

2022 Annual Report

Tyree Foundation Institute
of Health Engineering
(Tyree IHealthE)



Acknowledgment Of Country

Tyree Foundation Institute of Health Engineering would like to acknowledge the Bedegal people that are the Traditional Custodians of the lands on which the Institute stands. We pay respect to Elders past and present, and extend that respect to other First Nations people. We celebrate the diversity of Aboriginal cultures and languages across Australia.

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**Tyree Foundation
Institute of Health
Engineering**

Connecting unmet needs with
co-designed innovations

Thank you

As President & Vice-Chancellor of UNSW Sydney, I want to thank the Sir William Tyree Foundation for their visionary support of the Tyree Foundation Institute of Health Engineering (Tyree IHealthE).

In its first year of operations, Tyree IHealthE successfully attracted a diverse and highly credentialed team of professionals devoted to the common goal of using advanced technologies to address the needs of patients and clinicians. As a group, they were united in their steadfast commitment to putting people at the centre of their work, and to collaborating across disciplines and networks to achieve the best possible outcomes for the health workforce, and the community at large.

Those solid foundations made it possible for Tyree IHealthE to seize the momentum in 2022. They rapidly added some stellar recruits to their expert team, began the process of building out their capabilities in key areas, and became an integral and active member of the innovation community, supporting, hosting, and attending a wide range of events and activities. It comes as no surprise to learn that Tyree IHealthE membership numbers are increasing exponentially.

All this means that Tyree IHealthE is well on its way to fulfilling the vision of an interdisciplinary hub of healthcare translation, contributing to a much-needed national culture of innovation, channelling the knowledge gains of the research sector into broad-based economic and social gains, and securing a future wealth base for the country.

We are enormously proud of what Tyree IHealthE has achieved to date, and excited by what lies ahead.

Professor Attila Brungs
President & Vice-Chancellor

Challenge, opportunity and progress



I am proud to deliver this Annual Report, detailing the growth and the considerable achievements of Tyree IHealthE over the last 12 months.

Our capabilities in Connected Health, Bionics and Bio-robotics, and Image Analytics have been firmly established with the confirmation of Medical and Technology Leads across all three research pillars. We have assembled an outstanding team of disciplinary experts, experienced in both interdisciplinary collaboration, and in the translation and implementation of novel health technologies.

We have bolstered our ability to support emerging innovators, recruiting a number of specialists including two Professors of Practice, and bedding down processes to help our community members identify and clarify unmet needs, and then connect with the most suitable people and resources to progress their work.

And we have formed valuable partnerships across our networks, cultivating both formal and informal pathways to future collaboration.

Along the way, we have also been reminded of the benefits that Tyree IHealthE delivers to both the health system and the community. The work we are doing here is helping to ease the pressures on over-burdened clinicians and facilities, while making health services better, more responsive, and more cost effective for all Australians.

I hope the detail presented in this Annual Report leaves you in no doubt that all of us here remain deeply committed to your vision, and to ensuring that Tyree IHealthE reaches its full potential in the years ahead.

We remain enormously grateful to you for both your generosity and your leadership.

Scientia Professor Nigel Lovell

Director, Tyree IHealthE

Head of the UNSW Graduate School of Biomedical Engineering

Tyree IHealthE team

The Tyree IHealthE team more than doubled in size in 2022, with key appointments to all three research pillars. Our new recruits have significantly deepened and broadened our clinical and technical capabilities, as well as our expertise in education, engagement, and translation.

Scientia Professor Nigel Lovell

Director



Scientia Professor Lovell is the Head of the Graduate School of Biomedical Engineering, working in the areas of bionics, telehealth, biosignal processing and physiological modelling. Nigel has authored 350+ journal papers and been awarded over \$106 million in research and development funding. Over his career he has mentored 80 PhD students and delivered more than 150 keynote presentations. He is a Fellow of seven learned academies throughout the world.

As the Director of Tyree IHealthE, Nigel is responsible for delivering on the Institute's vision, creating a transformational engine of discovery, innovation, and healthcare translation.

Professor Laura Poole-Warren AM

Deputy Director



Professor Poole-Warren AM leads a research group focused on improving interfaces between biomedical technologies and tissues. Laura is passionate about translational research and education and currently holds ARC Linkage grants with industry and NHMRC ideas grants in materials and technologies for bionic devices. She is currently on the executive committee of the Australian Brain Alliance, and co-lead of the Frontier Technology Clinical-Academic Group of

Maridulu Budyari Gumal (the Sydney Partnership for Health, Education, Research and Enterprise or SPHERE). She is a Fellow of four learned academies, the Royal Society of NSW and in January 2020 was honoured as a Member of the Order of Australia (AM) for service to Biomedical Engineering and Education.

As the Deputy Director of Tyree IHealthE, Laura is responsible for the development of translational research and education strategy, integrated with end-user engagement, as well as matters relating to governance and operational excellence. She also deputises for the Director on all matters.

Gemma Ashton

Chief Operating Officer



Gemma Ashton is a senior program-operations professional with extensive experience delivering strategic initiatives in the higher education sector. Her work has had a special focus on the translation of health research and education.

Prior to joining Tyree IHealthE, Gemma was the Program Manager at the Charles Perkins Centre, a multidisciplinary research centre committed to improving global health. In her role there, she led the implementation of strategies to support collaborative, solution-focused research, and managed partnerships with industry and government collaborators.

As Chief Operating Officer, Gemma is responsible for the financial and administrative operations of Tyree IHealthE and driving new opportunities for collaboration and commercialisation with external stakeholders.

Dr Ian Goon

Head of Strategy and Innovation



Dr Ian Goon is a strategy and innovation leader with a multi-disciplinary skillset developed through real-world experience in professional and academic environments. Prior to joining Tyree IHealthE, he worked at The Boston Consulting Group and subsequently co-founded a health technology start-up focused on building digital tools for healthcare research projects, and led the development and implementation of technology platforms for the South Asia Biobank (South Asia and UK) and the SG100K population health study in Singapore.

