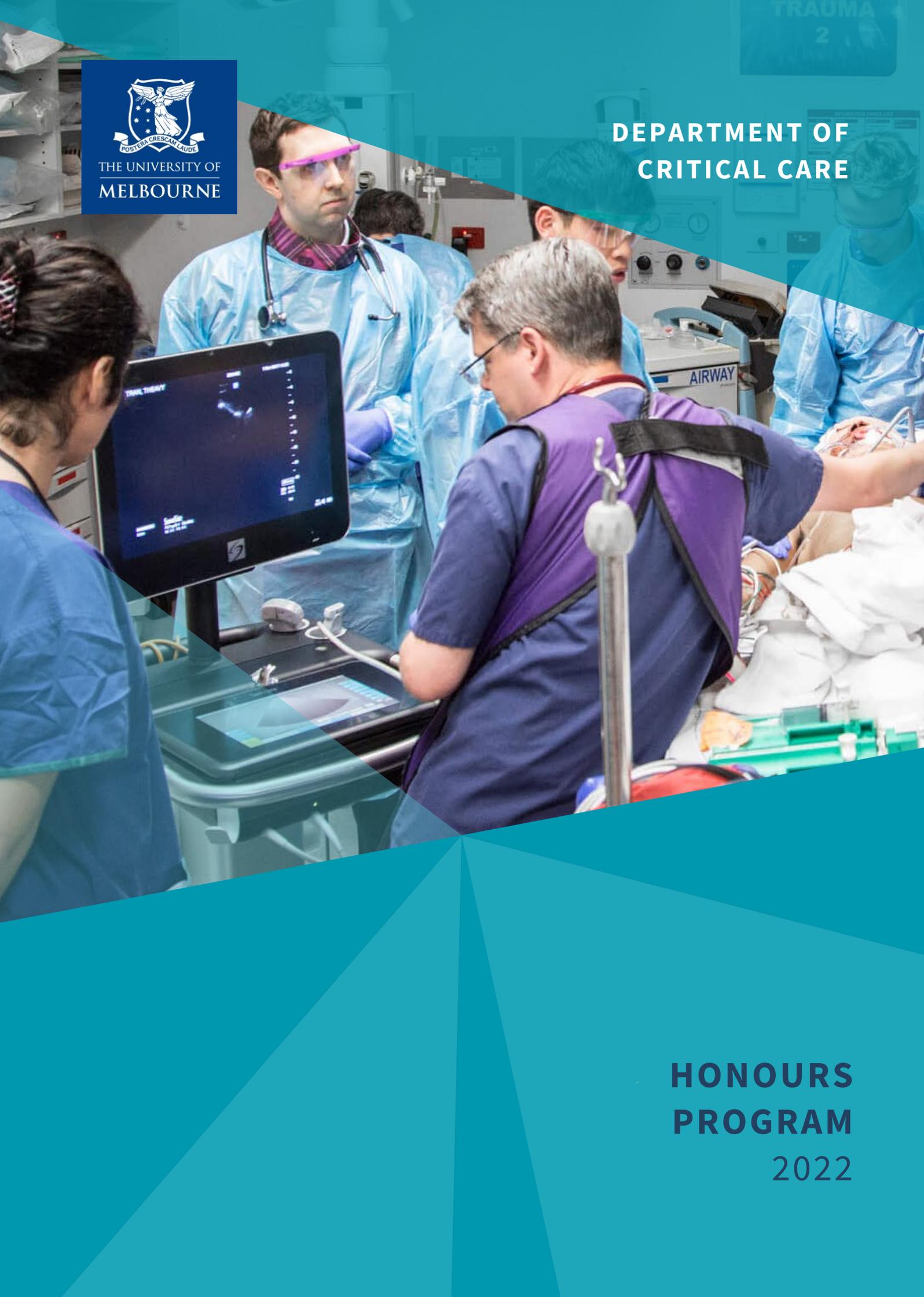




THE UNIVERSITY OF
MELBOURNE

DEPARTMENT OF CRITICAL CARE



**HONOURS
PROGRAM**
2022

WELCOME



Welcome to the Department of Critical Care (DoCC) within the Melbourne Medical School. DoCC is one of the few University departments anywhere in the world that embraces all three critical care specialties: anaesthesia, emergency medicine, and intensive care medicine. DoCC covers over 20 hospitals affiliated with the University.

The need for DoCC stems from the unfortunate fact that many high-risk, deteriorating, and critically ill patients have poor outcomes. Collectively these patients have a broad range of problems from trauma to children with sepsis to mental health to severe co-morbidity before surgery to complex pain syndromes; to name a few. Both preventing and managing health care crises is a key common feature of the three critical care specialties.

DoCC was established in January 2021 and in 2022 we are very excited to be offering a dedicated critical care honours specialisation for the first time. The DoCC Honours Program is designed to provide research projects directly relevant to acute human disease and treatment of the high-risk, deteriorating, and critically ill patient.

We hope to see you at our information session on Tuesday 31st August 2021, where you will have the opportunity to hear from potential supervisors, current students and ask questions about the projects on offer.

