

TE PAPA HAUORA

SHAPING THE FUTURE OF HEALTHCARE

The quakes and our children

How research is helping our
children after the earthquakes

Diagnosing
a silent killer

Simulation
– preparing
our health
professionals





welcome

Dr. Ian Town, Chair, Health Precinct Advisory Council

“Coming together is a beginning, staying together is progress, and working together is success.”

– Henry Ford

As the great innovator and businessman Henry Ford observed, working together is success. When the Christchurch Health Precinct, Te Papa Hauora, was established, many of its partners had worked together for years and already achieved much together. For example, the University of Otago, Christchurch, has employed Canterbury District Health Board clinicians as lecturers and researchers since its establishment in 1973. This close clinical collaboration has contributed to the University campus’s reputation as the country’s top medical school for leading-edge research and student achievement.

Ara Institute of Canterbury and the University of Canterbury combined their skills to develop a programme where graduates can study towards

both nursing registration and a Master’s degree in two years.

The world’s leading health think tank, The King’s Fund, identified the Canterbury health system as an international leader in collaboration and integration.

The Health Precinct makes it easier to connect and collaborate. It articulates and engages partners in common goals to improve Canterbury’s health, wellbeing and economy.

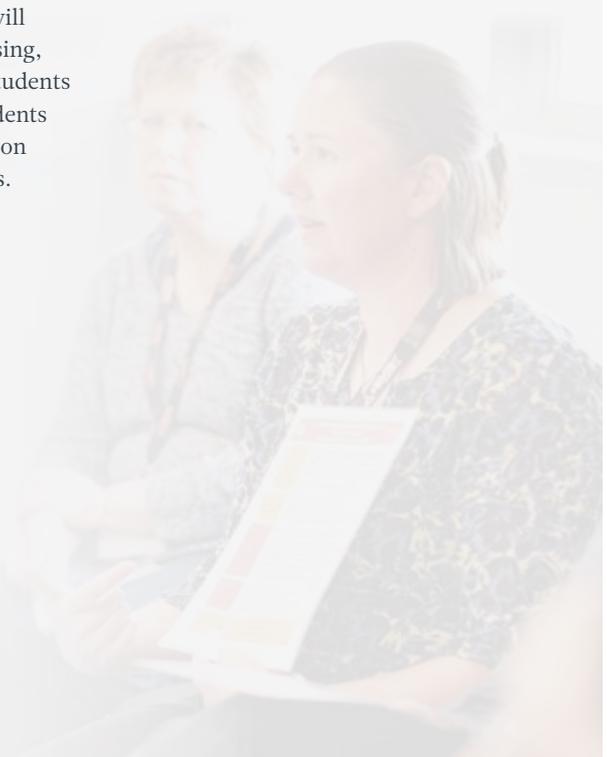
The development of the flagship Health Research and Education Facility will strengthen bonds as it brings nursing, midwifery and medical imaging students a stone’s throw from medical students and working health professionals on the Christchurch Hospital campus.

As relationships and collaboration between Te Papa Hauora’s partners grow, so will our success. And success for the Health Precinct means a healthier future for Cantabrians. We hope you enjoy reading about some of our successes.

*Dr. Ian Town, Chair
Health Precinct Advisory Council*



Te Papa Hauora / Christchurch Health Precinct is the hub of a creative and inspiring network that integrates world-class healthcare, research and innovation, education and industry. Te Papa Hauora’s key partners are: The Universities of Otago and Canterbury, the Canterbury DHB, Ara Institute of Canterbury, and Matapopore, which is Ngāi Tahu’s earthquake recovery agency.



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TE PAPA HAUORA

The Christchurch Health Precinct

healthier futures

A University of Canterbury child health researcher is studying the impact of the earthquakes and their aftermath on some of Christchurch's smallest and most vulnerable residents.



Afternoons were the worst. That was typically when the outbursts of crying, hitting or other violence would erupt in Christchurch classrooms and playgrounds. Not from every pupil, nor in every classroom or school. But the noticeable increase in behavioural problems and volatility following the Canterbury earthquakes was enough to really worry educators.

University of Canterbury child health researcher Associate Professor Kathleen Liberty first heard about these problems in late 2011, from her friend and colleague Maureen Allan. Allan is the manager of support services for children with learning and behavioural problems in schools on the east side of Christchurch. They were experiencing a big spike in referrals from schools needing help for troubled children. Teachers were also expressing concern over new entrants struggling to learn and without many of the skills that children of that age would normally have.

It set Liberty to thinking. What was the cause of these issues in new entrants who would have been pre-schoolers during the biggest quakes, and subsequent aftershocks? They could not explain what was happening to them, and possibly couldn't remember their lives before the earthquakes.

A few years before the earthquakes, Liberty had done a study of new entrants' mental health and behavioural problems with some University of Otago paediatric researchers. She had the perfect group to compare the situation of post-quake new entrants with.

Starting at the end of 2012, Liberty and Allan invited schools to be part of the new study. They wanted to see if children starting school after experiencing earthquakes and aftershocks were different from those surveyed before. It was a big ask, as schools and their communities were dealing with the earthquakes' aftermath. Five schools agreed, and

their students were assessed for post-traumatic stress disorder (PTSD) symptoms and behavioural problems.

Liberty says the results were shocking. "We saw significant differences in the children's behaviour and learning compared to new entrants who had not experienced the earthquakes, or the very disruptive post-earthquake environment."

Seventy per cent of the post-quake children had at least one symptom of PTSD. One in five exhibited all classic symptoms of PTSD. This incidence of significant levels of PTSD was double the rate of the children surveyed before the quakes. "More than 70 per cent of children had sleep problems, headaches, stomach aches, eating problems, nightmares, wetting the bed. The list goes on. The children also had hyperarousal, anger outbursts, crying for seemingly no reason and irritability."

Liberty acknowledges her study was small – involving about 600 children from the east and south of Christchurch – but concerning nonetheless.

To understand what was causing these problems, Liberty spent six months studying international research on children's brain development, and children and disasters. She found evidence that exposure to prolonged stress can disrupt the development of the brain and neurological systems of young children.

"There were 17 months of high intensity earthquakes, in which there were thousands of earthquakes, many of which were magnitude 5 or greater. So these children's bodies are registering the quakes. They can't relate or tell you what's happening – but it's definitely

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Liberty says the results were shocking. "We saw significant differences in the children's behaviour and learning compared to new entrants who had not experienced the earthquakes, or the very disruptive post-earthquake environment. These children's brains have become neurologically different because of the quakes and aftershocks."