As Head of Strategy and Innovation, Ian is focused on implementing initiatives that will help identify unmet needs in the health system, as well as supporting the development and translation of the innovations that address these needs.

Jacqueline Wells

Senior Project Officer,
Communications and Marketing



Jacqueline Wells is a marketing and communications professional, with experience in developing digital communication strategies, stakeholder engagement programs, and managing large strategic events. With a background in social sciences and digital communications, Jacqueline is especially interested in the potential for better communication around health technology and innovation. She has over 10 years' experience working in higher education; prior to joining Tyree IHealthE she managed the Digital Health and Informatics Network (DHIN) at The University of Sydney, where she ran a virtual network for researchers in digital health.

As Senior Project Officer, Jacqueline supports outreach activities, stakeholder engagement initiatives, and manages the Tyree IHealthE communications channels.

Brice Lenfant

Project Manager



Brice Lenfant is an IT professional with extensive experience implementing, customising, and scaling up digital platforms in the education sector. With a background in Contract Law and IT Project Management,

Brice has held various positions in education, including as a lecturer in Mongolia, and a Student Hall Manager in New Zealand. Prior to joining Tyree IHealthE, he was a Digital Systems Specialist at the Catholic Education Office in Canberra where he rolled out cloud-based education software in 56 schools and six colleges across NSW and ACT.

As Project Manager, Brice manages technical projects and ensures the development of Tyree IHealthE clinical applications and solutions.

Tahlia Theodorou

Senior Project Officer, Health
Engineering



Tahlia Theodorou is a health education professional with experience in health services research and continuing medical education. Tahlia has a background in public health and implementation science, and has worked on multiple national healthcare projects including the implementation of the Australian Reproductive Genetic Carrier Screening study (also known as Mackenzie's Mission). Prior to joining Tyree IHealthE, Tahlia worked at the Royal Australasian College of Physicians (RACP) where she led various projects on digital health and cultural safety.

As Senior Project Officer, Tahlia is responsible for supporting the development of educational courses in health technology as well as contributing to broader Tyree IHealthE projects.

Tyree IHealthE committees

Steering Committee

The Tyree IHealthE Steering Committee has oversight of the Institute's operations and oversees the implementation of the Tyree IHealthE strategy. The Steering Committee meets four times a year.

Chair

Emeritus Professor Ian Webster AO
Director, Sir William Tyree Foundation

Steering Committee members

Lisa Altman

Director, Strategy, Innovation and Improvement,
South Eastern Sydney Local Health District

Professor Guangzhao Mao

Head of School, Chemical Engineering, Faculty
of Engineering

Professor Mark Parsons

Professor Medicine & Neurology, UNSW South
Western Sydney Clinical School, South Western
Sydney Local Health District

Professor Anushka Patel

Vice Principal Director and Chief Scientist, The
George Institute for Global Health

Professor Klaus Schindhelm

Graduate School of Biomedical Engineering,
Faculty of Engineering

Professor Adrienne Torda

Associate Dean, Education & Innovation, Faculty
of Medicine

Professor John Watson

Emeritus Professor, Faculty of Medicine

Knowledge Translation Advisory Committee

The Knowledge Translation Advisory Committee advises on the appropriate translation of clinical and biomedical engineering research to commercial technologies and/or clinical practice. The Knowledge Translation Advisory Committee meets twice a year.

Chair

Professor Chris Roberts AO
Visiting Professor, UNSW. Ex-CEO, Cochlear Ltd.

Knowledge Translation Advisory Committee members

Dr Gerard Gibbs

Senior Director, MedTech Horizons Program,
MTPConnect

Bronwyn Le Grice

Founder and Managing Director, ANDHealth

Dr George Margelis

Independent Chair, Aged Care Industry
Information Technology Council

Professor John Parker

Independent Consultant Medical Devices

Leanne Wells

Chief Executive Officer, Consumers Health
Forum of Australia

Connected Health



A/Prof Beena Ahmed receives her 2022 Brilliant Women in Digital Health Award from Elizabeth Koff AM, Managing Director of Telstra Health.

“TCC-NeoNatal is for premature babies who are having a hard time. It means they can go home after being discharged from the Royal Hospital for Women, and continue to be monitored, but with the TCC application. We can monitor their fluid ingestion, that their breathing is normal, that the colour of their skin is healthy - all things that make a difference in the quality of care.”

Brice Lenfant
Project Manager

The Connected Health pillar was the proving ground for Tyree IHealthE in its first year of operations. The centrepiece was the development, trial, and implementation of Tele-Clinical Care (TCC) solutions, led by Tyree IHealthE Director, Nigel Lovell, and Connected Health Medical Lead, A/Prof Sze-Yuan Ooi.

Over the last twelve months, the team have built on that very solid foundation. A significant milestone was the appointment of the Connected Health Technology Lead: A/Prof Beena Ahmed (School of Electrical Engineering and Telecommunications, UNSW), recently named by Telstra Health as one of their 2022 Brilliant Women in Digital Health. With leadership in place, and the urgent need for pandemic-related TCC solutions subsiding, the Connected Health team were in a position to clarify their priorities and their goals.

Ultimately, it was agreed that the pillar would focus its efforts on four areas:

- the acquisition of data using new or existing sensors that provide either novel or better clinical representation,
- further development of expertise in clinical interpretation of sensor data and predictive analytics,
- application of predictive analytics to build tools for clinical-decision support, and
- integration, sharing and fusion of data to enable the creation of innovative digital models for shared care.

TCC product development

The collaboration between the Connected Health team and South Eastern Sydney LHD on TCC projects continued in 2022. This builds on the enormous success of TCC-COVID which supported more than 6,000 patients from 2020 until 2022, providing them with at-home care while relieving pressure on over-burdened hospitals. Modules currently in implementation-mode include Gestational Diabetes Monitoring, Neonatal Care, and Heart Failure.