We believe critical care is the future of hospital medicine and regardless of the project you choose, you will be pursuing an important and challenging area of research with direct, patient-focussed outcomes, alongside a world-renowned community of researchers.

I look forward to meeting you in the Department next year.



Professor David Story

Head, Department of Critical Care
Chair of Anaesthesia
Melbourne Medical School,
The University of Melbourne

THE CRITICAL CARE HONOURS PROGRAM

OVERVIEW

The Department of Critical Care Honours Program is designed to offer research projects directly relevant to acute human disease and treatment of the high-risk, deteriorating and critical ill patient.

Commencing in 2022, projects offered are from leading clinician scientists in the areas of anaesthesia, emergency medicine and intensive care medicine, across a range of University-affiliated hospital sites.

Our supervisors have prominent national or international profiles with outstanding track records of exceptional mentorship and supervision.



Associate Professor Adam Deane

Honours Coordinator, Department of Critical Care
Senior Staff Specialist, Head of Intensive Care Unit Research, and Deputy Director Intensive Care Unit
Royal Melbourne Hospital

RESEARCH PROJECTS & SUPERVISION

Research projects offered by individual research groups within the department and have been overseen by the Research Committee.

All projects address fundamental scientific questions or key questions in improving care for high-risk, deteriorating or critically ill patients.

Supervisors have extensive experience in research and graduate supervision and student assessment.

Two supervisors are assigned to every student to ensure the best quality student experience.

SEMINAR PROGRAM

A comprehensive seminar program complements the research project, comprising weekly presentations from world leading critical care researchers.

Each seminar focusses on a key area of critical care research. The aim is to provide students with a comprehensive knowledge base, using a pragmatic approach, that can be applied to both research and clinical care.

Lectures cover research methodology and the latest translational research across the three key critical care disciplines of anaesthesia, emergency medicine and intensive care medicine, with topics ranging from clinical trial design, meta analysis, sepsis, delirium and perioperative risk through to toxicology, substance abuse and recreational drug related behaviour.

MEET SOME OF OUR SUPERVISORS



Professor Kate Leslie AO FAHMS leads the vibrant clinical research program in the Department of Anaesthesia and Pain Medicine at the Royal Melbourne Hospital.

She is a member of the Australian and New Zealand College of Anaesthetists (ANZCA) Clinical Trials Network (CTN) Executive and is currently a chief investigator of the Balanced, PADDI, ROCKet, Chewy and LOLIPOP randomised controlled trials.

Professor Leslie and her colleagues are experienced and supportive Honours supervisors and will offer interesting and achievable projects in anaesthesia and pain medicine that will include exposure to patients and perioperative care.



Associate Professor Kimberley Haines (PhD, BHSc (Physiotherapy)) is the Physiotherapy Research Lead and Critical Care Physiotherapist at Western Health and Clinical Associate Professor, Department of Critical Care.

Her research has largely focused on recovery following critical illness – to measure, predict, and improve patient and caregiver outcomes. More recently Associate Professor Haines has led some of the first co-designed studies in critical care - a co-designed critical care recovery program that is currently being testing via a virtual platform.

She has also led large, international qualitative studies for the Society of Critical Care Medicine evaluating the implementation of ICU recovery programs, and describing patient and caregiver experiences of ICU survivorship.

