Chairman’s Note

After a year in operation, it is timely to provide an update and reflect on what the MedTech CoRE has achieved, what we still need to achieve, and what 2016 holds in store. Our successful bid for 6-year funding from the Tertiary Education Commission (TEC) for a translational research programme in medical device technologies was built on the back of the business-facing CMDT network. It is therefore important that the two operations, one focused on translational research and the other on business operations, remain closely linked.

First, progress in 2015:

- A Research Operations Manager, Natalie Solomona, and a Doctoral Training Programme (DTP) coordinator, Nina Pettersson-Fox, joined the MedTech CoRE to help its running.
- All subcontracts with the CoRE partners are now active.
- The CoRE Board and Advisory Board are in place and functioning.
- Our third Seed funding round has just been completed.
- The combined CMDT and MedTech CoRE website (www.cmdt.org.nz or www.medtech.org.nz) is substantially complete with information on our people, resources and projects.
- Out first major equipment purchase, a Bruker micro-CT is now installed at the University of Auckland. It is capable of imaging at sub-micrometer and has already been utilised by 16 different New Zealand R&D groups, including four companies.
- Teaching material for our DTP programme has been developed – and tested on existing students in some cases. Six modules will be launched in March 2016.

Most importantly, the CoRE has sparked new collaborations across the MedTech partners, most of whom had not worked together previously. The CoRE and Advisory Boards are well represented by expertise in business, industry, research, regulatory and clinical areas. It also has a good balance of medical devices and health IT knowledge reflecting the increasing integration of these two parts of the MedTech sector. Catherine Mohr, from Intuitive Surgical, brings along an international perspective to the industry needs together with her vast global networks. The CoRE Board meets quarterly and the Advisory Board meets twice a year. At these meetings, the CoRE PIs and Management Team members are invited to attend on a rotational basis and present their work. This ensures transparency and good communication within the CoRE. The main function of the Advisory Board is to help review and identify shortlisted seed proposals for funding. However, the Advisory Board also has an ongoing dialogue with funded projects to provide business and clinical guidance.

At present, the CoRE is reviewing its Seed project application process after three investment rounds. This includes tighter alignment between the assessment criteria used by CMDT External Review Panel to help shortlist the seed projects that are submitted to the Advisory Board for consideration.

We have always been clear that these projects should not be about undertaking basic medtech research, but rather gaining clinical validation for an already well developed idea and developing the business opportunities to the point where they can attract business funding – consistent with the CoRE being about translational rather than basic research. However, this demarcation is not always clear and part of the challenge has been in encouraging the medtech research community in New Zealand to develop a more entrepreneurial culture.

What’s coming up in 2016?

The MedTech CoRE has 23 Primary Investigators and over 160 Associate Investigators. Research profiles for all our investigators will be on the website by early 2016. A search facility is planned to allow companies to find MedTech people with appropriate skills. Note that anyone wanting to become an AI can apply via a web-form from the our researchers page.

Our first annual report is due in April and will address the large number of (diverse) KPIs agreed with TEC. These KPIs are listed under the six Outcome Measures at KPI Page on CMDT website and we are currently adding features to the website to make it easier for PIs to list existing, and enter new, KPI data via the website.

Our Doctoral Training Programme will be launched in March 2016 at the University of Auckland. Funding is available to support new MedTech PhD students attend - if interested, please apply to the CoRE. Another new development will be developing postgraduate student industry internships.

An outreach event for the MedTech CoRE is planned from Oct 26 to Nov 6, 2016. This will be organised by TheTestPod with help from MedTech PIs and is aimed at school groups (8-14 year olds) during weekdays and the general public in the weekends. We are also planning tech talks in the evenings in conjunction with the exhibition. The venue is the set of six old grain silos at the Wynyard Quarter in Auckland and if this proves successful we will take it to other venues in 2017.

Peter Hunter and Diana Siew, CMDT Co-Chairs
MEDICA is the annual world’s premier medical technology fair held in Düsseldorf. The MedTech companies of the world congregate here filling 18 halls with all kinds of technology - from the most sophisticated MRI imaging systems to compression stockings, and implantable devices to bandages! COMPAMed alongside MEDICA, showcases all the latest components and technology for MedTech device production.

Callaghan Innovation and NZTE teamed up to put together an Innovation Delegation of 10 NZ companies, from startups to more established organisations, to MEDICA this year. The aim was to provide these young and growing NZ businesses with the opportunity to meet partners and undertake market research. Here are my observations from Medica:

- There was a strong focus on wellness and not just healthcare. Integrated care from the hospital to community continuum was strongly emphasized along with the technologies to fulfil this growing need.
- Wearables is now an accepted technology area at MEDICA and sensing systems monitoring every common aspect of our physiology incorporated into garments was a key feature.
- Apps and gamification of healthcare was also another area that is firmly claiming its stake at MEDICA, particularly in the rehabilitation and assistive technology area.