Microsoft Teams integration

In a close collaboration with Microsoft Australia, plans are well underway for Microsoft's video conferencing platform, Teams, to be integrated into TCC products. Initially, it will be embedded in the alert-system: if a patient's regularly monitored results trigger an alert, the clinical team will now have the option of checking in with them either by phone, text, or video call. In the longer term, it's envisaged that TCC will also support routine clinical appointments via the Teams platform. These virtual check-ups will further ease workloads and waiting times in busy hospitals, and make ongoing care more accessible for patients who struggle to attend in-person appointments including the elderly, people with disability and people with carer responsibilities. They will also be transformative in rural and remote health districts where patients often live hundreds of kilometres from their local hospital.

“The TeleClinical Care (TCC) application developed jointly between Tyree IHealthE and SESLHD chose Microsoft Azure as a secure, scalable cloud platform. It validated that at-risk patients can be safely monitored in the community using digital engagement tools, and played an important role in the response to community COVID during the height of the pandemic.

“However, this capability was not well integrated into LHD community care systems. A discussion with Microsoft led to pioneering work linking TCC with Microsoft Teams, which was already in widespread use at SESLHD. This close partnership has involved Tyree IHealthE and SESLHD working with Microsoft core engineering in the US to deliver a national first. Azure Communication Services (ACS) is leveraged to bring a unified video, notifications, and chat experience to the TCC application; where clinicians can join using their Teams client, and patients engage directly inside of the TCC iOS app. This means that both parties get to join the conversation using the platform they are already confident in, breaking down the barriers to entry for simpler virtual care.

“This is an important step in digitally enabling community care with virtual and remote monitoring capabilities, and ensuring that the digital experience is clean and modern for clinicians and patients alike.”

Dr. Simon Kos
Microsoft Australia



A/Prof Beena Ahmed

Connected Health Technology Lead
Tyree IHealthE

A/Prof Beena Ahmed, is the founder of Say66, a start-up that is revolutionising the way children with speech difficulties can access affordable and engaging speech therapy exercises. An international leader in artificial intelligence (AI) and signal processing, Beena was recognised for her outstanding achievements and contributions in digital health in the 2022 Telstra Health Brilliant Women in Digital Health Awards.



What is it that you love about engineering?

The thing about engineering is that you're actually building something that someone, at some point, will use to do something. Laptops, mobile phones - engineers' minds have collectively contributed to these products that we're now using. That has always fascinated me, and that's what I like about engineering as a profession. And then I chose signal processing as an area of expertise because it was more computational, and I enjoy that stuff! I enjoy how you can get information from sensors, from microphones, from accelerometers, from body signals, all of that, and then control different things based on those inputs.

How does health technology push us toward greater health equity?

It's a matter of providing opportunities to people who cannot access them at the moment. In every health care system, there are gaps. In Australia, we have one of the best health systems in the world, but it is still undeniably inequitable. The health care you get in different parts of Sydney varies. Technology allows us to connect people to the health care system via devices so they don't have to go to a clinic or a hospital.

That opens up enormous potential. It means we can monitor how somebody's health is progressing, and pre-empt problems. We know how they're tracking and so, before they get to the stage where they might need to be admitted to hospital, we've already delivered treatment to them. It's preventive health care, rather than what we have now, which is a reactive health care system.

What are you hoping to achieve at Tyree IHealthE?

I believe Tyree IHealthE can truly be a melting pot of skills and ideas and mindsets. There is interaction already between clinicians and engineers, but it's not as rich as it could or should be. Doctors realise just how much engineering they use in their daily lives: all the devices, all the technology. And engineers aren't going to be able to help unless we talk to doctors about those unmet needs. Both sides need each other - because none of us can improve health care in this country on our own.

Bionics and Bio-Robotics

In 2022, Professor Gary Housley was appointed as Medical Lead for the Bionics and Bio-robotics pillar, supporting IHealthE Deputy Director, Professor Laura Poole-Warren, who serves as the interim Technology Lead.

First steps for the pillar in 2022 included a landscape survey which allowed the team to identify bionics and bio-robotics capabilities within UNSW faculties, and to connect with clinical people looking to solve a relevant unmet need.

Informed by this preliminary work, the decision was made to focus efforts on developing capabilities in:

- the development of devices, materials and biomolecules,
- the development of preclinical models and evaluation, and
- functional data mapping and computational modelling.

As the year progressed, the team secured two permanent part-time roles in Embedded Electronics and Manufacturing Engineering, and put in place processes to help determine whether an unmet idea is likely to be feasible and sustainable, and therefore suitable for further support from the pillar.

The pillar already has numerous projects under way, including:

- flexible surgical robots for gastrointestinal cancer and cardiovascular disease treatments,
- novel materials for neural electrodes and other soft-tissue interfaces,
- advanced soft haptic interfaces for telemedicine,
- soft exoskeletons for rehabilitation and human augmentation,
- 3D engineered neural tissue models, and
- the Bionic array Directed Gene Electrotransfer (BaDGE®).



BaDGE

The underlying knowledge breakthrough of the Bionic array Directed Gene Electrotransfer or BaDGE® project began with Professor Gary Housley's work on the neural development of the cochlea. He studied the receptors that played a crucial role in establishing and maintaining synaptic connections between the sensory hair cells and the auditory neurons. From there grew an interest in developing the tools that would help control the expression of the genes responsible for those receptors.

Years of development and broad collaboration has led to the creation of a first-in-kind gene electrotransfer device which creates a focused-electric field to precisely steer naked DNA to target cells. This BaDGE device uses extremely low-intensity electric pulses to deliver DNA encoding genes for factors that stimulate rapid nerve repair. BaDGE is now in clinical trial to improve the hearing of patients receiving cochlear implants, where the resulting re-growth of the auditory nerve closes the gap with the cochlear implant array to improve hearing outcomes.