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Along with clues about the cause of a rise in problems in new entrants, Liberty scoured the literature for ways to help. Because there were so many children exhibiting symptoms of PTSD, she decided on a school-wide programme. It would focus on calming the environment to reduce stressors that could trigger children. The rationale: if the environment is calmer, everyone can learn better.

The comprehensive programme

- *Explaining to teachers and parents how children’s behaviour changes under stress, and how to respond to stressed children.*
- *Calming the classroom environment by reducing visual over-stimulation, and adjusting levels of light, heat and noise.*
- *Changing the routine of the day to ‘Play, Eat, Learn,’ allowing a calmer food consumption experience.*
- *Encouraging children to eat a complex carbohydrate snack at a time when they need energy to maintain concentration.*
- *Offering a daily dose of Omega 3, which may soothe aggravated nerve pathways and improve sleep.*
- *Encouraging children to drink more water and explaining how it improves learning and how bodies and brains under stress need more.*

All strategies were identified from extensive literature reviews, have an evidence base, and are effective in addressing the biological and neurobiological effects of stress.

A detailed description of the strategies may be downloaded from this link: <https://archive.org/details/ReducingStressInSchools2017>.

The five schools involved started the programme in 2016, doing as many aspects as they could. There was no cost to schools or families. Organisations such as the Rātā Foundation and the Canterbury Primary Principals Association funded the Omega 3 and drink bottles.

At the end of 2016, one year after the introduction of the strategies, the impact of the programme was measured. In schools that implemented the majority of strategies, the proportion of children with high levels of behavioural problems decreased by a third. A third of the other children also showed improved behaviour. On average, behavioural issues reduced by two problems per child.

In mid-2017, Liberty presented her preliminary results to the Canterbury Primary Principals Association, which decided to invest in extending the programme.

The schools involved in the original research are also now trialling programmes to improve children’s sleep and coping skills.

Nine primary schools, 12 kindergartens and six preschools –with a total of 4000 students—are now implementing varying aspects of the programme in a replication study. At the end of the year, Liberty and her colleagues will have a good idea of the impact of different aspects of the programme, and whether it is worthwhile for schools to implement just part of it.

“My hope is that we can make a positive impact on the children who were vulnerable to the effects of the earthquakes, and ensure they have healthy and bright futures.”





*Shevaun Karipa,
Deputy Principal and
SENCO, Ōpāwa School,
Christchurch*

a place of calm

Ōpāwa School is one of five primary schools involved in a groundbreaking programme to help young children affected by the Canterbury quakes. Its involvement and efforts over five years, are paying off.

What happened in Canterbury from September 2010 onwards – the large, damaging quakes and thousands of nerve-jangling aftershocks – was unique on a world scale. It was always going to leave an imprint on the population. Including its smallest citizens.

Within a year of the first big earthquake, education leaders such as Ōpāwa School's Shevaun Karipa noticed a big shift in the school environment.

“Children were going from zero to 100 in terms of aggression. We had a big spike in referrals to specialist services for children with learning and behavioural problems. You could see many children struggling to learn. The impact of the earthquakes was really profound in a lot of our children.”

Karipa is the school's Deputy Principal and its Special Education Needs Coordinator (SENCO). That means

she plays a critical role in ensuring children with special education needs or disabilities receive the help they need. By the end of 2012, she and her colleagues realised the combination of the school's well-developed support systems and Ministry of Education programmes were not enough to address the 'tsunami' of need. “It was obvious we needed to do something else.”

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They became one of five schools implementing the programme designed by Associate Professor Kathleen Liberty and her University of Canterbury colleagues. Ōpāwa School implemented all of the programme's components. They began with new entrants, extending the programme so now all pupils are involved.

Karipa says while being part of the programme is tough, it is exceptionally worthwhile. It has resulted in a better learning environment, and higher achievement for pupils. For example, the percentage of children who met or exceeded the national standard for reading for their age rose from 52% to 85%.

She says there has been a noticeable drop in the number of times the leadership team is called to classrooms to support or remove children who are not coping, and a corresponding drop in referrals to external agencies.

“The school feels much calmer since we introduced the programme. We are so glad we took part and in my opinion the children are definitely better off as a result.”



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risky business

Christchurch researchers are working to more accurately predict New Zealanders' risk of having a heart attack.

Sharon Duthie's job is to help save lives.

But on a hot Mid-Canterbury evening, as the St John intensive care paramedic neared the end of a 12-hour shift, it was her life on the line.

The slim, fit 52-year-old had no warning signs of a heart attack. She was suddenly nauseous, sweating profusely, and her face had turned what her colleagues later described as a worrying 'cardiac' shade of grey.

Duthie's colleagues rushed her to Ashburton Hospital. She went into cardiac arrest, lost consciousness, and had her heart shocked back into rhythm twice by a defibrillator. Duthie was airlifted to Christchurch Hospital and had lifesaving surgery to insert a stent into an artery that was 90 per cent blocked.

The traumatic experience left her grateful to her colleagues, but also puzzled. "I'd done a risk assessment during my paramedic training, and was classified as low risk," Duthie says. "But to my surprise, there I was, collapsed on a stretcher in the back of my ambulance, clearly having a heart attack."

In the days before her collapse she had vaccinated and weaned almost 600 lambs on her rural property, and had a healthy lifestyle. But in fact, Duthie is one of many New Zealanders who have heart attacks despite not fitting the classic risk profile.

After her release from hospital, Duthie signed up to a major new study examining the complex interplay between genes and lifestyle factors in determining a person's risk of heart disease. The Multi-Ethnic New Zealand Study of Acute Coronary Syndromes (MENZACS) is aimed at better understanding New Zealanders' real risk of heart disease. To put it simply, the study investigates why thin, fit and seemingly healthy people such as Duthie suffer heart attacks, when other more overweight, stressed-out and unfit people do not.

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The study is a collaboration between the University of Auckland and the University of Otago's Christchurch Heart Institute (CHI). More than 3000 people who have had a heart attack, or a case of angina, are being recruited through hospitals nationwide.

Geneticist Professor Vicky Cameron is leading the study in Christchurch and will oversee the analysis of information on the genetics and lifestyles of the New Zealanders involved. International studies have identified key genetic variations that might put people of European descent at greater risk of having a heart attack. Cameron and her MENZACS colleagues will see if those variations are reflected in the New Zealand population, including Māori and Pacific Island people.