Finally, NZ Innovation is competitive in the global space. Our MedTech sector is similar in composition to many of the European nations and our innovation ecosystem compares well.

- Diana Siew
Sound Technology helps monitoring of hip implants

Dr Geoff Rodgers, a University of Canterbury mechanical engineer, is developing a new device that analyses the performance of hip joint replacement implants.

This is especially pertinent as joint replacements are on the rise, as the elderly population increases. Dr Rodgers intends for this device to assist surgeons to improve their diagnosis of implant problems, helping them manage patient treatment and guide revision surgery.

“Patients often come to surgeons complaining of pain or discomfort from their replacement hips, or in some cases experience audible squeaking from the hip joint. It can be very difficult for orthopaedic surgeons to diagnose what is happening within the joint and why the patients are having trouble,” he says.

“With an ageing population it’s very important to enable surgeons to gain insight into the implant condition and decide on a correct course of action, without operating unnecessarily. Currently the system uses four passive ultra-sonic receivers placed directly on the skin near the hip replacement implant, which are then connected to a recording system.

“The monitoring technique measures vibrations that are created by the implant and make it through tissue to the skin surface. By listening to the ultra-sonic vibrations of the implant, we have the ability to record sounds and relate them to implant condition. It is entirely non-invasive and can detect issues when a patient is moving and the implant is loaded.

“I hope one day the device will be wireless and so small it could be worn under clothing and obtain data over multiple days outside the clinic.”

Dr Rodgers began working on the project in 2010, and since then has developed the prototype and tested the device on 80 patients at Burwood Hospital’s Canterbury Orthopaedic and Bone Research Association unit.

He is currently modifying the concept to also use Inertial Measurement Units (IMUs), which use three-axis accelerometers and gyroscopes to determine limb angles during testing. These additional sensors can be used to determine the articulation angle of the implant and can be linked to the acoustic data.

Using this fused-sensor approach, the revised system will enable recorded vibrations to be correlated to not just the implant type and patient motion, but the actual implant angle at the time the emissions occur. This additional information increases the ability to accurately re-create the motions on retrieved implants, enable laboratory bench testing to better represent the conditions within the patient.

Dr Rodgers is working with researchers including Dr Tim Woodfield and Professor Gary Hooper from the University of Otago, Christchurch and Associate Professor Thor Besier from the Auckland Bioengineering Institute. The current extension of the sensing technology is being supported by a Seed Project grant from the MedTech CoRE.

Technology puts the puff where the words are

Ground-breaking research under way at the University of Canterbury’s New Zealand Institute of Language, Brain and Behaviour could soon help Deaf New Zealanders and those who have hearing difficulties.

Dr Donald Derrick has been working on cutting-edge technology that will measure the air flow that occurs when people speak, making it easier for people with hearing difficulties to better understand speech.

“The demand for improved hearing aids in noisy environments is largely unmet, and these conditions seriously interfere with headphones, emergency radios and smartphones,” says Dr Derrick.

His research is all to do with speech airflow – the puffs and flows of air we produce as we speak.

“If you blow a puff of air at someone’s hand at the same time as they hear a ‘pa’ or ‘ba’ they are more likely to receive it as a ‘pa’. If you put your hand in front of your face and say the word ‘ba’ you will not feel an air puff. But if you put your hand in front of your face and say ‘pa’ you will,” Dr Derrick says.

“Listeners incorporate this inaudible air flow information automatically without any effort and without distracting the listener from the message or taking away from visual tasks.”

“We developed an automated system that runs in real time and uses existing technology. The entire system could easily be miniaturised to about the size of the tip of a thumb.”

Dr Derrick’s team is currently optimising this system. His research received a $1 million funding boost from the Ministry of Business, Innovation and Employment in 2014.
BreatheHero: Making Chest Physiotherapy Entertaining

BreatheHero™ is a young start-up from Hamed Minaeizaeim, Robert Gallichan, Katherine Herbert and Dr. Christof Lutteroth from University of Auckland. Their interest in helping children with chronic lung diseases led them to developing a novel chest physiotherapy device that uses sensors and gaming technology to make this a more motivating experience. Chest physiotherapy is a common exercise for a number of respiratory diseases like cystic fibrosis, bronchiectasis and chronic obstructive pulmonary disease. Current technology provides neither feedback, measurement nor motivation. As a result, the physiotherapy becomes a boring experience that is often neglected or done incorrectly.

Hamed’s idea brought together a team of individuals with varied expertise in imaging, electronics & sensors, software & game development and business expertise from their rock climbing and hiking experiences. The diverse team have brought their complimentary skills, and passion to empower children with breathing disorders, to the table to create a new generation of chest physiotherapy device that has received tremendous interest from therapists and patients alike.

Katherine mentions that adherence in older children has been recognised as one of the major issues - “When there’s no sticky star as a reward, there’s really nothing motivating you ...they would have such a better quality of life if they were simply more motivated” The BreatheHero™ device will gamify the experience to encourage adherence by making it fun and motivating, whilst also providing valuable feedback for both patients and therapists.