Compounding successes have encouraged the team to look into other applications for BaDGE. Early investigations suggest promising opportunities in the treatment of epilepsy and Parkinson's Disease. The technology is also proving effective for targeted delivery of genes to the eye, establishing the foundation for new non-viral DNA and RNA therapeutics to treat loss of vision.

"At Tyree IHealth E, we are working to migrate this technology into a broad electro-therapeutic platform. Now that we understand and can control the electric field focusing process, we've actually been able to modify the BaDGE® technology for safe delivery of a DNA or RNA solution into the brain. And with National Health and Medical Research Council (NHMRC) funding, we're collaborating with clinical scientists at the University of Tübingen in Germany to develop DNA molecules that will suppress the hyper-excitability of local neural circuits. So, the challenge is whether we can provide very precise expression of these therapeutic molecules to regulate neural circuit excitability of the brain, potentially to treat epilepsy."

Professor Gary Housley
Bionics and Bio-robotics Medical Lead

Professor Gary Housley

Bionics and Bio-robotics Medical Lead
Tyree IHealthE



Appointed Medical Lead of the Bionics and Bio-robotics pillar, Professor Gary Housley has spent decades exploring the neural development of the auditory senses and brain injury and repair processes. The Bionic array Directed Gene Electrotransfer (BaDGE®) is now a flagship project for Tyree IHealthE.

What fascinates you about hearing?

People don't realise it, but we only have 20,000 neurones in the ear. It's not a lot. And they don't regenerate. They are created in the first trimester, as a baby, and then they've got to last 100 years. About fifteen neurones go to each of the inner hair cells, where they form single synaptic puncta, like the finest little touch that you could imagine. So how do those neurones know that they've got to go to that one cell and then make that contact - and then that's it for life? And that's the challenge, holding on to those synapses across a lifetime.

How did your work collaboration with Cochlear get started?

When I first came to UNSW about 15 years ago, I'd been looking at the neural development of the cochlea. And the people at UNSW Knowledge Exchange set me up in a meeting with the Chief Scientist of Cochlear, Jim Patrick, and I showed him my nice images of some of the proteins that are important for controlling nerve growth in the cochlea and determining why some nerve fibres target particular cells - and I can still remember Jim saying, "Gary, look, this is fantastic fundamental science, but we make cochlear implants so people can hear better. How can we find some common ground here to improve the engineering of cochlear implants?" And so that was interesting because that was a conversation I hadn't had before - between industry, which is focussed on a challenge, and biomedical science, which had the tools.

You developed a method of bionic gene transfer therapy to regrow nerve fibres in the ear, using a very low-level electrical pulse. How has our relationship with Tyree IHealthE enhanced that work?

Well, the next challenge was how to get this into clinical trials. And that involved Cochlear coming on as an industry partner to make an implant that could have a tube inside it to deliver the DNA solution, and which would use the wiring that we had optimised to create this electrical field for steering the DNA. But we were a bit puzzled as to why it was working so well, why we were getting good gene transfer with just a very, very small charge. Normally, if you were using two separate electrodes in the tissue, it would take damaging amounts of electricity to do it. Why was this so efficient? And that's where the collaboration with Professor Nigel Lovell and the engineers came in. With their help, we learned that we were creating an electric lens, and that if you changed the configuration of the electrodes in the array you could control the field of delivery in a way that gene delivery has never been controlled before. And that's why this project has worked - because of the skills that the different members of the team bring to the party. That's the cross-disciplinary mix that makes all the difference here. Tyree IHealthE has established an ideal ecosystem across biomedical engineering and medical molecular engineering and neuroscience for refinement of the BaDGE platform and translation to promising gene therapy applications.



Image Analytics

Two key appointments were made at the end of 2021, paving the way for the 2022 development of the Image Analytics pillar. Professor Daniel Moses, already working as the Medical Director of Research Imaging at South Eastern Sydney LHD, was appointed Medical Lead. And Professor Erik Meijering, a Professor of Biomedical Imaging in the School of Computer Science and Engineering, was appointed Technology Lead, coming on board in March.

Together with Tyree IHealthE leadership, the new team members have agreed to develop expertise and capabilities in the following four areas:

- infrastructure, including hardware and software for data handling, data flow, exchange, and storage,
- algorithms, including developing artificial intelligence methods for automated medical image analysis
- analysis, including image feature extraction, quantitative measurement, and statistical analysis for clinical insight, and
- translation, transforming technologies from research to the clinic to support clinical decision making.

“Machine learning, deep learning in particular, needs lots of examples, lots of curated data. And radiologists are at the coalface every day. We could have the radiologists reporting on the scans, and then moving the data over to the software that then pipes it into the backend for the computing people. I spend my half my life trying to get hold of other researchers’ data and it sort of drives me a bit mad because it’s very manual. To automate that process would be very good.”

Professor Daniel Moses
Image Analytics Medical Lead

➤ Deep learning infrastructure pipeline

One idea flagged for further exploration is the development of a data pipeline, capable of feeding the data generated in the day-to-day analysis of images in the clinical environment, into the deep-learning systems being developed by researchers to support future innovation. Medical Lead, Professor Daniel Moses, imagines embedding software on every radiologist’s workstation, so that it can detect automatically the clinical and diagnostic information contained within an image and share it with the most appropriate research data set.

Professor Daniel Moses

Image Analytics Medical Lead
Tyree IHealthE



Professor Daniel Moses has been appointed the Medical Lead of the Image Analytics pillar. As someone with both clinical and computing expertise, he is especially well suited to support collaborations between clinicians and engineers.

What is it that drives your dual interests in radiology and image analytics?

