients home if there is any chance the diagnosis may be wrong. Dr. Than recognises these challenges: "Overall the feedback I have received has been very positive," he comments, "as with any new process, uptake has been gradual while clinicians become familiar and learn to trust the new approach." Thus the next stage of rolling out the new procedure, currently underway, requires optimising the process of changing over from standard diagnostic techniques to the accelerated diagnosis program. This requires talking to local hospital clinicians, studying their current processes to see where improvements could best be made, choosing an ADP (there are several varieties to choose from), implementing the ADP, and then reviewing how implementation has progressed and what lessons have been learnt.

Once implemented into hospitals, the ADP takes its place amongst a vast number of processes making up the standard care of an emergency department, Dr. Than's goal is to combine them such that "assessment of the low risk chest pain patient is a part of a larger overall assessment." His aim is to standardise the process as much as possible, with defined time-points for each test, a well-documented pathway to guide clinicians to perform the work, clear reasons to perform follow-up diagnostics on patients, and robust quality testing to ensure that everything works as it should. Together, this should provide "safe, consistent and reliable way to most effectively manage chest pain patients to offer better outcomes."

The ultimate aim of this work? A reproducible process for implementing an accelerated diagnostic process, quickly, easily, and reliably. If successful, this could lead to the spread of the ADP across the globe, with corresponding decreases in ED wait times for many patients. This would provide physicians with more time to focus their limited resources on treating the life threatening emergency cases – in turn saving lives. In the end, for physicians such as Dr. Martin Than, there are few better goals to strive for.

Researcher Profile

Dr. Martin Than
Director of Emergency Medicine Research
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Dr. Than received his medical degree from the University of London with a strong interest in emergency medicine. He was awarded the Beaven medal for Excellence in Translational Research by the Health Research Council and has been recognised by the receipt of the Commonwealth of Australia Decoration for Bravery, the Surf Life-Saving Australia Meritorious Award for Bravery and the Royal Humane Society of Australia Bronze Medallion. Dr. Than's current research focuses on faster diagnosis of potential acute coronary syndrome from unclear symptoms such as chest pain, and the implementation of these improved techniques into hospitals.

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Heart Foundation of New Zealand
Health Research Council of New Zealand

Canterbury District Health Board
Te Poari Hauora ō Waitaha