Accelerated pathway reduces hospital admissions for chest pain

By Mark Wright

A new fast-track cardiac diagnostic tool trialled in an HRC-funded study is already cutting down the number of unnecessary hospital admissions involving people with chest pain.

Dr Martin Than

The Accelerated Diagnostic Pathway (ADP), developed by Dr Martin Than and a cross-speciality team at Christchurch Hospital, was designed to speed up the diagnostic process without compromising patient safety.

Dr Than says chest pain of suspected cardiac origin is one of the most common (5 to 10 per cent) presenting complaints in hospitals in the western world and represents up to 25 per cent of admissions. In the United States it leads to about 8 million visits per year at a cost of $20 billion annually, and it is a similar story in Europe.

"That sort of volume of patients puts a lot of strain on a health system because one of the biggest challenges in the modern era is the issue of available beds and overcrowding in the emergency department," he says.

"When an emergency department is so overcrowded that patients are waiting for six hours compared to one hour the odds ratio for increased likelihood of harm is approximately 1.7 because staff are trying to keep so many balls in the air. The chest pain patient may be looked after well but there might be an elderly patient in the corner quietly dying of sepsis."

Dr Than says the usual process for ruling out a heart attack is quite time consuming.

"Only about 10 to 20 per cent of patients with chest pain will have a heart attack as the cause of their pain, which means 80 per cent don't."

The assessment process usually involves a blood test for cardiac troponin when the patient comes in, then a later follow-up troponin test about six hours later. This later test means that patients usually have to be admitted or put in observation wards.

"Potentially there is not only a huge burden on the system, there is a lot of worry for the patient and their family for something that is not as serious as feared."

Building on their earlier accelerated pathways studies at Christchurch Hospital, Dr Than and his colleagues made use of modern troponin assays in their two-year HRC-funded randomised control trial, which involved 544 patients.

Patients in the experimental group were given a troponin test and an ECG, as well as undergoing risk assessment using the Thrombolysis In Myocardial Infarction score (TIMI). The TIMI score was designed to predict the risk of people coming into hospital with a cardiac problem, and the risk of them coming to harm over the next 30 days.

Dr Than's group hypothesised that if your TIMI score was zero and you had two negative troponin tests and an ECG in the first two hours then you were at less than 1 per cent risk of having a heart attack. You could therefore go home and be followed up as an outpatient, or proceed more quickly to the next in-patient investigations – also saving time.

"The results showed that we could double the number of patients that were discharged early from 10 per cent to about 20 per cent. Effectively one in five patients could be discharged within two hours."

He says doctors in the emergency department were not forced to follow the pathway and there were a further 15 per cent of people that doctors admitted for investigation even though they were categorised as low risk by the diagnostic pathway. None of these patients turned out to have heart disease.

"Potentially we could have seen 35 per cent of patients discharged early but as the pathway becomes more accepted over time those are gains that will also be picked up."

Dr Than also points out that it was an implementation study so was run to reflect real life. The hospital did not receive extra resources and used tests

that were already in use or available to other hospitals. That means that the system could be picked up by other hospitals straight away.

The study team was so confident in the data that they implemented the pathway immediately at Christchurch Hospital in mid-2012.

"We have been auditing it and it has been a very successful pathway. We're not aware of any adverse events and we are turning people around quickly."

The pathway has also been implemented at Nambour Hospital on the Sunshine Coast in Queensland without any adverse events, and the Director General of Health in Queensland wants to adopt it for the whole state.

A paper on the study will be released online on 7 October 2013 in the *Journal of the American Medical Association* (JAMA).

Dr Than and his team have also developed a new score called the Emergency Department Assessment of Chest pain Score (EDACS), which they have validated and are planning to publish on. They have secured further HRC funding to compare that score with the TIMI score. ■

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and pruning those that it doesn't. However, in children with an epileptic encephalopathy, the electrical activity in the brain is so chaotic that the brain doesn't develop normally."

For the study, Dr Sadleir recruited New Zealanders with epilepsy and their families. A detailed picture of their phenotype (physical traits as determined by their genetic makeup and environmental influences) was undertaken and subsequently genes were sequenced.

"Heather Mefford's lab performed targeted massive parallel resequencing of 19 known and 46 novel candidate genes in 500 individuals with an epileptic encephalopathy. They found multiple individuals carrying mutations in either of the two new genes for epileptic encephalopathy: *CHD2* and *SYNGAP1*."

Last month *Nature Genetics*[2] announced that the same Australian, New Zealand and American collaboration, of which Dr Sadleir leads the New Zealand group, had found a cause of a specific group of the epileptic encephalopathies called Epilepsy-Aphasia Spectrum disorders. In this group of disorders previously normal children develop seizures and lose the ability to speak.

"Genes were sequenced in 519 patients with severe seizure disorders. Within this group, 44 patients had epilepsy-aphasia and nine per cent of those and their affected family members had mutations in the *GRIN2A* gene."

To find nine per cent of patients with a genetic mutation for a particular epilepsy disorder is significant, says Dr Sadleir.

"Occasionally a gene is identified that's responsible for 80 to 90 per cent of a particular type of epilepsy, but usually there will be multiple genes involved."

Dr Sadleir says that epilepsy gene discovery is important because it provides a definitive diagnosis and forms the first step towards developing targeted therapies to improve the outcomes for children with epilepsy and their families.

"The genes that we find are allowing comprehensive epilepsy gene panels to be developed, which means families can find out what type of epilepsy their children have and get the correct treatment sooner. Up to 50 per cent of infants with epileptic encephalopathies will soon be able to receive quick and cost-effective diagnoses of mutations of specific genes based on this type of research." ■

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1 Carvill L G, et al. (2013) Targeted resequencing in epileptic encephalopathies identifies *de novo* mutations in *CHD2* and *SYNGAP1*, *Nature Genetics*, doi: 10.1038/ng.2646.

2 Carvill L G, et al (2013) *GRIN2A* mutations cause epilepsy-aphasia spectrum disorders, *Nature Genetics*, doi: 10.1038/ng.2727.