I’ve always been interested in the physical sciences. When I was doing my combined science-medicine degree, I asked permission to do some physical sciences because I just loved them so much, so I did maths and physics. After I finished my degree I went straight into radiology, and I really enjoyed all the things that go along with that: the problem-solving part of looking at the images, the technical part of how the machines work. And then, later, I enrolled in a PhD in computer science. So, I consider myself very lucky. If you’re just a computer scientist, you don’t know that much about medical images. And if you are just a radiologist, you don’t know that much about computer science. As it is, I feel very fortunate that I understand both the limitations and the advantages and the insights that come along with both domains.

Why is image analysis such an important tool for health innovation?

One thing I like about images is that they provide a well-defined, quantitative description of something. In clinical medicine, when you see a patient and you’re trying to extract information, there’s a lot of noise. But with images, you’ve got a certain amount of information. Now, not all of that information is available to the human eye, and there’s lots of options for using computers to extract that ‘hidden’ information - and that can be used to help patients beyond what we can do routinely.

How does Image Analytics fit into the broader Tyree IHealthE mission?

I’ve been involved in a lot of image analysis research. Sometimes it’s a clinician trying to do something, sometimes it’s a computer scientist. And a lot of the time, they’re actually trying to do exactly the same thing – just reinventing the wheel over and over and over again. No one is capturing that work and harnessing it and bringing it all together to make it useful for the next person. I think that’s what we can do at IHealthE. This is an opportunity to centralise and pool that expertise and that data. That’s one of my ambitions - to capture that information with computer systems and allow other people to use it.

What value does Tyree IHealthE deliver to the innovation community?

I believe our value lies in two things. One is a concentration of expertise in things that are done repeatedly and needlessly reinvented by many researchers. The other is having the infrastructure, including computer systems, that can break down the barriers of getting the data from the clinical coalface to the researchers, and can capture and store the data in a very efficient way - not just the medical images, but all the metadata in the system.

Education

Australia has a number of very fine entrepreneurial programs, not least the University's own UNSW Founders. Typically, these focus on supporting emerging innovators to test their ideas and begin to master the wide range of skills they will need to transform their ideas into working products or services.

With its focus on health engineering, Tyree IHealthE takes a particularly robust and systematic approach to innovation, supported by the IHealthE innovation framework, which has been developed by drawing on global best practice methodologies for medical innovation. It also distinguishes itself by taking as its starting point not the idea, but the unmet need. It's a simple but significant shift in emphasis that promises to generate better solutions, and greater benefits for patients, clinicians and the health system.

Through its education agenda, Tyree IHealthE aims to embed an 'unmet need' mindset among staff and students, and to encourage innovators to align with the very structured translational pathway offered by the IHealthE innovation framework. The ultimate goal is to foster a generation of entrepreneurial thinkers, skilled in identifying problems, collaborating across disciplines, and developing fit-for-purpose solutions that are also commercially viable.



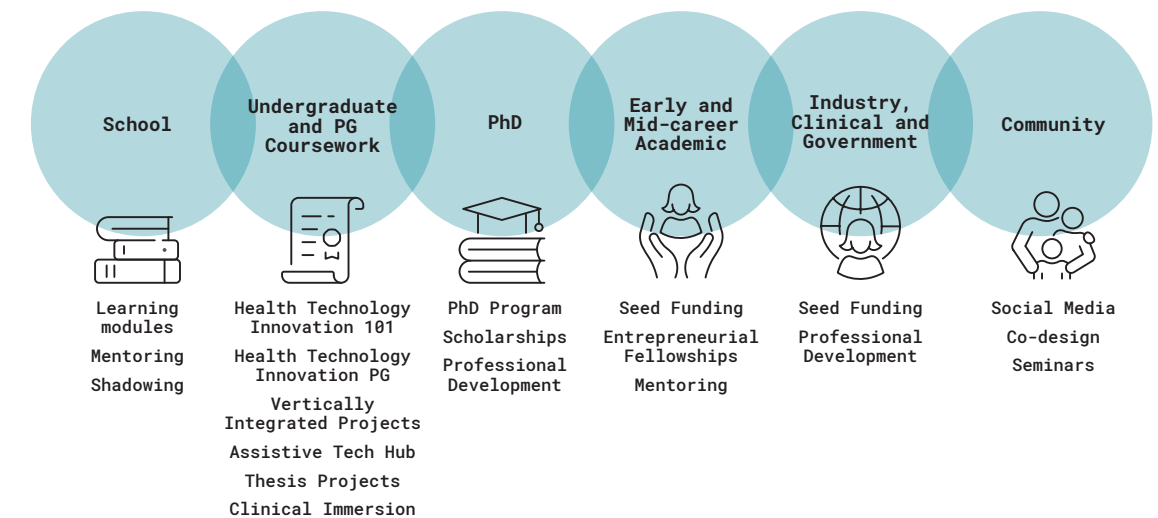
> Lifelong learning

Tyree IHealthE educational activities reach across the lifespan, from early mentoring opportunities for school students, through to professional development programs for industry and government.

In the hands of A/Prof Lauren Kark, the Assistive Tech Hub gained momentum in 2022. It provides undergraduate and postgraduate students with opportunities to partner with a client living with a disability for the purpose of co-designing and prototyping an assistive technology product.

The Tyree IHealthE PhD Top-Up Scholarship was launched in 2022, geared towards supporting outstanding research students whose work aligns with the Tyree IHealthE vision, and who already have PhD projects under way. The Top-Up Scholarships provide successful candidates with financial funding of up to \$15,000 per annum for up to three years, as well as access to experts and processes that can support the translation of research into real-world solutions.

The scholarship application process delivered a large number of high-quality applications; with the announcement of the three successful applicants to be made in February 2023. Tyree IHealthE looks forward to them joining the Tyree Scholar Network.



> Health Innovation 101

The Education Team concentrated their efforts on the development of an undergraduate course in Health Innovation. The course is due to be submitted for approval in early 2023 but the fundamentals have been established.