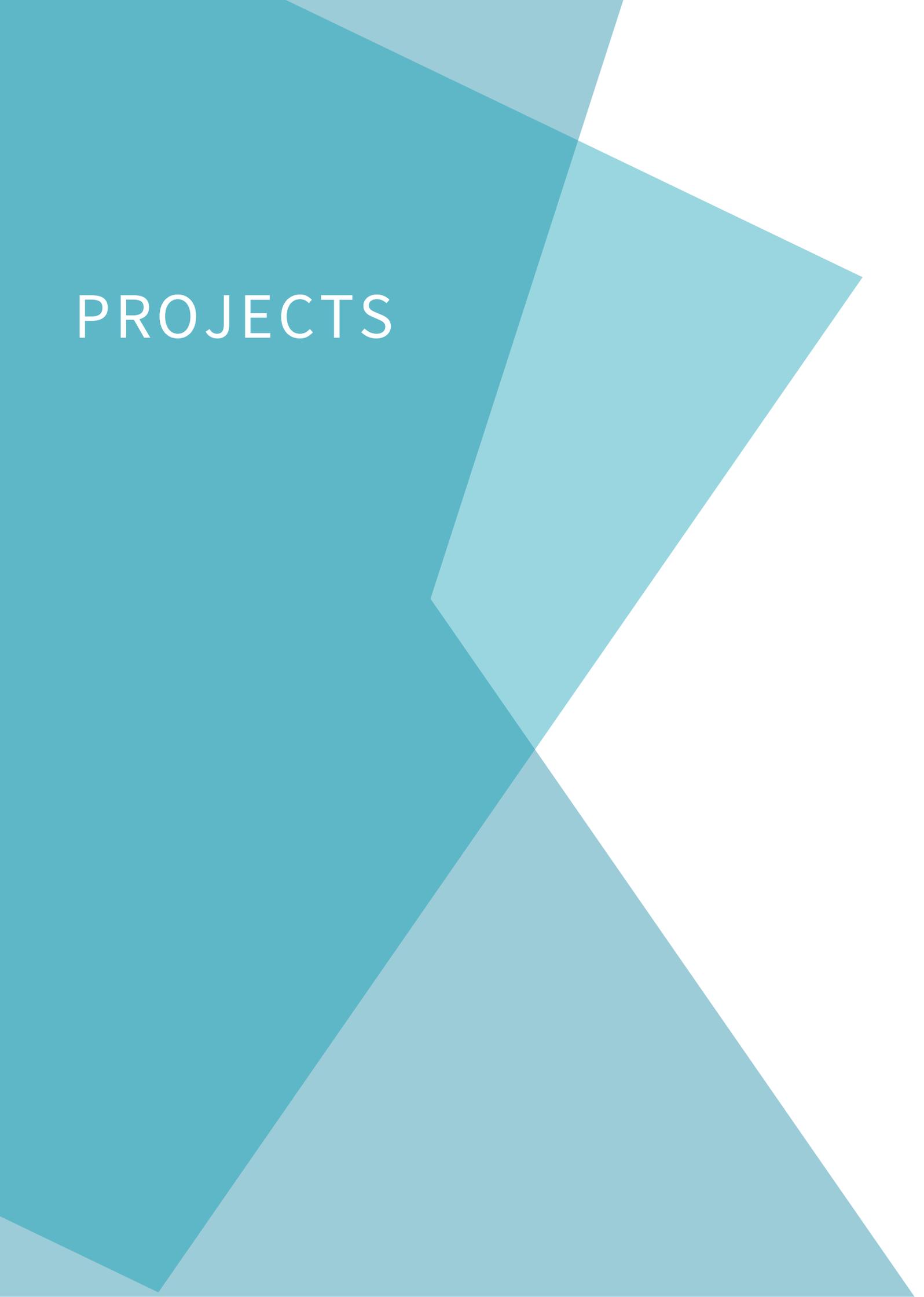
Associate Professor Haines has supervisory experience (including in medicine), and currently supervises 2 PhD and 2 Masters students, and several clinician-researchers.



Dr Yasmine Ali Abdelhamid (MBBS, PhD, FRACP, FCICM) is a Specialist Intensivist at The Royal Melbourne Hospital and Honorary Senior Clinical Fellow at the Department of Critical Care, University of Melbourne.

Dr Ali Abdelhamid's research interests include glycaemia, nutrition and metabolism in critical illness; muscle physiology and critical illness weakness; reducing morbidity after traumatic brain injury and multitrauma; and optimising follow-up care and long-term outcomes in patients following critical illness. She has specific expertise in complex physiological studies of critical illness, clinical trial design, and long-term functional outcome assessment in survivors of critical illness. She has experience in supervising Honours students, as well as medical students undertaking research projects.

Dr Ali Abdelhamid's research program receives support from research nurses, a research scientist and study manager with expertise in electronic medical records – who will all be able to assist the successful applicant/s.



PROJECTS

Presentations to the emergency department post admission with COVID-19

Contact: **Associate Professor Anselm Wong**

Email: **Anselm.WONG@austin.org.au**

Co-supervisors: **Dr Joe Rotella, Professor George Braitberg AM OStJ**

Location: **Emergency Department, Austin Health**

This project will investigate the number and types of presentations to the Austin Emergency Department of patients previously admitted with COVID-19 to Austin Health.

The student will investigate the symptoms, diagnoses, management and disposition of these patients and compare this with other reports of “long COVID”.

This will be a retrospective chart review of an electronic database. This project is suited for those beginning to perform research and is an opportunity to lead this novel research.

In addition, flexibility is offered with remote learning.

Postoperative nausea and vomiting

Contact: **Professor Kate Leslie**

Email: kate.leslie@mh.org.au

Co-supervisor: **Associate Professor Jai Darvall**

Location: **Department of Anaesthesia and Pain Medicine,
Royal Melbourne Hospital**

The Chewy Trial is an ongoing multicentre randomised controlled trial of chewing gum or ondansetron (standard drug treatment) to treat postoperative nausea and vomiting. This trial is recruiting 1200 women undergoing surgery at 16 sites internationally.

Our Honours student will recruit patients and collect data for Chewy; review the literature on postoperative nausea and vomiting and use Chewy data to investigate the impact of preoperative and intraoperative risk factors on postoperative nausea and vomiting.

Our supportive team will provide training in research methods, data analysis and thesis preparation.

More information: [The Chewy Trial](#)

Quality of recovery after general anaesthesia

Contact: **Associate Professor Jai Darvall**

Email: jai.darvall@mh.org.au

Co-supervisor: **Professor Kate Leslie**

Location: **Department of Anaesthesia and Pain Medicine,
Royal Melbourne Hospital**

The Chewy Trial is an ongoing multicentre randomised controlled trial of chewing gum or ondansetron (standard drug treatment) to treat postoperative nausea and vomiting (PONV). This trial is recruiting 1200 women undergoing surgery at 16 sites internationally.

Our Honours student will recruit patients and collect data for Chewy; review the literature on patient-reported quality of recovery scores and use Chewy data to investigate the risk factors for poor quality of recovery.