Cameron says understanding genetic variations is important because they are probably the reason seemingly fit and healthy people have heart attacks. They can also affect the way people respond to medication, which is why drugs to thin the blood or lower cholesterol, for example, don't work as well for everyone. If doctors understand the genetic profile of a high-risk person, they can prescribe the best medications, surgery or lifestyle changes for that patient. To try to predict who will have a heart attack, CHI researchers are studying healthy people like Duthie before her heart attack, and her two healthy adult sons. By studying detailed information from thousands of participants, the researchers hope to build up a picture of the characteristics of heart attack patients.

“The research won't help me, but it could help my boys and prevent them or other people going through a frightening and life-threatening heart attack.”



Cameron says understanding genetic variations is important because they are probably the reason seemingly fit and healthy people have heart attacks.

To understand the reasons for higher rates of heart disease among Māori and Pacific peoples, the CHI have set up the Hauora Manawa/ Community Heart Study and the Pasifika Heart Study. These studies document levels of cardiovascular disease and diabetes, and look at risk factors particular to these ethnic groups.

Cameron says thanks to tens of thousands of participants in CHI research, the group has developed promising new blood tests for doctors to use to help predict the risk of an imminent heart attack. They have

also developed better strategies for prioritising which patients to monitor more closely, and heart disease and diabetes risk factor management for those individuals most at risk.

Duthie is proud to be a research participant in one of CHI's research studies to better define risk. "The research won't help me, but it could help my boys and prevent them or other people going through a frightening and life-threatening heart attack."

"I'm very proud to be playing a small part in research to make lives better."



health system delivers economic benefits

Joanna Norris, Chief Executive, ChristchurchNZ



Canterbury's health system is internationally recognised for its innovation, integration and collaboration – bringing significant benefits for residents' health and delivering economically for the city and region.

At the geographical heart of the health system is the Te Papa Hauora / Health Precinct, which brings together health education, research and innovation and invites participation from both commercial and community interests.

The Precinct's broader approach to collaborative working is allowing wider commercial innovation in the health sector and mirrors the wider ethos of our city. Christchurch is a city of opportunity and exploration that is open to new ideas and ways of doing things. We challenge the status quo and explore the future across all sectors and industries with the aim of better outcomes for our people.

Canterbury's integrated health system is recognised as one of the best and most innovative in the world, where creative solutions to global health issues are being imagined and turned into commercial realities.

Our enviable health system brings international visitors to our city every year to see what we are achieving. Canterbury clinicians and leaders are sought-after speakers at international forums. This continues to build our reputation and helps foster the right environment for further entrepreneurship in the sector.

It was right here in Christchurch that the MARS colour scanner – a true colour CT machine – was invented by father and son scientists Professors Phil and Anthony Butler. Anthony is a radiologist and Professor at both the Universities of Otago and Canterbury, while his father is a physicist at University of Canterbury.

GE Healthcare has recently donated a \$1 million state-of-the-art scanner to the project team. The donated CT scanner's output will be compared with output from the MARS scanner as its development team finalise a human-sized model, and so groups, including Lincoln University, can use it in their research.

This is collaboration in action. Kiwi entrepreneurs working alongside an American multinational to investigate cutting-edge technologies to improve healthcare worldwide. The calibre of the work has been recognised with MARS Bioimaging being named as a finalist in the 2018 NZ Hi-Tech Awards.

Close partnerships are also highlighted in the life-saving discoveries of the University of Otago's Christchurch Heart Institute (CHI), working alongside Canterbury District Health Board clinicians and patients who agree to participate in research studies.

The CHI discovered a hormone in the blood and its relationship to a heart under stress. The subsequent test they developed is now being used in emergency departments around the world to diagnose heart failure. Faster diagnosis leads to faster and more appropriate treatment and, ultimately, saves lives.

The CHI is continuing to discover, and develop tests for the commercial market, to diagnose different types of heart disease.

This work is all testament to the success of our health system and demonstrates the huge social and economic potential that we can continue to tap into. Not only are these innovations bringing better health results for our people, as well as others around the world, they are strengthening our city and region's economy through creation of jobs and goods and services for export.

It really is a win for Christchurch. We are proud our city has created a health environment that allows the exploration of ideas and innovation with impact – leading to healthier people and better lives.



diagnosing a silent killer

A Christchurch research group that first discovered a hormone predicting heart failure has patented a test that could identify patients with pneumonia and a fragile heart.

When patients come to the emergency department (ED) with chest pain or shortness of breath, it could be a life-threatening condition. A fast, accurate diagnosis is imperative for patients to get the best care.

The University of Otago's Christchurch Heart Institute (CHI) is a world-leader in developing the tools to improve such vital decision-making.

In the 1990s, the institute was the first to recognise that a hormone in the blood could identify heart failure. The institute developed a test and guidelines for doctors which are now used in hospitals around the world.

They have since developed several more promising initiatives. One is a test that could diagnose pneumonia that complicates heart failure – a critical

piece of information for a patient's treatment – and it came about by chance.

Associate Professor Chris Pemberton, who leads the CHI team involved, says they were studying the potential of a new hormone to diagnose patients arriving in emergency departments with acute coronary syndromes such as a heart attack or unstable angina. It didn't work for those conditions – but it did for detecting people with pneumonia and heart failure.

“There are good tests to diagnose heart failure but not pneumonia,” Pemberton says. “People can come to ED with both conditions, and both need quite different treatments. Someone with undiagnosed pneumonia on top of heart failure can get the right drugs for heart failure but their condition

still deteriorates. “Our test could potentially identify those most at risk from having both conditions.”

Pemberton says there is a real need for rapid tests for pneumonia because other methods, such as chest x-rays, aren't always clear and can take a long time to confirm. Furthermore, the numbers of people with both pneumonia and heart failure are growing – “and we need to deal with that.”

The blood test has so far shown promise in a trial of 500 Canterbury patients. As a result, the researchers patented it with commercial partners Upstream Medical Technologies, and are now testing it on a much larger group. This evidence will be needed before they can market the test to hospitals globally.

the perfect storm

Simulation is preparing Canterbury health professionals to work at their best under pressure and in the most unexpected situations.

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When 38-year-old motorcyclist Richard is wheeled into the Emergency Department (ED), he's clinging to life. His lower left leg has been severed after colliding with a car's trailer. He's lost dangerous amounts of blood and is in severe shock.

For 45 minutes, the team of eight doctors and nurses work hard to save the father-of-two's life. They secure his mangled leg with a tourniquet and pump litres of blood into him. Eventually, Richard's condition is stabilised. He's sent off to an operating theatre where a surgical team do their best to repair his amputated stump. Exhausted and relieved, the emergency staff prepare to debrief the case.

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Richard is not a real patient. He's a mannequin, spurting fake blood, and is used as part of a Canterbury DHB simulation training exercise. But the emergency staff's intense effort in saving "Richard" shows the situation felt very real to them.



