



THE UNIVERSITY OF
MELBOURNE

DEPARTMENT OF CRITICAL CARE



**HONOURS
PROGRAM**
2023

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 2023 we are very excited to be offering a dedicated critical care honours specialisation for the second 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 in the coming weeks, where you will have the opportunity to hear from potential supervisors, current students and ask questions about the projects on offer. More information about this information session will be posted on our website soon.

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.

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.



Dr Yasmine Ali Abdelhamid

Honours Coordinator, Department of Critical Care
Specialist Intensivist at The Royal Melbourne Hospital,
Honorary Senior Clinical Fellow, Department of Critical Care, University of Melbourne

RESEARCH PROJECTS & SUPERVISION

Research projects are 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.

At least 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



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.



Associate Professor Lachlan Miles (MBBS (Hons), PhD, FANZCA) is a Staff Specialist and Deputy Head of Research in the Department of Anaesthesia at Austin Health, and an Honorary Principal Fellow of the Department of Critical Care.

His subspecialty clinical practice involves cardiothoracic and major hepatobiliary anaesthesia (including liver transplant) and peri-operative medicine.

Lachlan balances his clinical interests with a substantial research portfolio. He completed his PhD at University of Melbourne in 2021, where his thesis examined the identification and management of non-anaemic iron deficiency in patients undergoing cardiac and colorectal surgery. He has published 30+ original manuscripts in high-impact anaesthesia and general medicine journals in the last 5 years, and is the principal chief investigator of the IDOCS and NATO studies.

He is a previous winner of the Douglas Renton Medal for the Primary Fellowship Examination in 2010, the Anaesthesia and Intensive Care Emerging Researcher Award in 2019, and the Gilbert Brown Prize in 2020. He is an Editor of the journal *Anaesthesia Reports*.



Dr Yasmine Ali Abdelhamid (MBBS, PhD, FRACP, FCICM) is the Academic Coordinator of the Honours program, 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

The immune signature of sepsis

Contact: **Dr Laura Cook**

Email: **l.cook@unimelb.edu.au**

Co-supervisors: **Associate Professor Yugeesh Lankadeva, Dr Mark Plummer**

Location: **Peter Doherty Institute for Infection and Immunity**

There is an urgent need for treatments of sepsis, which is a dysregulated immune response to infection causing one in five deaths globally.

Although this burden is highest in low-income countries, over 10% of Australian Intensive Care Unit (ICU) admissions are due to sepsis, with ~25% of these patients dying in hospital.

Currently, there are no therapies to reverse sepsis-induced organ failure. Phase 1 clinical trials are now testing the use of mega dose sodium ascorbate (a formulation of Vitamin C) to treat sepsis.

This project will use blood samples from Phase 1 human clinical trials and blood and tissue samples from large animal studies of sepsis. We will perform detailed immune phenotype analysis and functional cellular assays using flow cytometry as our main research tool to investigate how the immune signature of sepsis changes over time in ICU and with treatment. This will help us understand the immunological signature of sepsis and identify patients most likely to benefit from treatment.

PHASMA: a prospective observational study of anaesthetists' ability to predict postoperative hypotension

Contact: **Dr Ned Douglas**

Email: **ned.douglas@mh.org.au**

Co-supervisor: **Associate Professor Jai Darvall, Professor Kate Leslie**

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

Postoperative hypotension is common, life-threatening and poorly understood.

The accuracy of an anaesthetist's ability to predict postoperative hypotension is an essential question to resolve to design systems of care to protect surgical patients.

The study will ask anaesthetists to predict hypotension in patients they are caring for, and then follow the patients for 24 hours to establish predictive accuracy.

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: **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 standalone 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.

Taxane-based chemotherapy induced peripheral neuropathy in an Australian population: a retrospective cohort study

Contact: **Dr Jamie Young**

Email: **jamie.young@petermac.org**

Co-supervisor: **tba**

Location: **Peter MacCallum Cancer Centre**

Chemotherapy induced peripheral neuropathy is a common and debilitating side effect for patients undergoing cancer therapy. It is well supported that, this can manifest as pain or sensory changes that can impact quality of life as well as contribute to early cessation of treatment, thus increasing cancer related morbidity and mortality (Seretny et al, 2014). Our study aims to gain perspective of incidence of CIPN within an Australian cohort and identify potential risk factors for this condition.

Participants treated with Paclitaxel and Docetaxel between the 2000 and 2017 were sourced via the Peter MacCallum pharmacy records. Sixty-eight participants have been recruited to date and consented for a phone questionnaire exploring pain or sensory symptoms, and their impact on functionality and reduction or early cessation of treatment.

Improving transitions of care from ICU to and primary care

Contact: **Associate Professor Kimberley Haines**

Email: **kimberley.haines@wh.org.au**

Co-supervisor: **Dr Yasmine Ale Abdelhamid, Ms Nina Leggett**

Location: **Western Health and University of Melbourne**

The purpose of this study is to investigate the current experience of critical care survivors and their caregivers, as they move through the transitions of care, from ICU to reintegrating with their primary care provider.