- The course will be enquiry-based. Students will have the opportunity to immerse themselves in a clinical setting to observe and then question clinicians with the aim of identifying unmet needs.
- Classroom work will be in a workshop format. Students will return to the classroom to workshop the issues identified, and the possible solutions. Teaching staff will scaffold and support this exploration, raising awareness of useful tools including relevant research or databases.
- Solutions will be collaborative. With clarity around the unmet need and a toolkit of strategic resources, students will then connect with their peers to collaborate on further investigations and development.

The course will first be implemented with an undergraduate cohort, but the intention is for individual units to be made available to postgrads and even industry professionals.

"What excites me most about the Assistive Tech Hub is its potential to transform the lives of our students, and the people who we work with. The course really is different because students aren't working with industry, they're working with individuals. They create a piece of technology that facilitates participation and, in the process, learn about themselves, about their potential, about their possible impact."

A/Prof Lauren Kark
Associate Head of School,
Biomedical Engineering
And Lead - Assistive Tech Hub

Dr Chun C Billy Chan

Graduate School of Biomedical Engineering

Educated in Hong Kong and the UK, Dr Chun C Billy Chan joined UNSW in 2022 as a Postdoctoral Fellow in the Graduate School of Biomedical Engineering (GSBmE). His skills in education design have been put to use in a review of the GSBmE curriculum, including the development of the new Health Innovation course.



What's different about the Health Innovation course?

A lot of courses focus on problem solving, but they don't break it down. What do you mean by 'problem solving'? I think one of the key characteristics of this course is that we give students an authentic scenario and then ask them to identify the problem. They have to dissect it, understand it—and then come up with a solution. It is about developing a solution, but the starting point is really to identify and understand the problem at hand.

What will the experience be like for students?

The focus is on hands-on practise. Instead of just sitting in the classroom, going to tutorials and lectures, we will immerse students in a real clinical environment so they have an understanding of what goes on in an authentic workplace. We want to develop what you could call the students' 'graduate qualities'; some people might call them 'soft skills' or 'transferable skills'. We will be looking at how students work together, their leadership skills. It's changing the whole learning dynamic from passive to active.

What will students come away with?

The course will develop their independent and critical-thinking skills, but more importantly, their skills in communication and collaboration. Most graduates, when they finish university, they can do a PowerPoint presentation and they can write a report. These things are basic and expected. In this course, students won't just be presenting to teachers. They will also be presenting to clinical partners, and answering their questions. Our students will learn how to deliver their knowledge to different audiences, in different contexts.

And what will be the benefits to industry?

We have been conducting a needs-analysis with stakeholders over the past six months - industry experts and young alumni who are recently graduated from the GSBmE or Biotech. In our focus groups there was a feeling that they would like graduates to have more experience in the workplace, to be job-ready. This course will give students that real experience, because they will be in the clinic, seeing what's happening.



Engagement

Collaboration is an essential element of innovation: between disciplines, between sectors, and even between individuals. For that reason, Tyree IHealthE devotes time and resources to the cultivation of a community interested in working together to identify the unmet needs of the Australian health system, and to meet those needs with technology-driven solutions.

This was the first year that Tyree IHealthE was able to pursue its outreach activities unimpeded by the social restrictions of the COVID-19 pandemic. Accordingly, engagement figures grew exponentially.



Membership

Tyree IHealthE began its membership drive in 2022 to make the technical and translational capabilities of the Institute available to a broad community of students, researchers and clinicians. Members have the opportunity to connect with like-minded innovators across all UNSW faculties as well as medical research institutes, local health districts, and a range of external partners. Depending on their interests, members can also take advantage of consultation and mentoring from leaders in biomedical research and translation; access to seed funding; and access to the IHealthE innovation framework. By the end of the year, membership had reached 114.



Newsletters

In 2022, Tyree IHealthE also began communicating with members, partners, and other stakeholders through a regular eNewsletter. IHealthE News shares updates on members, funding opportunities, and upcoming events. The subscriber base for the newsletter grew rapidly, doubling between June and November.



Twitter

Tyree IHealthE consolidated its presence on Twitter in 2022, doubling its followers in the space of 12 months. The Institute uses the channel to welcome new staff members, announce new partnerships, and keep the community informed about upcoming events and other opportunities to connect.



LinkedIn

The Tyree IHealthE LinkedIn page continues to see strong growth, with a year-on-year increase of almost 500 percent. LinkedIn has been used as a channel to promote events being held by the Institute and its partners, and to share behind-the-scenes insights from the team.



Events

A return to campus in 2022 gave Tyree IHealthE the opportunity to foster connections and support the IHealthE community through a range of in-person events.

Some were educational events, hosted collaboratively with partners. Ageing x Technology, held jointly with the UNSW Ageing Futures Institute, gave attendees an insight into new possibilities in technology-assisted ageing. A seminar on Navigating the Health System, co-hosted by Cicada Innovations and the NSW Health Commercialisation Training Program, was livestreamed at the Institute, with opportunities for those attending to network with colleagues during session breaks. And Professor Gary Housley from Tyree IHealthE was on hand to help launch the Bionics Challenge 2022, run by Bionics Queensland, which this year was focused on bionic supports for road accident trauma, disability and disease.

But it was the Tyree IHealthE morning teas that proved to be the most consistently successful community-builders. The regular events brought staff and students together in an informal and welcoming environment to hear from speakers including A/Prof Beena Ahmed and Prof Daniel Moses on building clean datasets to support the application of Artificial Intelligence and Machine Learning, and UNSW Founders' Dina Titkova on developing an entrepreneurial skillset.

Tyree IHealthE was also an active supporter of the events of its partners, including the annual 3-Minute Thesis competitions hosted by UNSW Engineering and the GSBmE, and conferences such as the Australasian Society for Biomaterials and Tissue Engineering's ASBTE 2022, and the 2022 International Nanomedicine Conference.