Our supportive team will provide training in research methods, data analysis and thesis preparation.

More information: [The Chewy Trial](#)

Improving transitions of care from ICU to and from primary care

Contact: **Associate Professor Kimberley Haines**

Email: kimberley.haines@wh.org.au

Co-supervisor: **Dr Yasmine Ale Abdelhamid**

Location: **Departments of Physiotherapy and Intensive Care, Anaesthesia,
Pain & Perioperative Medicine, Western Health and others**

The INTEGRATE Study, is being conducted in partnership with General Practitioners (UoM), Melbourne Health, Austin Health, and Western Health (three UoM-affiliated hospitals).

This qualitative study is investigating how to improve the transitions of care from ICU to and primary care from the perspectives of patients, carers, GPs, and ICU consultants. Data has been collected for this study.

The Honours student assist with data analysis and to contribute to identifying from the data, a new model of care to de-centralise post-ICU care, from major metropolitan health services (where in-person attendance is a major barrier to access) to primary care to optimise this existing infrastructure.

ICU-RESOLVE-Digital study: patient reported outcomes

Contact: **Associate Professor Kimberley Haines**

Email: kimberley.haines@wh.org.au

Co-supervisor: **Dr Yasmine Ale Abdelhamid**

Location: **Department of Physiotherapy and Intensive Care,
Anaesthesia, Pain & Perioperative Medicine, Western Health**

A nested study to measure novel patient reported outcomes within the ICU-RESOLVE-Digital study, being conducted at Western Health and Melbourne Health.

This is a pilot randomised controlled trial of a co-designed peer support group for ICU survivors delivered via telehealth, which has two advantages: a co-designed patient-led intervention and the ability to improve access for our most vulnerable and disadvantaged patients.

The Honours student will recruit patients, collect and analyse data as part of a supportive research team.

Long-term mortality and disability outcomes for intensive care survivors

Contact: **Associate Professor Kimberley Haines**

Email: kimberley.haines@wh.org.au

Co-supervisor: **tba**

Location: **Department of Physiotherapy and Intensive Care, Anaesthesia, Pain & Perioperative Medicine, Western Health**

This project is looking at the factors affecting recovery following critical illness.

How do we measure, predict, and improve patient and caregiver outcomes?

This project involves contributing to systematic reviews investigating topics such as long-term mortality and disability outcomes for intensive care survivors or the prevalence, risk factors, and trajectory of psychosocial morbidity in informal caregivers of critical care survivors.

Non-invasive monitoring of cardiac output by the Capnodynamic method in cardiac surgery and liver transplantation

Contact: **Professor Philip Peyton**

Email: **Phil.PEYTON@austin.org.au**

Co-supervisor: **tba**

Location: **Department of Anaesthesia, Austin Health**

Simple, reliable, non-invasive means of monitoring cardiac output has been described as the “Holy Grail” of patient monitoring. Continuous monitoring of cardiac output is still not performed routinely during anaesthesia and critical care. In the past this has been because of the absence of convenient, safe and non-invasive technologies. Newer minimally invasive techniques, operating via stand alone peripheral devices, have become available, but add expense and complexity to the conduct of anaesthesia monitoring, and have not become widely popular.

This project is validating a method for the continuous automated measurement of cardiac output during general anaesthesia, based upon measured elimination of carbon dioxide by the lungs. It is entirely non-invasive and “hands-free” and permits continuous monitoring of cardiac output on a breath-by-breath basis. It is suitable for routine use in any ventilated patient, and is able to be fully and seamlessly integrated into the anaesthesia delivery platform, using hardware which is present as standard equipment on a modern anaesthetic workstation. The method is being implemented by researchers at Maquet Critical Care (Getinge, Solna, Sweden) to be embedded in their Flow-i anaesthetic machine.

The proposed study will measure its accuracy and precision of measurement of cardiac output in comparison to right heart thermodilution via a pulmonary artery catheter (PAC) in 50 patients undergoing cardiac surgery or liver transplantation, who are routinely cannulated with a PAC as part of standard clinical management for their surgery. Simultaneous comparison with other widely used minimally-invasive devices (the Flo-Trac Vigileo, Edwards Lifesciences, USA) will also be made.

Complete cast vs Charnley splint for wrist reduction in the emergency department: randomised controlled trial

Contact: **Dr Sanneil Mathias**

Email: **SMathias@bendigohealth.org.au**

Co-supervisor: **tba**

Location: **Emergency Department, Bendigo Health**

This study is based at Bendigo Hospital and aims to investigate the difference in outcomes for full plaster of paris cast application compared with a charnley three-quarter dorsal backslab splint for distal radius and forearm fractures requiring reduction in the emergency department.

The student will be involved in collecting and analysing patient data to help assess rate of adverse outcome or complication (i.e. loss of fracture position, number of plaster cast changes required for either a cast that is too tight or too loose).

This project would suit someone who could attend Bendigo Hospital and some classes in Parkville. Note, travel and accommodation are not provided.