“Simulation training helps to reduce the stress that a new and challenging situation can cause; familiarity with a situation allows clinicians to channel their energy into thinking and focusing on what’s most important – the patient.”

ED consultant Dr Laura Joyce leads the detailed debrief with ED staff. It’s a robust and brutally honest dissection of their teamwork, communication and clinical management. Honesty and self-reflection is required to ensure the exercise results in learning and improvement. Teams of ED staff regularly take part in simulation exercises, as do other departments such as paediatrics and anaesthetics.

Simulation Centre coordinator Christine Beasley says the purpose is to give clinicians the chance to practise critical medical skills in a safe environment before dealing with them for real. Many of the scenarios may occur only once or twice in a person’s career, but getting it right first time is essential.

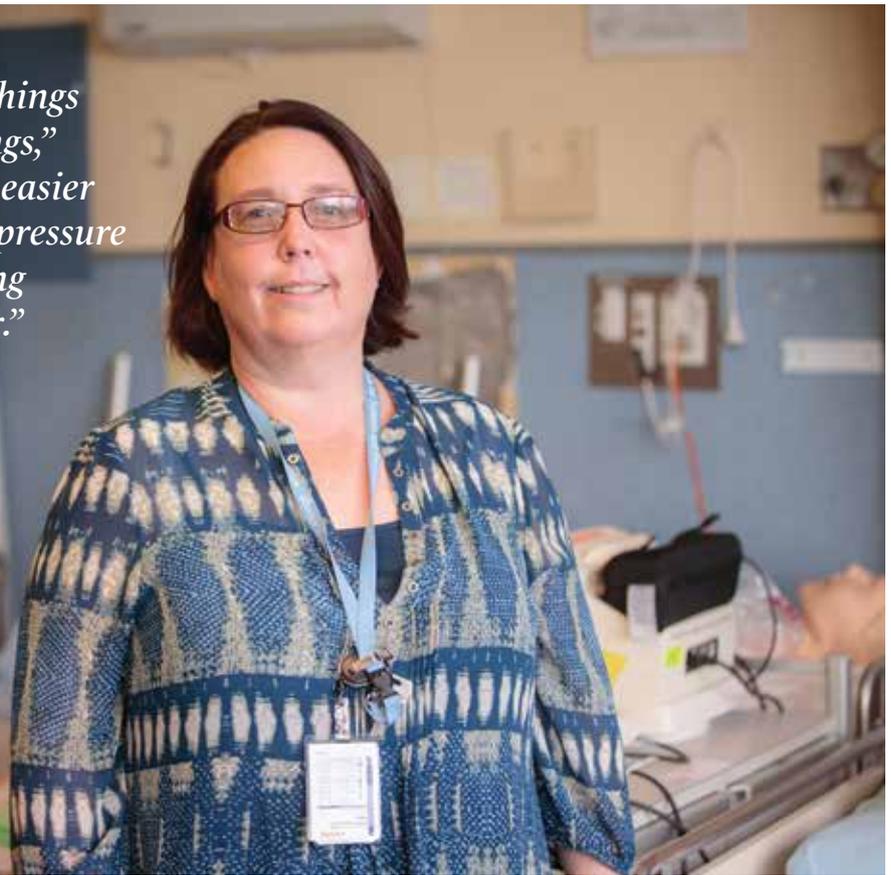
“You wouldn’t expect the All Blacks to win the World Cup without practising their skills and teamwork before running out on the field. People expect health professionals to get it right first time, even if the situation is one they’ve never encountered before and they’re working with an unfamiliar team.”

Beasley works for weeks with clinical experts to ensure simulation scenarios are exact and realistic. Every last detail is taken into account. “If blood needs to be labelled, in the simulation exercise it must be labelled. The same detail is required with every other aspect. What happens in the exercise has to replicate exactly what happens in real life. This is how staff learn, and this is how they identify processes that could be improved.”

Simulations range from simple scenarios involving one type of health professional to complex cases involving multiple disciplines. The exercises are held in clinical areas of the hospital or at the Simulation Centre on the Christchurch Hospital campus. Beasley has a range of mannequins and works with the health board’s biomedical engineering team to produce the necessary technology and patient responses. This includes

“You learn from doing things more than reading things,” Beasley says. It’s much easier to perform well under pressure if you’ve done something before and are familiar.”

*Christine Beasley,
Simulation Centre
coordinator*



replicating real patients who can breathe normally or abnormally, have a pulse, blood pressure and speak; as well as using make-up and fake body parts. Actors are also employed when participants’ emotional intelligence and communication skills need to be tested.

Beasley says giving participants the chance to reflect on their relationships with team members and their communication skills is as important as the clinical skill and decision-making required in exercises. “We’re looking at how they work as a team, how they communicate with each other to ensure the patient gets the best care possible. It’s about being precise, safe and efficient.”

Beasley, a registered nurse, says she regularly hears from medical staff who have dealt with a scenario in a

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simulation exercise before facing it in real life. One example followed an emergency caesarean simulation exercise. A doctor involved in the exercise had to perform one a few months later – removing a baby of 30-week’s gestation, then performing life-saving chest compressions on its mother, all in less than four minutes in an unsterile environment outside an operating theatre. “Mum and baby both survived, and that’s not usually the case,” Beasley says. “It’s not a massive leap to assume practising the exact

procedure, following the protocols and best way of working and communicating in a team, contributed to the positive outcome for this mother and baby.”

“You learn from doing things more than reading things. It’s much easier to perform well under pressure if you’ve done something before and are familiar. Simulation training helps to reduce the stress that a new and challenging situation can cause; familiarity with a situation allows clinicians to channel their energy into thinking and focusing on what’s most important – the patient.”

“Simulation exercises can be pretty confronting for clinicians as they have to be brutally honest about how they performed and what they could have done better. But from the difficulty comes improved care.”

Supercharging simulation

The Health Precinct’s new shared training centre will use the latest technology to help boost the skills of health professionals and students.



Artist's impression

Internationally, simulation is becoming an essential part of health care training and ongoing professional development. The Health Research and Education Facility (HREF) is a flagship building in the Health Precinct. It will house almost 2000 Ara Institute of Canterbury nursing, midwifery and medical imaging students, and University of Canterbury health staff and academics.

Canterbury DHB education and development staff will be based there in a new Simulation Centre. The centre will cover one floor of the building and include an operating theatre, hospital ward, emergency

room, a home environment with bedroom, kitchen, and living area; and high-technology equipment such as virtual reality and video facilities for recording and reviewing training sessions.