Dina Titkova

UNSW Founders

Dina Titkova is Scale-Up Program and Investment Manager at UNSW Founders, the University's highly regarded entrepreneurship program. Throughout 2022, she has been a critical collaborator, supporting the involvement of Dr Ian Goon as a mentor in this year's Health 10x accelerator program, and helping to raise awareness of Tyree IHealthE with the University's emerging innovators. Dina was a featured speaker at one of this year's Tyree IHealthE Morning Teas.



What makes Tyree IHealthE a natural partner for UNSW Founders?

We start at the same spot. We have the same objective: to facilitate the development and commercialisation of solutions that address unmet clinical needs. We complement each other along the product commercialisation journey. The Institute has the capabilities and the networks to put engineers and clinicians together to start developing solutions that address those unmet health needs, while UNSW Founders is strongest on the business side of things, providing entrepreneurs with education, access to funding, and networks to de-risk and accelerate their business growth.

What appeals to you about the Tyree IHealthE morning tea format?

It serves the very important purpose of raising awareness and building capability within our community. We need more people to be aware of the broad scope of capabilities and support available via a network of key stakeholders here on campus. I believe we have all the components of success – expertise, talent, facilities, networks; we just need to bring it all together to ensure smooth health innovation processes for all. All key stakeholders complement each other in a fantastic way, and that's how we can achieve impact. I think that's one of the most exciting takeaways of the morning teas.

What's ahead for Tyree IHealthE and UNSW Founders as partners and collaborators?

I feel like we've landed on a common vision to build the strongest health innovation platform in Australia. We're definitely stronger together.

Innovation Engine

Across all pillars and all outreach activities, Tyree IHealthE provides its community with the expertise and resources necessary to help translate needs-driven solutions into real-world innovations capable of transforming clinical practice and patient outcomes.

The IHealthE innovation framework and the Institute's presence in the Randwick Health Innovation Precinct (RHIP) are two of the most substantial elements of that translational support. The process that IHealthE has developed is based on the Boston CIMIT model. RHIP, meanwhile, affords members of the Tyree IHealthE community with both opportunities to connect with their peers, and workspaces in which to collaborate.

In addition to these fundamentals are a number of more targeted initiatives which gained ground in 2022.



> Consultations

Clinicians with the seed of a good idea are encouraged to get the conversation with Tyree IHealthE started by scheduling a confidential 'consultation' with a trained translation expert. During this informal conversation, the expert will run through a set list of questions to clarify and assess the thinking done to date. A written account of that meeting will be shared with the community member, and then the idea will be considered by an expert panel of scientists, clinicians and industry practitioners. Ideas assessed to have translation potential are connected to suitable resources and expertise. During 2022, clinicians and technologists from St Vincent's Hospital and The George Institute for Global Health participated in the pilot consultation program to interrogate their ideas and get advice on next steps.

> Professors of Practice

The Tyree IHealthE team has expanded in 2022 to include two Professors of Practice: Dr Peter Spencer and another appointment to be confirmed in 2023. The concept is borrowed from a business school context in which industry veterans are appointed to academic posts to give staff and students the benefit of their real-world experience, and to deepen the ties between research and industry. Within Tyree IHealthE, Professors of Practice are key enablers, exposing community members to the realities of translation and commercialisation, and guiding them through a multi-faceted innovation process.

> Functional briefs for Precinct spaces

The Randwick Health Innovation Precinct will provide the Tyree IHealthE community with opportunities to engage directly with clinicians in a clinical environment. Plans for the structure and fitout of the buildings that will ultimately house Tyree IHealthE, the Health Translation Hub and the Integrated Acute Services Building, are in the process of being finalised. Tyree IHealthE has been in discussion with partners in recent months to ensure that the developers of the Precinct are working to briefs that will deliver spaces purpose-built for clinical engagement and collaboration. To date, these include discrete spaces for co-design, ideation, prototyping and data visualisation.

Dr Peter Spencer

Tyree IHealthE Professor of Practice



Dr Peter Spencer has been part of the Australian healthcare innovation community for more than 35 years. He has led product development in multinationals and start-ups, mentored young innovators in a range of entrepreneurship accelerators; and was a co-founder of AusMedtech, the national industry group for the Australian medical device sector. He likens his role as Tyree IHealthE Professor of Practice to that of an orchestra conductor, bringing together all the necessary people and parts of the innovation process to achieve success.

Where does your expertise in translation and innovation come from?

I started life with degrees in science and chemical engineering. After completing a biomedical engineering PhD, my first job had me working in a hospital in Germany for a year. For a technical person interested in innovation, that connection into the health care system is important. Obviously, clinicians get it, but if you're a non-clinical technical person, then being immersed in the health care system, meeting patients, getting to see firsthand what the issues are - I think that's really critical. If the problem you're solving isn't a priority for the health system, then it's very difficult to progress it, even if it is solving a clinical problem. So that was one early learning: that there was a lot more to successful commercial innovation than just solving a clinical problem.

What are some of the common stumbling blocks for Australian health tech innovators?

Well, if you think about a clinician coming up with a solution to a problem – that solution's got to work, but then it's also got to be able to sustain an international business. I'd say that's one of the hardest things. Australia is such a small market, about 2 percent of the global market. So you have to be thinking early on: Will this work in America? Will this work in Europe? Will it work in Japan? Another big challenge is there's probably in the order of 15 professions involved in developing a medical product. There are people who are expert in the laboratory

and clinical studies, people who are expert in regulatory approvals, people who handle the reimbursement models, the manufacturing, the marketing. So the innovator in the public system, whether they're a clinical or a non-clinical academic, they're making commercially relevant domain project decisions every day, often without even knowing it.

What value do you think the Professor of Practise brings to the process?

The Professor of Practise is like the conductor of an orchestra, or a 'facilitator' to use accelerator terminology. You're there to help coach and mentor and manage the process, and to educate people about the inputs that are needed at different points of the process – and often they're nothing to do with the technology. It's enabling people to understand all the other 15 areas of expertise they need to be thinking about, and hopefully helping to bring in that expertise, if and when it's needed.