Outcomes of patients referred but not admitted to ICU

Contact: **Dr Matthew Durie**

Co-supervisor: **tba**

Email: **Matthew.Durie@mh.org.au**

Location: **Intensive Care Department, Royal Melbourne Hospital**

Many patients are referred for intensive care unit (ICU) admission but ultimately not admitted.

The reasons for non-admission are complex, but many of these patients subsequently deteriorate or die in hospital.

Between 2017 and 2020 the Royal Melbourne Hospital ICU prospectively collected data on over 6,000 referrals for ICU support (including medical, surgical and trauma patients), of whom approximately 40% were not admitted.

This large dataset offers a unique opportunity to explore reasons for why patients are not admitted to ICU and identify how mortality and morbidity can be reduced for these patients.

Utilising data from networked glucose meters to study glycaemic control in Intensive Care Unit (ICU) survivors following transition to the hospital ward

Contact: **Dr Yasmine Ali Abdelhamid**

Email: **Yasmine.Aliabdelhamid@mh.org.au**

Co-supervisor: **Associate Professor Adam Deane**

Location: **Intensive Care Department, Royal Melbourne Hospital**

Blood glucose is closely monitored and tightly controlled with insulin infusions in the ICU. However, the intensity of blood glucose monitoring and control is reduced when patients are discharged to the hospital ward. This increases the risk of dangerous hypoglycaemia, hyperglycaemia and glycaemic variability for patients.

This retrospective cohort study will utilise data from networked glucose meters to study glycaemic control in ICU survivors following transition to the hospital ward to understand how patients are cared for after ICU.

The Honours student will work within a supportive research team to collect and analyse data and a component of work will be conducted with the Royal Melbourne Hospital Department of Endocrinology.

Continuous glucose monitoring in the Intensive Care Unit (ICU)

Contact: **Dr Yasmine Ali Abdelhamid**

Email: **Yasmine.Aliabdelhamid@mh.org.au**

Co-supervisor: **Associate Professor Adam Deane**

Location: **Intensive Care Department, Royal Melbourne Hospital**

In order to avoid dangerous hypoglycaemia or hyperglycaemia, blood glucose is frequently checked in the ICU using blood collected from arterial lines or finger prick. This prospective cohort study of continuous glucose monitoring technology (small sensors inserted under the skin) will evaluate whether this technology is useful in the Intensive Care Unit (ICU).

The student will work within a team to recruit participants in the ICU, apply the sensors and collect and analyse data.

A prospective observational study evaluating methods to record and improve patient sleep in the Intensive Care Unit (ICU)

Contact: **Dr Yasmine Ali Abdelhamid**

Email: **Yasmine.Aliabdelhamid@mh.org.au**

Co-supervisor: **Associate Professor Adam Deane**

Location: **Intensive Care Department, Royal Melbourne Hospital**

Critically ill patients admitted to the ICU frequently have sleep disturbances due to illness and environmental factors. Disturbed sleep can impair the recovery of patients.

This prospective observational study will evaluate methods to record and improve patient sleep in the ICU.

The student will be part of a team which recruits participants in the ICU and will collect and analyse data.

The student will also work closely with sleep scientists at the Royal Melbourne Hospital.

A prospective observational study of critically ill patients with sepsis to assess muscle-specific mechanisms that contribute to muscle wasting and develop a 'virtual biopsy' procedure

Contact: **Dr Yasmine Ali Abdelhamid**

Email: **Yasmine.Aliabdelhamid@mh.org.au**

Co-supervisor: **Associate Professor Adam Deane**

Location: **Intensive Care Department, Royal Melbourne Hospital**

Patients admitted to the Intensive Care Unit (ICU), particularly those with sepsis, often experience significant muscle loss and weakness, which impairs recovery and quality of life. There is a need to develop new tests and treatments for ICU-acquired weakness.

This prospective observational study of critically ill patients with sepsis will assess muscle-specific mechanisms that contribute to muscle wasting and develop a 'virtual biopsy' procedure.

The Honours student will work within a supportive research team to recruit participants, collect blood and muscle specimens and analyse data. A component of work will be undertaken with the University of Melbourne Department of Physiology.

A randomised clinical trial of personalised DVT prophylaxis dosing when compared to fixed dosing in heavier critically ill patients

Contact: **Dr Yasmine Ali Abdelhamid**

Email: **Yasmine.Aliabdelhamid@mh.org.au**

Co-supervisor: **Associate Professor Adam Deane**

Location: **Intensive Care Department, Royal Melbourne Hospital**

Patients admitted to the Intensive Care Unit (ICU) are at increased risk of developing dangerous deep venous thrombosis (DVT) and pulmonary emboli. DVT prophylaxis medication (enoxaparin) is routinely prescribed in the ICU. Heavier critically ill patients are at increased risk of DVT and the optimal prophylaxis dosing regimen for these patients is unknown.

This randomised clinical trial will evaluate personalised DVT prophylaxis (drug) dosing when compared to fixed dosing in heavier critically ill patients.

The student will be an integral part of the trial team, which recruits and monitors patients, collects data and analyses the trial results.

