

## **Point of Care Technologies**

### **PhD opportunities in Wellington New Zealand**

Excellent candidates are invited to apply for fully-funded PhD projects hosted by the Wellington Medical Technology Group - a team of physiologists, physicists, biomedical engineers, and clinicians developing point of care technology solutions for critical care medicine.

### **Description of available projects**

1. **Portable NMR sensor technologies.** Oxygen deprivation to the brain leading to irreversible brain injury is a devastating condition that is both common and hard to treat. Central to the clinical problem is that brain tissue has minimal ability to regenerate, so unless tissue re-oxygenation occurs rapidly, death or permanent disability ensues. Current technologies for detecting brain tissue hypoxia have limited utility as they are either non-specific, highly invasive, or are financially prohibitive.

We propose a portable solution for monitoring brain tissue using specially designed nuclear magnetic resonance (NMR) sensors. The aim of this project is to translate our technology into a ubiquitous point of care medical device that will enable precision healthcare by making physiological measurements available without the need for sophisticated imaging facilities or invasive interventions. With hypoxic brain injury being the world's second leading cause of mortality, there is a clear need for accessible technologies that can support clinical decision making at the point of care.

**Profile of applicants.** Students applying for this position should have a background in a physiological, engineering, or physical science. Candidates with a physiological background should ideally have experience working with animal models of cerebrovascular disease. Potential applicants with an engineering or physics background should ideally have experience in biomedical signal processing, NMR physics, MRI imaging, and NMR hardware design. The successful PhD candidate will need to meet the requirements for enrolment in the University of Otago PhD programme (<http://www.otago.ac.nz/study/phd/otago009275.html>) in New Zealand.

The successful applicant will be required to undertake full time study for the duration of their degree. Candidates will be based either at the University of Otago's Centre for Translational Physiology in Wellington, or the MacDiarmid Institute for Advanced Materials and Nanotechnology at Victoria University of Wellington depending on their background experience.

2. **Precision Health in Intensive Care (PHysIC project).** New Zealand intensive care units generate terabytes of data daily during routine care delivery. This includes multi-channel physiological waveform data sampled hundreds of times per second, vital sign time series updated each second or minute, alarms and alerts generated by multiple devices as well as laboratory results, imaging results, records of medication and fluid administration, and clinical notes. Currently, the data from these existing sources are not routinely aggregated, and none of the real-time data are subject to detailed analysis to generate clinical evidence.

The PHysIC project aims to combine clinical and streaming physiologic data collected from intensive care patients to be mined by clinicians and scientists for deep information. Successful candidates will work with our team of data scientists to develop predictive algorithms and decision support tools that will help hospitals reduce the incidence of complications, unnecessary treatments, adverse drug reactions, and length of stay in intensive care units, which cost on average \$800-1000/patient/day.

**Profile of applicants.** Students applying for this position should have a background in critical care medicine (Medical degree with clinical training in intensive care or cardiothoracic surgery) or a background in the engineering or computer sciences. Applicants with a medical background should be prepared to work with scientists who specialise in systems physiology and data analysis. Applicants with an engineering or computer science background should ideally have experience in some of following areas: applied statistics, biomedical signal processing, computational modelling of physiological processes, machine learning.

This is a collaborative project so all candidates will be expected to work with intensive care physicians, IT professionals, medical device manufacturers, commercial software developers, and our international collaborators at the Massachusetts Institute of Technology. The successful PhD candidate will need to meet the requirements for enrolment in the University of Otago PhD programme (<http://www.otago.ac.nz/study/phd/otago009275.html>) in New Zealand. The successful applicant will be required to undertake full time study for the duration of their degree. Candidates will be based at the University of Otago's Centre for Translational Physiology in Wellington.

### **Application process**

Applications should include a CV, copies of published academic papers and academic transcripts, a brief (1 page maximum) statement of research experience, and the names of at least two people who can provide professional letters of reference. These positions offer candidates the opportunity to work in a translational environment where physiology and technology have a direct impact on human health.

For more information, please contact:  
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