This highly novel sub-study will investigate survivors access to, and satisfaction with primary care providers using a validated outcome measure - the General Practice Assessment Question.

Thirty-five participants will be recruited from 3 health services, and from varied areas of socioeconomic advantage and disadvantage as defined by the Australian Bureau of Statistics. Data will be collected via telephone interview. The student will assist with recruitment, data collection, data management and analysis, and manuscript preparation. Ethics approval is in place for this larger project of work and an ethics amendment for this sub-study will be sought imminently.

ICU-RESOLVE-Digital study (patient reported outcomes)

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**

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.

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

Contact: **Dr Tim Makar**

Email: Timothy.Makar@gmail.com

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

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.

OPTimisation of Peri-operaTive Cardiovascular Management to Improve Surgical outcomE II (OPTIMISE II) trial

Contact: **Dr Tuong Phan**

Email: **tuong.phan@svha.org.au**

Co-supervisors: **Associate Professor Lis Evered, Associate Professor Brendan Silbert**

Location: **St. Vincent's Hospital**

OPIMITISE II is a large multi-centre RCT studying the effects of Goal Directed Therapy to reduce infectious complications in patients undergoing major abdominal surgery.

A biomarker substudy is being undertaken at Australian sites, recruiting approximately 100 patients. The biomarkers include troponin and a much wider array of exploratory inflammatory biomarkers. Biomarkers offer the ability to improve diagnostic prediction of perioperative outcomes as well as providing evidence of mechanisms of injury.

The Australian sites collaborating in the OPTIMISE II trial include St Vincent's, The Alfred and the Austin Hospital with the principal investigator, Prof Rupert Pearse, based in Queen's Medical University London.

More information: <https://optimiseii.org>

The epidemiology and outcome of nephrotoxin-associated acute kidney injury in hospitalised children

Contact: **Dr Emily See**

Email: see.e@unimelb.edu.au

Co-supervisor: **Dr Ben Gelbart**

Location: **Royal Children Hospital**

Acute kidney injury (AKI) occurs commonly in hospitalised children and is associated with increased morbidity and mortality. Exposure to nephrotoxic drugs is one of the most frequently encountered modifiable risk factors for AKI in the inpatient setting. This project will study the epidemiology and outcome of nephrotoxin-associated AKI in a cohort of children admitted to the Royal Children's Hospital between 1 January 2017 and 31 December 2021.

The student will work with the supervisors to determine exposure to nephrotoxic drugs during inpatient encounters, perform supervised statistical analyses of a large dataset, and prepare a manuscript suitable for publication in a peer reviewed journal. The data from this project will be used to inform prospective quality improvement initiatives to reduce adverse outcomes relating to this hospital-acquired complication.

Using the eye to measure the brain - A novel way to measure intracranial pressure in traumatic brain injury

Contact: **Dr Yasmine Ali Abdelhamid**

Email: yasmine.aliabdelhamid@mh.org.au

Co-supervisors: **Dr Emily See, Associate Professor Adam Deane**

Location: **Royal Melbourne Hospital**

Traumatic brain injuries are devastating, and often complicated by increased intracranial pressure which can lead to further injury and even brain death if left untreated. Unfortunately, there is no simple, non-invasive method of measuring intracranial pressure without brain surgery to implant an electrode.

In this study, we will measure pressure in the eyes (intraocular pressure) of critically ill patients with traumatic brain injury using a non-invasive device called a tonometer. The study will assess the relationship between intraocular pressure and intracranial pressure. The data obtained from this study will support the development of a novel, non-invasive device to quantify intracranial pressure without brain surgery and improve outcomes in patients with traumatic brain injury in the future.

The Honours student will work within a supportive multi-disciplinary team to recruit patients, manage the tonometry device, and collect and analyse data in the Intensive Care Unit at The Royal Melbourne Hospital.

Evaluation of novel sleep monitoring technology in the intensive care unit

Contact: **Dr Laurie Showler**

Email: laurieshowler@doctors.org.uk

Co-supervisor: **Dr Yasmine Ali Abdelhamid, Associate Professor Adam Deane**

Location: **Royal Melbourne Hospital**

Disrupted sleep during critical illness is common and associated with adverse outcomes, however quantifying this in the critical care environment has many barriers.

This study will assess the accuracy of a novel, wearable device to measure sleep against the “gold-standard” technique of polysomnography in 30 critically ill patients being treated in the Intensive Care Unit

The honours student will work within a supportive multi-disciplinary team to recruit patients, use the device, and collect and analyse data in the Intensive Care Unit at The Royal Melbourne Hospital

A multicentre, cluster randomised, double cross over pragmatic clinical trial comparing the safety and efficacy of enteral olanzapine with quetiapine in critically ill patients with hyperactive delirium (CALM – ICU)

Contact: **Ms Melissa Ankravs**

Email: **melissa.ankravs@mh.org.au**

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

Location: **Royal Melbourne Hospital**

The use of emergency anti-psychotic drug administration to treat delirium is a common Intensive Care Unit (ICU) intervention but our current approach to pharmacological treatment of delirium is variable because of lack of evidence.