Stella Ward, the CDHB’s executive director of allied health, says the new centre will allow students from a range of health disciplines to train alongside clinicians from different parts of the healthcare system. “It’s about creating and sustaining a culture of collaboration. Inter-professional learning will improve teamwork, which in turn contributes to improved patient outcomes.”

life-saving local invention

Christchurch surgeons have harnessed high technology and Kiwi ingenuity to come up with a solution to teaching a rare life-saving surgical procedure to the next generation of doctors.



Paediatric surgeon Spencer Beasley literally wrote the book on oesophageal atresia – a condition in which a newborn’s oesophagus (or gullet) doesn’t connect to the stomach.

A common complication of the condition is that the windpipe is connected to the stomach instead, forcing acid into the baby’s lungs. Premature babies are more likely to be affected. Babies do not survive without delicate corrective surgery.

“We perform this challenging and unforgiving surgery on tiny babies usually within a day of their birth,” Beasley says. “The stakes are extremely high. You have to get it right the first time. If it’s done inexpertly, the child faces many more operations.”

Beasley has been doing the surgery for more than 30 years. In the 1990s he published the definitive book on the condition, which is now used globally. But while he and fellow consultant surgeons such as Jon Wells are experts, teaching the next generation poses a real problem. “It’s hard for our trainees because at present the only way they can learn is on actual cases. Because it only occurs in about one in 4000 births – or about four cases in the South Island each year – the big question is: ‘How do we best train the next generation of paediatric surgeons to do such a difficult and uncommon procedure?’”

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In early 2017, Spencer and Wells put their heads together to dream up the ideal simulator... together they created a simulator using 3D-printed plastic for the ribcage cavity, and silicone moulds of the oesophagus and trachea.

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The answer: a home-grown simulator.

Teaching hospitals in the United States and Britain have created simulators, but with limitations. They use tissue from rabbits or piglets to mimic the oesophagus which brings with it ethical considerations, increased costs, and lengthy consent processes.

In early 2017, Spencer and Wells put their heads together to dream up the ideal simulator.

They applied some number eight wire mentality and then Wells, who has been co-ordinating the research, contacted the Canterbury District Health Board's department of medical physics and bioengineering. Together they created a simulator using 3D-printed plastic for the ribcage cavity, and silicone moulds of the oesophagus and trachea.

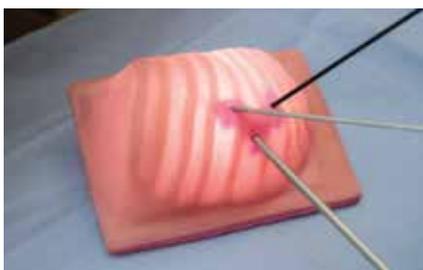
Using 3D-printing means they can make things exactly the right size, giving a precise, accurate model of a premature baby. Simulator parts can be produced cheaply. The entire machine fits in a box and potentially could be shipped to hospitals around the world, including to developing countries – with none of the ethical issues or logistical challenges of other models.

University of Otago medical student David Nairn is researching the simulator to make sure trainees who use it get the necessary technical skills, and that this acquisition of technical expertise can be measured.

The next step is taking it to a medical conference of the world's leading paediatric surgeons to study them using it and validate the model. The team are also exploring commercial and copyright issues.

“We’re really proud of this simulator and the diverse team of people who have contributed to its development,” Beasley says. “We think it’s got real potential to prepare the next generation of paediatric surgeons to learn how to do this life-saving surgery safely and expertly.”

“It’s hard for our trainees because at present the only way they can learn is on actual cases. The stakes are extremely high. You have to get it right the first time.”



elements of innovation

Tim O'Meara, Regional Research Manager for
GE Healthcare Australia and New Zealand



As a global medical technology company, GE Healthcare is constantly on the search for innovators. People or organisations who are inventing, or challenging existing wisdom with a view to improvement. Partners in transforming medical technology and solving medical problems.

We have collaborated with many organisations in many different parts of the world. This experience has taught us the ingredients required for successful innovation in medical technology.

These ingredients are:

- *A strong academic group with members from a range of disciplines, such as medicine, computing and engineering.*
- *Significant Government support with realistic timeframes.*
- *A start-up company with a focus on making a product, and some private investment.*
- *A connection to a multinational who can engage early and take the innovation to a global market.*
- *A health service willing to partner and innovate.*

Christchurch's medical technology sector has these elements. The Health Precinct strengthens the potential for success even further.

One good example of a Christchurch-based company we are working with, and who meets these innovation criteria, is Mars Bioimaging Ltd. This company is developing a revolutionary 3D colour spectral scanner. In the world of medical imaging, spectral imaging will be a game changer. Spectral imaging technology is a

way of combining the advantages of traditional imaging, such as MRIs, with spectroscopy. Put simply, these next generation imaging machines will allow us to see inside the body in far greater detail, detailing the elements and compounds in a single scan.

Mars Bioimaging Ltd. is led by father and son Professors Phil and Anthony Butler, who invented the MARS scanner. Phil Butler is a physicist at the University of Canterbury; his son Anthony is a radiologist and Professor at both the Universities of Otago and Canterbury. The team they have gathered around them to develop the project includes biologists, computer engineers, technology experts, doctors and students.

We recognised the invention's potential early on and have been working with the MARS team for a number of years. In 2014 we signed a partnership agreement to work together on developing medical imaging technology. The MARS team are well-supported by both private and government grants, such as multi-million dollar support from the Ministry of Business, Innovation and Enterprise, who recognise the potential of the technology – in medicine, and also in other industries such as scanning people and baggage for security at airports.

The University of Otago, Christchurch, is a leader in medical research with close proximity and connections to the Canterbury DHB and its clinicians. This means the technology is being tested against rigorous scientific standards, and the clinicians who will ultimately use it have input into its development.

To play its part in the evolution of this technology, GE Healthcare donated one of its state-of-the-art CT scanners, the kind being used in hospitals around New Zealand and the world, to test the MARS against. The scanner will also be used by local universities in their medical research.

Our relationship with the MARS team first focused GE Healthcare's attention on Christchurch. We have since developed further relationships and see it as a thriving centre for invention, collaboration and ultimately in the development of technology that will improve and extend people's lives.

safe places

Christchurch researchers, in collaboration with the University of Sydney, have completed a world-first study showing the safety of primary birthing units for healthy expectant mothers.



When Melissa O’Grady visited Lincoln’s Primary Maternity Unit on an antenatal visit, she felt immediately at home. “It was calm, welcoming and the midwives were wonderful and warm.”