A blinded randomised clinical trial of prolonged glycine supplementation in critically ill patients to attenuate muscle loss and improve recovery

Contact: **Dr Yasmine Ali Abdelhamid**

Email: **Yasmine.Aliabdelhamid@mh.org.au**

Co-supervisor: **Associate Professor Adam Deane**

Location: **Intensive Care Department, Royal Melbourne Hospital**

Patients admitted to the Intensive Care Unit (ICU), often experience significant muscle loss and weakness, which impairs recovery and quality of life. The amino acid glycine has been identified as a pivotal regulator of inflammation and muscle homeostasis and metabolism.

This blinded randomised clinical trial will evaluate whether prolonged enteral glycine supplementation in critically ill patients attenuates muscle loss and improves recovery.

The Honours student will be an integral part of the trial team, which recruits and monitors patients, collects data and analyses the trial results. A component of work will be completed with the University of Melbourne Department of Physiology.

Approaches to phosphate replacement in Intensive Care Unit (ICU) patients with hypophosphataemia

Contact: **Dr Yasmine Ali Abdelhamid**

Email: **Yasmine.Aliabdelhamid@mh.org.au**

Co-supervisor: **Associate Professor Adam Deane**

Location: **Intensive Care Department, Royal Melbourne Hospital**

Patients in the ICU frequently develop low serum phosphate concentrations. Clinical manifestations of severe hypophosphataemia may be life-threatening. Phosphate is frequently replaced via the enteral and intravenous routes in ICU.

This randomised clinical trial will compare approaches to phosphate replacement in ICU patients with hypophosphataemia.

The student will work with the trial team to recruit participants, undertake trial procedures and analyse data.

Contributing to systematic or scoping reviews in current ICU research

Contact: **Dr Yasmine Ali Abdelhamid**

Email: **Yasmine.Aliabdelhamid@mh.org.au**

Co-supervisor: **Associate Professor Adam Deane**

Location: **Intensive Care Department, Royal Melbourne Hospital**

A project which involves contributing to systematic or scoping reviews investigating topics such as: how muscle is assessed in the ICU; DVT chemoprophylaxis in heavier critically ill patients; drugs used to aid sleep in the ICU; or drugs used to treat hyperactive delirium in the ICU.

The student will work with a supportive team of cross-disciplinary researchers in the ICU.

Nutrition therapy in critical illness and patient centred outcomes

Contact: **Dr Kate Fetterplace**

Email: **Kate.Fetterplace@mh.org.au**

Co-supervisor: **Associate Professor Adam Deane**

Location: **Intensive Care Department, Royal Melbourne Hospital**

Critical illness is associated with substantial muscle loss, which impacts functional recovery and health related quality of life. Nutrition is a modifiable treatment, which may be able to attenuate this muscle loss and possibly improve the quality of survivorship, however this needs further investigations.

This project will investigate components of nutrition therapy, which could impact patient centred outcomes from critical illness.

The project would be ideal for a student who is interested in studying Nutrition and Dietetics or Medicine with an interest in gastroenterology and/or critical care.

The project could be tailored to the student preferences, either completing a retrospective or prospective study in the critically ill population at the Royal Melbourne Hospital.

Improving consent in an acute infectious diseases clinical trial

Contact: **Professor David Story**

Email: dastory@unimelb.edu.au

Co-supervisors: **Professor Steven Tong, Professor Robyn Woodward-Kron**

Location: **Department of Critical Care, University of Melbourne and the Doherty Institute**

There are cultural, language, and health literacy barriers to participant understanding and recruitment for clinical trials. Such factors may be exacerbated in clinical trials that have strict timeframes for enrolment.

The Staphylococcus aureus Network Adaptive Platform (SNAP) trial aims to enrol acutely unwell patients with staphylococcal sepsis. SNAP is a global trial and opening for recruitment in the second half of 2021.

We are seeking to improve the consent processes, particularly for culturally and linguistically diverse and elderly patients.

The research will involve developing and trialling new information and consent materials and assessing for participant understanding, satisfaction and consent rates.

The research will improve the patient experience during the trial lifetime and provide lessons for other clinical trials.

More information:

[The SNAP Trial](#)

[The CALDER Program](#)

[Widening Access to Clinical Trials](#)

Use of reusable vs disposable anaesthetic products: barriers and opportunities

Contact: **Associate Professor Forbes McGain**

Email: **forbes.mcgain@wh.org.au**

Co-supervisors: **Dr Eugenie Kayak, Dr Jess Davies (Austin Health)**

Location: **Department of Intensive Care, Anaesthesia,
Pain & Perioperative Medicine, Western Health and others**

Interest is growing in environmental sustainability within anaesthesia. Over the past decade the research foundation giving anaesthetists the ability to practice sustainably has increased substantially. For example, the use of reusable anaesthetic equipment makes environmental and financial sense even in Victoria (brown coal used for electricity).

Despite this increasing knowledge base, it is unclear if there has been any change in the use of disposable/reusable anaesthetic equipment or recycling etc. in hospitals in Victoria or other Australian states.

We propose a research agenda to examine whether there has been any translation of these new data into anaesthetic practice in Australia. Qualitative surveys and audits of both public and private Australian anaesthetic practice will be undertaken. Consideration of barriers and opportunities to change will be examined.