And what is Tyree IHealthE contributing to the innovation community?

The successful ideas, more often than not, come from clinical people because they have a personal experience of something bugging them. They have that domain expertise. And so IHealthE is getting it right by focussing on finding the clinicians with ideas, and then matching them up with people who can help on the technical side, people who can develop solutions for the problems.



Ecosystem

By necessity, the systems and agencies that support the nation's health tech innovators are diverse and widespread. There are those that focus specifically on areas such as global health, digital health, or medical devices. And there are those that home in on segments of the innovation process: the accelerators, incubators, and venture capitalists.

Tyree IHealthE is quite clear on where it sits within this broad ecosystem. It has devoted its resources to supporting innovators on their journey from identification of the unmet clinical need, through to development of an industry-ready product. And its expertise is channelled into the pillars of Connected Health, Bionics and Bio-robotics, and Image Analytics.

However, it works, pragmatically and enthusiastically, with partners to ensure wholistic support for individual innovators, and for the community at large. Key partners include UNSW Founders, The George Institute, UNSW Medicine, Cicada Innovation, UNSW Business, Knowledge Exchange, and the Australian Clinical Entrepreneurs Program.

Throughout the year, Tyree IHealthE has continued to expand and deepen those relationships through a range of activities.



Dr Katja Beitat

Cicada Innovations

Dr Katja Beitat made the bold leap to health tech innovation with the 2015 launch of Clinivid, an intuitive information-sharing platform for clinicians. These days she is Head of Health Tech at national deep tech incubator Cicada Innovations, and works closely with Tyree IHealthE to foster the development of local innovators.



"Ian Goon has been mentoring us now for about three months, getting us to think more about that unmet need, as well as the channels to market, and the financials. That's the big point of difference with Tyree IHealthE: the idea of working with people on the ground. Customer discovery is very important to them, and us. It allows us to develop solutions that can translate into practice faster - there's already a lock, you just need to make the key, rather than making the key and looking for a lock. Tyree IHealthE also uses their networks and the infrastructure of the university as a whole to make the linkages between academics, start-ups and the hospital system. Being connected to a wider global ecosystem is fantastic."

Dr Anthony Sunjaya
BantingMed Pty Ltd

> Health 10x

Tyree IHealthE had a direct presence in this year's Health 10x accelerator program, with Dr Ian Goon serving as a mentor to BantingMed, a team developing an app-based diabetes remission program. Delivered by UNSW Founders in partnership with The George Institute for Global Health, Health 10x has a particular focus on developing affordable and scalable solutions to some of the most pressing unmet medical needs, globally. With the benefit of Ian's guidance and support, BantingMed was one of only a handful of finalists nominated in the Best New Idea category of the 2022 Founders Awards.

> Hack the Pandemic

Co-hosted by UNSW Founders and the UNSW Faculty of Medicine and Health, Hack the Pandemic was a rapid problem-solving event targeting innovative and sustainable solutions to improve quality of life for people impacted by COVID-19. The event ran over a long weekend in October, with first place being awarded to The Bundle, a team promoting an AI-backed smart triage system to reduce waiting times in long-Covid clinics. Again, Dr Ian Goon served as a mentor, alongside a number of other key allies among Tyree IHealthE's partners.

> Cross-promotion of partner events

Tyree IHealthE has actively promoted and participated in events run by partners throughout 2022. These include the Commercialisation Training Program run by NSW Health, and the Australian Clinical Entrepreneurs Program. In particular, Tyree IHealthE has formed a strategic partnership with Cicada Innovations, running localised programs and events to support Cicada's national deep tech agenda.

Even before you launched your own business, you were working in health as a communication specialist. What draws you to the health sector?

I started working in health when I first moved to Australia, 17 years ago, and with that came a curiosity for the health industry and the health sector. For me, the interesting part of it is, health never lets you go because it's so multi-faceted, so complex. There are so many challenges that need to be solved. So, for a mind that is curious and constantly in problem-identifying and problem-solving mode, it was and continues to be fertile ground.

What stands in the way of a smart health tech idea becoming a successful product?

Technology is one tool for solving problems in health, but it's not your only tool. One of the problems I see with this love that some people have for technology is that they often don't consider the bigger context. They don't understand the bigger system they're hoping to operate within. And if you don't understand the system, you can't change it. You really have to work with it. We can make tech adoption more successful for innovators if we foster those stakeholder contacts from an early stage.

What can Cicada Innovations and Tyree IHealthE achieve together?

What Cicada and Tyree IHealthE have in common is that we believe the challenges will be solved, maybe by the current players, but equally by new ideas that come from the outside. I think that's the common goal. Cicada Innovations is a deep tech incubator with a big support network across Australia and globally, but Tyree IHealthE has a razor-sharp focus on building their local community. And we really see the value in that community connection. So, for example, we had a local group of innovators, curated by Tyree IHealthE, that linked in to our virtual commercialisation training, and afterwards the Tyree IHealthE worked with them on the implementation of what they'd learned. I think that is where the magic happens, because you have this seamless support for our innovators across the health sector, different universities, medical research institutes and independent founders with the NSW Health Commercialisation Training program that is free and accessible to anyone in the state. We can help them with their fundamental needs – the regulatory pathways, the intellectual property issues – and then they can get support from Tyree IHealthE to implement their learnings locally, every single day.

For more information, please contact:

Gemma Ashton

Chief Operating Officer

Tyree Foundation Institute of Health Engineering (Tyree IHealthE)

Faculty of Engineering

UNSW Sydney

P: +61 9348 0473

E: g.ashton@unsw.edu.au

Website: <https://www.ihealthe.unsw.edu.au/>

Email: IHealthE@unsw.edu.au

Twitter: @TyreeIHealthE

LinkedIn: UNSW Tyree Foundation Institute of Health Engineering