That positive first impression convinced the 30-year-old Burnham woman that a Primary Maternity Unit (PMU) was the perfect place to have her first baby.

Her determination to have her baby in a non-clinical environment was such that when her waters broke while visiting her grandmother at Christchurch Hospital, she hopped in her car and drove home to avoid well-meaning attempts to admit her to the neighbouring Christchurch Women’s Hospital. Baby Joseph Roguski was born without complications a few hours later at the Lincoln unit; a healthy 3.2 kilograms.

Joe and his mother stayed at Lincoln for three nights. Joe’s father and his maternal grandmother also stayed a few nights – making it a “wonderful experience” for the wider family. In the weeks since his birth, Joe has thrived. “He’s such a good baby. He sleeps well and feeds well, and my mother reckons it’s partly because he was born in such a nice, homely environment, not in a more clinical one,” O’Grady says.

She is in the minority having her baby at a PMU, as most New Zealand women choose to give birth in hospital. In 2015, 86.4% of New Zealand births occurred in a secondary or tertiary hospital, 9.9% in a freestanding PMU and 3.4% were home births.

Primary-level maternity units offer birthing facilities with midwifery services, while tertiary and secondary-level units offer midwifery services, specialist obstetric, anaesthetic and paediatric services.

O’Grady is pleased she bucked the trend and recommends all her pregnant friends consider that option.

Research from Ara Institute of Canterbury, published in the BMJ Open (a subsidiary of the British Medical Journal) shows that if mothers choose a PMU, they and their babies will be as safe as if they gave birth in a hospital. In fact, the study of almost 700 Canterbury women found low risk women who chose to give birth at primary-level maternity units had better outcomes than those who chose hospital environments.

Ara maternity researcher Rea Daellenbach says the study demonstrates that midwife-led, primary-level maternity units are physically safe places for well women to give birth. Women who give birth at a primary unit are also more likely to have a natural birth and fewer interventions, such as forceps delivery, than those who have a hospital birth. The study found no difference between the health of babies delivered at Christchurch Women’s Hospital or a PMU.

The study was a collaboration between Ara academics and researchers from the University of Sydney. Daellenbach and her colleagues were invited to be part of the Australian-funded research because of their strong academic credentials, and Christchurch’s range of birthing options.

“We’re pretty lucky in Christchurch because women have choices. There’s three excellent primary units, plus Christchurch Women’s. This choice is not the norm in Australia or all parts of New Zealand.”

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LOCATION OF NEW ZEALAND BIRTHS



86.4%

Secondary or Tertiary Hospital



9.9%

Freestanding PMU



3.4%

Home Births



Ara maternity researcher Rea Daellenbach says the study demonstrates that midwife-led, primary-level maternity units are physically safe places for well women to give birth. Women who give birth at a primary unit are also more likely to have a natural birth and fewer interventions, such as forceps delivery, than those who have a hospital birth. The study found no difference between the health of babies delivered at Christchurch Women’s Hospital or a PMU.

New Zealand has 54 freestanding midwife-led Primary Maternity Units (PMUs). There are 18 secondary-level and six tertiary-level obstetric-led maternity hospitals or Tertiary Medical Units (TMHs), with specialist services.

The study was a world-first because it examined where women planned to give birth, and why. About half of women who planned to give birth at a primary unit actually had their babies in the hospital, with 17% of them transferring during labour to Christchurch Women’s Hospital. However, overall the women who initially planned to go to a primary unit still had better outcomes than the low risk women who planned a hospital birth. It is worth noting that a third

of the women who wanted to birth at a primary unit but transferred to Christchurch Women’s did so because of earthquake disruptions to PMUs.

Researchers found a woman’s confidence in themselves and their ability to give birth was a common factor for those who chose a primary level birth. “These women were confident in their own ability to give birth naturally, and confident that the maternity system would support them. Confidence is quite a different concept from trust. It’s more personal to the woman and way more empowering. They are saying they believe in themselves and that is very powerful,” says Daellenbach.

The study would have included more women but the earthquakes disrupted recruitment for the study.

Daellenbach says she and the other researchers are grateful to those who agreed to take part, as their birth stories provide much needed information for other expectant mothers. “The results can give women with low risk pregnancies confidence in planning to give birth in a midwife-led primary birthing unit and in the New Zealand maternity system.”

co-locating students and professionals

Tony Gray, Chief Executive, Ara Institute of Canterbury



The Health Research and Education Facility (HREF) will benefit the next generation of undergraduate nursing, midwifery and medical imaging students and their future patients.

The Health Research and Education Facility (HREF) is a flagship building in the Health Precinct. It will house almost 2000 Ara nursing, midwifery and medical imaging students, and University of Canterbury health staff and academics. It will provide an outstanding opportunity for our students to be co-located on a daily basis with health professionals.

They will learn in facilities that replicate actual healthcare environments, and get further training to develop their careers in this New Zealand-first, innovative new Te Papa Hauora Health Precinct.

We are fortunate to be sharing this developmental journey in healthcare education with the Canterbury District Health Board (CDHB) and University of Canterbury. Ara has enjoyed a close collaboration with the CDHB for many years. Both organisations share a passion for excellence in healthcare training and this has led to HREF, in what we hope will be an exemplar of collaborative and co-located training and professional development.

My colleagues at Ara began working on this project with our partners back in 2012, but our involvement has intensified in the last few years as we work on the design of the building's interior and prepare to move 1800 of our

students and staff from June 2018. There has been and continues to be a huge amount of work happening to align all partners' systems and processes and to prepare for a smooth relocation.

The quality of the healthcare programmes at Ara is well recognised throughout New Zealand, and our graduate employment statistics are some of the best in the country. However, we want to ensure we continue to improve the experience and development of our students. We believe HREF offers a unique opportunity for our students from the region, across New Zealand and internationally, to experience the everyday immersion of training alongside our partners' health professionals and researchers, and enjoy the benefits of inter-professional learning, to become the best healthcare professionals they can be.

Medical imaging students at Ara were the first in the world to use virtual reality training and we expect to see this trend gather pace across other disciplines at HREF, with co-location expected to lead to creative solutions to shared challenges. Students will have access to CDHB's digital platforms as well as superior simulation environments including real world operating theatre, trauma room, post-operation recovery room, home and ward environments and larger, more modern learning spaces.

HREF will allow our programmes and our people to grow and develop, and will deliver better outcomes for students, for patients, for health professionals and for the sustainable future of the health sector in Canterbury and New Zealand.