Patient-centred care and environmental impacts of anaesthesia agents

Contact: **Dr Jess Davies**

Email: jess.davies@unimelb.edu.au

Co-supervisors: **Associate Professor Forbes McGain, Dr Eugenie Kayak, Professor David Story**

Location: **Department of Anaesthesia, Austin Health and others**

Volatile anaesthetic agents such as Sevoflurane, Desflurane and Nitrous Oxide are potent greenhouse gases that contribute up to 5% of national healthcare carbon emissions. When equivalent anaesthesia is delivered intravenously (Propofol TIVA), the greenhouse gas emissions are up to 10,000 times less than Desflurane.

The Australian public is interested in making more environmentally sustainable choices, but patients are rarely aware of anaesthetic agents, their impacts or that a choice may be available. Understanding patient's perceptions about anaesthetic type and their environmental impacts may be important in providing patient-centred anaesthetic care.

This project will investigate elective patient's perceptions of environmental impact from healthcare during the perioperative period. This study may appeal to those interested in the environmental effects of healthcare.

Our Honours student will assist with recruiting patients, collecting and analysing data. Our supportive team will provide training in research methods, data analysis and thesis preparation.

Triple Bottom Line and hospital equipment guidelines

Contact: **Dr Jess Davies**

Email: jess.davies@unimelb.edu.au

Co-supervisors: **Associate Professor Forbes McGain, Dr Eugenie Kayak**

Location: **Department of Anaesthesia, Austin Health and others**

In the past 10 years there has been research into the environmental impact of commonly used items in anaesthesia and surgery. These include life-cycle analysis of single use anaesthetic items compared with reusable items. The environmental impact of single use anaesthetic items compared with reusable items is significantly influenced by the source of energy.

In 2025, the Victorian government has pledged that all public buildings will be powered by 100% renewable energy which provides an excellent opportunity to transition to reusable equipment where possible.

This would be a desk-based honours project involving a systematic review of the environmental impact of reusable hospital equipment and production of guidelines for hospitals to reduce their carbon footprint.

Quantifying the carbon footprint of Nitrous Oxide in Australian healthcare

Contact: **Associate Professor Forbes McGain**

Email: **forbes.mcgain@wh.org.au**

Co-supervisors: **Dr Eugenie Kayak, Dr Jess Davies (Austin Health)**

Location: **Department of Intensive Care, Anaesthesia, Pain & Perioperative Medicine, Western Health and others**

Nitrous Oxide has anaesthetic and analgesic properties. It is used in anaesthesia, maternity, paediatrics, the emergency department, and (in other countries) in pre-hospital ambulance settings. Recent unpublished research in Australia suggests that Nitrous Oxide is used in larger quantities outside of the operating room.

Nitrous Oxide is a potent greenhouse gas with a GWP (global warming potential) equal to 265 times that of CO₂.

Nitrous Oxide is responsible for approximately 3% of the UK Healthcare's entire carbon footprint, while in Australia, Nitrous Oxide's contribution to the carbon footprint of healthcare is unclear.

The aim of this project is to quantify the amount of Nitrous Oxide used within Australian healthcare by examining data on use within hospitals (public and private), state by state, and (if data are available) in Womens' and Childrens' hospitals and by state ambulance services.

Effects of hypothermia on heparin clearance during cardiopulmonary bypass (HepTemp Study)

Contact: **Associate Professor Lachlan Miles**

Email: lachlan.miles@unimelb.edu.au

Co-supervisor: **Professor Julie Simpson**

Location: **Department of Anaesthesia, Austin Health**

Cardiac surgery requires a still and bloodless field for the surgeon to undertake a successful operation. To do this, the functions of the patient's heart and lungs are assumed by the cardiopulmonary bypass.

To prevent blood clotting inside the cardiopulmonary bypass pump, patients are administered an anticoagulant medication (heparin). Additionally, the patient is often cooled to a lower body temperature as a means of providing additional organ protection. Hypothermia is known to decrease the rate of heparin metabolism, but the degree to which different degrees of hypothermia affect the rate of drug clearance is unknown. This has implications for maintaining safe anticoagulation on cardiopulmonary bypass, and for calculating the correct dose of reversal agent at the end of cardiopulmonary bypass to ameliorate the anticoagulant effects of the heparin.

The HepTemp study is a prospective observational study that will examine how different degrees of hypothermia on cardiopulmonary bypass affect the clearance of heparin. The student will be an integral part of recruiting patients into the latter part of the trial, be involved in assisting clinicians in theatre with the delivery of the study protocol, assist with data audit and cleaning and assist with the analysis of study results.

Associations between non-anaemic iron deficiency and outcomes after major surgery

Contact: **Dr Justin Nazareth**

Email: **Justin.NAZARETH@austin.org.au**

Co-supervisor: **Associate Professor Lachlan Miles**

Location: **Department of Anaesthesia, Austin Health**

Non-anaemic or early iron deficiency is very common in colorectal cancer patients, affecting 50 – 75% depending on how it is defined. It is most commonly caused by inflammation from the tumour, or chronic, low-level bleeding from the tumour. Very little is known about how non-anaemic iron deficiency affects the recovery from major surgery.