“We want to reduce the cost, economic impact, and quality of life impact of chronic lung diseases and hopefully with our devices, patients will need fewer antibiotics and also have a better quality of life. That’s of huge value for patients as well as for our healthcare system.”

BreatheHero™ has won the UniServices Commercialisation Prize in the 2015 Spark 100k Challenge, where they were one of the finalist teams. They found the spark entrepreneurship programme a really shaping experience for their commercialisation journey. “From workshop to workshop you end up with lot of different perspectives that helps you shape your own perspective, and learn what needs to be done.”

BreatheHero is a story of great innovation, collaboration and teamwork. With their entrepreneurial spirit, we will surely see the device a success in respiratory therapy.

- Jyoti Chugh

Let us know what you think...

As we say Goodbye to exciting 2015 and gear up for an even more exciting 2016, get involved and let us know what you would like to hear more about.

For any feedback or any story you would like to contribute to our quarterly CMDT newsletter, or if you would like to contribute your ideas for seminars, workshops or any other events, please email: Jyoti.chugh@callaghaninnovation.govt.nz

Don’t forget to keep an eye out on what’s happening at: cmdt.org.nz or follow us on twitter at @medtechnz
Mathematics and Medtech Empower Amputees

Amputees around the world are relying on world-leading mathematics and award-winning Kiwi innovation from Christchurch for the comfort of their prosthetics.

The orthotics and prosthetics industry widely uses ARANZ Medical’s FastSCAN portable 3D scanner in the manufacture of customised artificial limbs and other supports. The company has received multiple awards this year, including the United Nations-sponsored World Summit Award recognising innovations that benefit the development of communities.

FastSCAN applies Fast RBF™ algorithms developed by ARANZ (Applied Research Associates New Zealand), and University of Canterbury Associate Professor Rick Beatson and his team at the Mathematics and Statistics Department. The result is a handheld scanning ‘wand’ and software that enables users to ‘3D paint’ surfaces to create real-time, accurate 3D images.

“We stand for the empowerment of clinicians and patients through accurate assessment information,” says Dr Davey.

“It’s exciting to see lives being transformed as people literally get back up on their feet with the help of our systems.”

For more on ARANZ Medical, visit the [feature on CMDT website](#).

Other News & Events

<table>
<thead>
<tr>
<th>MedTech Sector Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ companies are invited to provide their views and insights into their company for a survey of health technology companies. Your participation will help to provide a better understanding of the health technology industry in New Zealand, its strengths, opportunities and challenges. The aim is to identify factors that influence our commercial success in order to support growth and the innovation ecosystem.</td>
</tr>
<tr>
<td>A survey for the sector review will be emailed in January. We value your thoughts and your contribution for this project. For any comments or suggestions, please email: <a href="mailto:Kevin.Sheehy@navigator.healthcare">Kevin.Sheehy@navigator.healthcare</a> or <a href="mailto:Jyoti.Chugh@callaghaninnovation.govt.nz">Jyoti.Chugh@callaghaninnovation.govt.nz</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medical Devices featured in Time’s Best Inventions 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME’s annual Best Inventions list for 2015 featured five medical devices:</td>
</tr>
<tr>
<td>1. 6SensorLabs’ Nima: Tests food or drink for gluten in as little as two minutes.</td>
</tr>
<tr>
<td>2. Doppler Labs Here Active Listening Earbuds: A user can use these earbuds to choose what frequencies to filter out in order to mute or turn down the intensity of noise.</td>
</tr>
<tr>
<td>3. Eko Core – Smart Stethoscope: This device streams heartbeat data we can't hear with our ears to the cloud so it can be downloaded, analyzed, and compared to previous recordings.</td>
</tr>
<tr>
<td>4. The Sproutling baby monitor: This Fitbit-like device tracks a baby’s temperature, heart rate and position with mobile app notifications if something could be alarming.</td>
</tr>
<tr>
<td>5. Juno desktop DNA lab: Comparing DNA strains can take an entire day. Juno reduces that time to 3 hours; it has a microchip that can amplify samples 1,000 times smaller than a drop of water.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Save the Date for NZ HealthTech Week 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ HealthTech Week 2016 is scheduled for the 17—23 June. It will bring together the MedTech Sector in NZ, and host investors and developers from around the world.</td>
</tr>
<tr>
<td>For more information, keep up to date on <a href="http://cmdt.org.nz">cmdt.org.nz</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3D Printed Prosthetics: MedTech meets Art</th>
</tr>
</thead>
<tbody>
<tr>
<td>A new generation of prosthetics are now 3D printed to express individuality. Companies, such as Create Prosthetics and Overworld Design specialize in manufacturing and design of custom 3D printed prosthetics and covers for amputees and those needing limb prosthetics. They are not only functional but also aesthetically pleasing and empowering!</td>
</tr>
</tbody>
</table>