*Dardanelle McClean-Smith
and her daughter Leila.*

Kā Rakatira o Āpōpō voice of the future

*Mā te huruhuru te manu ka rere
Let our rakatahi be the wings that give us flight*

Ngāi Tahu has a young population, with 32 per cent aged under 15 years, and 49 per cent under 25 years. As the newly released report on income inequity by Tokona te Raki suggests; inequities across education, income and health for Māori have an impact at a micro and macro level for the whole of society. This also presents us all with an opportunity to support an agenda for change so that these youth are able to realise their part in society o āpōpō – of the future. We asked a group of emerging Ngāi Tahu hauora leaders what their aspirations entail. *Mō tātou, ā, mō ngā uri a muri ake nei For us and those who come after us.*

DARDANELLE MCLEAN-SMITH
Ngāi Tahu, Waihao

Dardanelle McLean-Smith's daughter Leila is an intelligent, loving pre-schooler. When the 26-year-old watches her child play, she often wonders what life will be like for Leila as an adult.

“How are we as tāngata whenua going to address the issues facing us? Physical health is poor, the mental health statistics for Māori are a disaster, our wellbeing is not good. We are continually at the top of the table for the bad statistics. Things can't still be like this when my daughter is grown up. We need to look at things and do things in a different way, and the rangatahi (youth) need to be driving that change.”

McLean-Smith says because rangatahi represent so much of Ngāi Tahu, and its future, it is essential they are involved in initiatives for change.

“The rangatahi voice needs to be heard. They need to be able to contribute in a meaningful way, rather than feel they are being told off if they try to speak, because they are just ‘youth’.”

McLean-Smith trained as a social worker and for several years worked at the national youth justice facility at Rolleston. There she came in contact with many Māori youth with no positive role models, identity or path for the future. “Sixty-six per cent of that population were Māori. We're talking about the top youth offenders in the country here, so that's a pretty telling, and sad, statistic.”

Her experiences, and desire to contribute for the good of Ngāi Tahu, led her to work for the iwi. At the beginning of 2018, she began working as Kaitohutohu Hauora and Mātauranga (health and education advisor) for Te Taumutu Rūnanga, near Leeston. The role involves working with justice, health and education organisations to improve outcomes for those in the Taumutu area. She is also a member of the Ngāi Tahu Working Group, Tōpuni Tamariki that has led the strategic relationship for the iwi and Oranga Tamariki, the national agency for vulnerable children.

In a step towards better engagement with rangatahi, McLean-Smith and her cousin Talia Ellison-Collins organised the first Ngāi Tahu Rangatahi Summit in 2017. Each of Ngāi Tahu's 18 tribal areas had two representatives at the Summit. During the one-day event, rangatahi spoke of aspirations for themselves and other Ngāi Tahu youth. One of the ideas that came across strongly was that young people felt there needed to be a sense of ‘reciprocity’ to opportunities provided by the iwi. For example, rangatahi who got educational grants should give back in some way, such as sharing their knowledge or working on the marae. “They don't want to feel like beneficiaries when they are capable of giving back,” McLean-Smith says.

One idea from the summit will be presented to the iwi's governing body – Te Rūnanga o Ngāi Tahu (TRONT). The participants want a rangatahi council established with elected representatives from each of the rūnanga. McLean-Smith says she's positive about the changes that will come about from increasing levels of engagement with rangatahi. “It's about being inclusive, not exclusive. When there is a change in the mind set, more positive outcomes will be had for all whānau. Hopefully this will mean when my child grows up she is not seeing the same issues we see today.”

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MEREMOANA POTIKI

Ōtākou, Wairewa

Meremoana Potiki had her first panic attack while studying psychology at Victoria University. “I’d experienced feelings of anxiety as a child but I didn’t really know what it was. I had a very supportive whānau, but I didn’t know how to talk about it.” When the shy, softly-spoken girl from Christchurch moved to Wellington to study psychology, her anxiety became more pressing. “I was submitting assignments, and the pressure was getting to me. I felt like a failure. I felt like I had to be perfect. It became overwhelming.” After experiencing her first panic attack, Potiki sought and received help from an excellent support system for Māori students at the University.



TAHU STANLEY

Tuahiwi

Working in a youth care and protection facility was both sad and rewarding for Tahu Stanley.

“The reality of working in child protection services in New Zealand is the sheer amount of young Māori who are in the system. Many have no cultural ties or pride in their Māoritanga. They know they are Māori, but most couldn’t tell you more than their iwi.”

Through her own experiences with anxiety, she noticed there was a severe lack of spaces where she and other Māori could speak openly about mental health. This eventually influenced her study aspirations. Potiki hopes to soon begin a PhD, centred on understanding mental health issues within her tribe. The research will tackle the scale and significance of mental health issues for Ngāi Tahu, as well as proposing some initiatives from the results of her study.

Potiki says poor mental health is one of the biggest issues facing Māori. While Māori have high rates of poor health and wellbeing, it’s not something a lot of them feel comfortable talking about. “We need to start talking about mental health, and feeling safe to do so. There’s this almost implicit belief

This cultural disconnect, and a lack of positive role models and life experiences, often affected the young people’s mental health. “A lot of young Māori come from violent backgrounds, and don’t know how to express their emotions when they feel overwhelmed. This would often lead to them working themselves up to the point of complete mental shutdown or physical outbursts as a release.”

Stanley worked in the facility on and off for about four years while studying towards a communications degree. Though the job was challenging, Stanley says it was a privilege to be able to share his pride in his Māoritanga with the rangatahi.

“This was the part of the job that I enjoyed the most, seeing some of the kids really embrace their culture when they were in an environment that encouraged it.”

Seeing the potential for change, Stanley decided he wanted to work in

in Te Ao Māori (The Māori World) that complaining about one’s struggle can sometimes be perceived as being ungrateful – that everyone has difficulties and they don’t want to be seen to be complaining about theirs.”

As part of her PhD research, Potiki will share her own experiences. “When I first talked about my experience with anxiety with other members of my hapū (sub-tribe), it wasn’t easy. But I found humour was a great thing. It really broke down barriers and I found once I started sharing my experiences with others, they felt comfortable sharing their own experiences with me.” Potiki hopes her research will enable others to share their stories, and get the support they need.

a full-time role with rangatahi. He is now working as a Kaitoko Mātauranga (education advisor).

“As a kaitoko, I work with education providers to ensure the learning objectives and aspirations of Ngāi Tahu whānau are met. There are a lot of young Māori who are doing well for themselves and have a good relationship with their own hauora (health). I think education is important in this, as is having a firm sense of identity.”

Now I’m working directly with schools and whānau, it’s an exciting opportunity to help change some of the poor statistics for Māori and see more young Māori proud in their identities and their Māoritanga.”