The NATO study has been designed to answer the question about the role of non-anaemic iron deficiency in colorectal cancer. Patients with iron deficiency, but who are not anaemic before their operation will be followed during and after their surgery and compared to a group of patients without anaemia, and a normal iron level. If the study hypothesis is correct, patients with non-anaemic iron deficiency will have worse outcomes than those patients who do not have anaemia or iron deficiency.

If the hypothesis of NATO is proven, it will identify a new group of patients who are at risk of poor recovery following colorectal surgery, opens an exciting new frontier in preparing patients for these procedures, and improving survival and reducing complications from the operation.

The student will be embedded in the trial team at the Austin Hospital and at the Department of Critical Care at Parkville. They will recruit patients, collect data, liaise with one of the 17 participating sites for data cleaning and audit and work with the study team to devise the statistical analysis plan for the study. The project can be further tailored to student preferences with the analysis of designated sub-study data for a previous, similar study undertaken in cardiac surgery patients.

Transdiaphragmatic Echocardiographic Monitoring (TANDEM)

Contact: **Associate Professor Lachlan Miles**

Email: lachlan.miles@unimelb.edu.au

Co-supervisor: **Associate Professor Ruth Lim**

Location: **Departments of Anaesthesia, Cardiology and Radiology, Austin Health**

Haemodynamic monitoring during major abdominal surgery is essential for the safe conduct of the anaesthetic and the procedure. In the last decade, echocardiography – ultrasound of the heart – has formed an important part of the anaesthetic armamentarium. Initially restricted to cardiac anaesthesia, transoesophageal and to a lesser extent, transthoracic echocardiography has been used to directly visualise the heart during all forms of major surgery and assist the anaesthetist in managing haemodynamic instability.

There are some types of surgery where it is not possible to perform echocardiography, either because the anaesthetist does not have access to the chest wall (due to the presence of the sterile field), or access to the oesophagus (either because of the surgical field, or because of oesophageal pathology). In cases where the surgeon is operating on the upper abdomen, it is theoretically possible for the surgeon to place an ultrasound probe into the abdomen and beneath the diaphragm – thereby allowing the heart to be imaged.

In this project, the student will work with cardiac anaesthetists, cardiologists with special proficiency in echocardiography, radiologists with special proficiency in cardiac CT and MRI, surgeons, and anatomists to develop an abbreviated, intra-abdominal echocardiographic examination that could be used in human subjects. Initial work will be conducted at Austin Health, working to correlate cardiac CT images with possible trans-diaphragmatic views. Should sufficient progress be made, the student will then work with clinicians and anatomists at the University of Melbourne to determine if these views are feasible in a cadaveric model before developing a protocol for first-in-man studies.

Midodrine for the prevention of perioperative hypotension (METEORITE)

Contact: **Dr Justin Nazareth**

Email: **Justin.NAZARETH@austin.org.au**

Co-supervisor: **Associate Professor Lachlan Miles**

Location: **Department of Anaesthesia, Austin Health**

Non-anaemic or early iron deficiency is very common in colorectal cancer patients, affecting 50 – 75% depending on how it is defined. It is commonly caused by inflammation from the tumour, or chronic, low-level bleeding from the tumour. Very little is known about how non-anaemic iron deficiency affects the recovery from major surgery.

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If the hypothesis of NATO is proven, it will identify a new group of patients who are at risk of poor recovery following colorectal surgery, opens an exciting new frontier in preparing patients for these procedures, and improving survival and reducing complications from the operation.

The student will be embedded in the trial team at the Austin Hospital and at the Department of Critical Care at Parkville. They will recruit patients, collect data, liaise with one of the 17 participating sites for data cleaning and audit and work with the study team to devise the statistical analysis plan for the study. The project can be further tailored to student preferences with the analysis of designated sub-study data for a previous, similar study undertaken in cardiac surgery patients.

Functional immunophenotyping in critical illness (FICI)

Contact: **Dr Alexander Wood**

Email: **alex.wood1@unimelb.edu.au**

Co-supervisor: **Associate Professor Adam Deane, Dr Laura Cook**

Location: **Royal Melbourne Hospital Intensive Care Unit and Peter Doherty Institute for Infection and Immunity**

Patients who become severely unwell and are admitted to the intensive care unit are at high risk of developing secondary infection and of organ failure. It is clear from previous research that the immune system plays an important role in these problems. This study aims to characterise the immune cell response to COVID-19 and compare it to the same response in severe trauma to identify features which predict important clinical outcomes such as infection, vital organ function and survival. Ethical approval has been granted and patient recruitment has commenced, with samples available for analysis.

The project offers exciting opportunities for Honours students to participate in a truly translational research project working with both clinical and laboratory teams to generate insights into severe disease states. Supervision will be by both clinical and laboratory experts, with participation in weekly laboratory and monthly clinical meetings. Students would assist with patient identification, recruitment, consent discussions, sample acquisition and transport of samples to the lab. Students would also design experiments and perform cell culture, basic laboratory assays of immune cell function and data analysis as part of the project.

For more information:

medicine.unimelb.edu.au/school-structure/critcare/study/coursework-degrees/honours

study.unimelb.edu.au/find/courses/honours/bachelor-of-biomedicine-degree-with-honours