As part of his desire to give back, Sollis is part of a Ngāi Tahu-backed initiative on the West Coast that aims to keep rangatahi (youth) in education. The initiative is called Tuia ki Te Tai Poutini and is for year 11 to 13 Māori students. It aims to engage rangatahi so they feel a connection to their tūrangawaewae and the people of that place.

MATT SOLLIS
Ngāti Waewae

Matt Sollis will be the first person from Arahura to graduate as a medical doctor, but not its first healer. His taua (grandmother) Miriam Mason, affectionately known as Auntie Nin, was a Reverend Canon in the Anglican Church and healer in the West Coast town of Arahura. “I feel that I’m following in the footsteps of my taua. She was interested in rongoā (traditional Māori medicine) and used to treat us with hot bread poultices and karakia (prayer). She influenced my understanding of hauora and wellbeing a lot.”

Whānau is hugely important to Sollis. He grew up in the bosom of his tūrangawaewae (standing place) of Arahura pā. Whānau support and encouragement has helped and sustained him on his journey to become a doctor. He is currently a fifth year medical student at the University of Otago’s Christchurch campus.

“It’s such a privilege. I feel that my whānau are behind me, it makes me super motivated to return home one day and give back where I can.”

Sollis says a lack of educational achievement is one of the biggest issues facing Māori. “The stats are pretty poor for Māori passing NCEA, and getting into and staying at university. I feel it’s a big issue for Ngāi Tahu, and particularly the West Coast.”

As part of his desire to give back, Sollis is part of a Ngāi Tahu-backed initiative on the West Coast that aims to keep rangatahi (youth) in education. The initiative is called Tuia ki Te Tai Poutini and is for year 11 to 13 Māori students. It aims to engage rangatahi so they feel a connection to their tūrangawaewae and the people of that place. The rangatahi attend five sessions throughout the year that aim to really celebrate them, each focused on a different aspect of Māoritanga. At the final session, rangatahi are presented with a kuru pounamu tāonga.

Sollis is a keen gardener and advocate of the environment’s ability to anchor people and improve their wellbeing. He spoke to rangatahi at the Tuia i Raro session and focused on whenua (the land) and the environment and its role in grounding our identity. “It talked about my experiences, told my story, and took them to see my garden.”

Sollis says he has received a lot of tautoko (support) from the Māori / Indigenous Health Institute (MIHI) at the University of Otago, Christchurch. MIHI has developed a Hauora Māori curriculum for medical students that has been adopted in medical schools around New Zealand and the world. “They have helped open my eyes about how to be a better doctor, and a better Māori doctor.”

Sollis says he hopes one day he can help young Māori and inspire them to be well, excel in education and achieve for themselves and their whānau as he is now trying to do.

bright sparks

Students from different backgrounds came together to work on solutions to some of the biggest problems facing the healthcare sector.

Their ideas show the future is in very good hands.



Imagine an artificial intelligence system guiding you through your hospital stay. Then making sure you get the support you need after you are discharged. Or an app that learns what you like then prompts you on easy ways to improve your health and wellbeing. These were two of the innovations developed during the 48 Hour Health Challenge. The Health Precinct-sponsored event gave students the chance to share their ideas and interact with current health and business leaders.

Over 48 hours, teams chose a challenge; researched and developed a plan to address it; then ran their idea past mentors who helped and challenged them to improve their solution. The weekend culminated in a presentation by teams to a panel of judges, including experts in health, business, technology, and entrepreneurship.

The winning team consisted of a medical student, web developer, data scientist, marketing student, and public health

specialist. Their innovation was called KanohiDB. It centres around a novel method of storing data developed at Stanford University, and only used by a small number of leading international software developers. Winning team member, and University of Otago medical student, Gabrielle Budd says KanohiDB pulls together myriad sources of information about an individual's health and wellbeing into one easy-to-use format. What

this means is that health professionals can access all relevant health and wellbeing information when treating a patient. The system has a very stringent security access system so only those who should be accessing it can.

The second-placed team came up with a concept called AiME. This is a culturally-responsive virtual nurse ready to answer medical questions, keep everyone informed of progress and discover

patient-specific information relevant to discharge and recovery, such as how much support is available at home.

Pocket-Doc was the brain child of the third-placed team. The app is a solution to patients failing to do things their doctor suggests or that are good for their health. The key to Pocket-Doc is that it learns what things work for each individual, and what behaviour changes drive improved health.

Health Precinct Advisory Council (HPAC) member Amber Clarke says the collaboration and diversity of thinking the groups applied to challenges reflects the way HPAC partners work together to enhance the hauora of our communities.



Te Papa Hauora – The Health Precinct

Te Papa Hauora—the Health Precinct—is the area of Christchurch city neighbouring the hospital, bounded by St Asaph Street, Montreal Street and Avon River/Ōtākaro.



Known developments as at May 2018

The vision for Te Papa Hauora is to be “the hub of a creative and inspiring network that integrates world-class healthcare, research and innovation, education and industry with a strong emphasis on population health. It will accelerate economic growth, act as a magnet for talent and promote community wellbeing.”

In short, Te Papa Hauora will further the reputation of Christchurch as a place of collaboration, discovery and learning.

1. **Acute Services Building**
This will include operating theatres, 400 beds, purpose-designed children’s facilities, an expanded intensive care unit, radiology and emergency departments, and a rooftop helipad.
2. **Outpatients Facility**
The new five storey building will bring services together under one roof, including general consultation clinics and diabetes, endocrine and eye and dental services.
3. 4 Oxford Terrace, University of Otago tenancy
4. Private development
5. Pegasus Arms Bar & Restaurant
6. HREF (Health, Research & Education Facility)
7. Christchurch Clinical Studies Trust
8. University of Otago owned site
9. Canterbury District Health Board
10. 36 Oxford Terrace vacant site (Ōtākaro Ltd)
11. 26 Tuam Street, MEDCAR private development

Whiria te tāngata. Weave the people together.

"This collaboration reflects our shared commitment to positive intergenerational hauora. Weaving our combined expertise together to create a strong foundation for wellbeing."

Amber Clarke, Ngāi Tūāhuriri
(Matapopore representative)



**TE PAPA
HAUORA**

Health Precinct

Health Precinct Advisory Council

C/- Canterbury District Health Board, PO Box 1600, Christchurch 8140, New Zealand

Phone 027 395 0939 www.healthprecinct.org.nz



**HEALTH PRECINCT
ADVISORY COUNCIL**

Te Papa Hauora

Canterbury
District Health Board
Te Poari Hauora o Waitaha