This multicentre, cluster randomised, double cross over, pragmatic clinical trial will compare the safety and efficacy of antipsychotic medications (olanzapine with quetiapine) in critically ill patients with hyperactive (agitated) delirium. The double cross over design means that we will randomise ICUs (instead of individual patients) to the open label use of olanzapine or quetiapine over four treatment periods, with each treatment period being a three-month block. Our study will establish which of these two most frequently prescribed anti-psychotics (to treat ICU delirium) increases the number of days alive and delirium/coma free.

The Honours student is supported by a multi-disciplinary team in ICU and will be involved with data collection/entry for the study, delivering study information/opt out consent form to the medical treatment decision maker at the bedside and assisting with education of ICU staff regarding the treatment allocation (at the changeover of treatment after each three-month block).

Multi-centre delirium period prevalence study in ICU

Contact: **Ms Melissa Ankravs**

Email: **melissa.ankravs@mh.org.au**

Co-supervisor: **A/Prof Adam Deane**

Location: **Royal Melbourne Hospital**

We previously published a multicentre point prevalence study of delirium assessment and management in patients admitted to Australian and New Zealand intensive care units (44 sites/627 patients on a single day). The breadth of this point prevalence data will now be complemented by granular epidemiological data obtained over 90 days from three ICUs in our period prevalence study.

For the period prevalence study, we will explore medication management and dosing in greater detail (of clonidine, dexmedetomidine, haloperidol, olanzapine, quetiapine and risperidone) and we will also obtain information regarding unstructured assessment of delirium status by bedside nursing staff (in addition to the data points collected in the point prevalence study). This information will be used to guide local improvements in delirium assessment, recognition, and management.

The Honours student is supported by a multi-disciplinary team in ICU and will be involved with data collection/entry for the study.

Do the rate of injection or the concentration of dexamethasone solution alter the gross motor response of patients receiving prophylactic iv dexamethasone?

Contact: **Associate Professor George Chalkiadis**

Email: **George.Chalkiadis@rch.org.au**

Co-supervisor: **Associate Professor Greta Palmer**

Location: **Royal Children's Hospital**

Dexamethasone is a steroid drug that has been demonstrated to be effective in preventing postoperative nausea and vomiting. Its rapid intravenous administration causes intense perineal pain.

The hypothesis is that diluting dexamethasone or its dilution and slower administration will not cause perineal pain as evidenced by a lack of motor response in anaesthetised children.

Anaesthetised children at the Royal Children's Hospital will be randomised to receive 0.15mg/kg undiluted dexamethasone 4mg/ml or 0.15mg/kg 0.4mg/ml over 5 seconds or 30 seconds prior to the commencement of surgery. Children's motor response and change in heart rate will be observed and recorded.

The student will be involved in collecting and analysing data within an established research team.

Who prescribes and what analgesia is prescribed following day-stay surgery at the Royal Children's Hospital?

Contact: **Associate Professor George Chalkiadis**

Email: **George.Chalkiadis@rch.org.au**

Co-supervisor: **Associate Professor Greta Palmer**

Location: **Royal Children's Hospital**

The level of seniority of medical staff prescribing discharge analgesia following surgery is unclear. The type of analgesia prescribed, if any, particularly after day stay surgery is unclear.

The hypothesis is that it is mainly junior medical staff that prescribe discharge analgesia and that many patients undergoing day-stay surgery at the Royal Children's Hospital do not have any analgesia prescribed.

This project will involve obtaining data from the EPIC electronic medical record, working within an established research team.

Presentations to the emergency department post admission with COVID-19: insights from the Omicron wave.

Contact: **Associate Professor Anselm Wong**

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

Co-supervisors: **Professor George Braitberg**

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. This will relate specifically to the Omicron wave.

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.

Associations between neuroinflammation, brain oxygenation and levels of Vitamin C after cardiac surgery (the CITRIC-CPB study)

Contact: **Associate Professor Lachlan Miles**

Email: lachlan.miles@unimelb.edu.au

Co-supervisor: **Associate Professor Yugeesh Lankadeva and Dr Tim Makar**

Location: **Department of Anaesthesia, Austin Health and Pre-clinical Critical Care Unit, the Florey Institute of Neuroscience and Mental Health**

While lifesaving, cardiac surgery is not without risk. To perform the surgery safely requires a still and bloodless field, which in turn requires the function of the patient's heart and lungs to be used by a heart-lung machine, also known as cardiopulmonary bypass.

Postoperative Cognitive Dysfunction (POCD) is the most reported complications after cardiac surgery, affecting up to 50% of patients. POCD can vary, from subtle disorders of memory and executive function to delirium. Those patients who develop POCD after cardiac surgery – even mild and temporary – have a higher incidence of dementia in the future. Understanding the causes of cognitive dysfunction after cardiac surgery is critical in developing treatments to ameliorate it or prevent it from occurring.

The CITRIC-CPB study will observe changes in the brain (markers of neuroinflammation, cerebral oxygenation and electroencephalography [EEG]) and in the blood (Vitamin C levels and systemic markers of inflammation), and to determine if they are associated. If they are, there is the potential that new treatments will be able to be developed to correct them, and possibly treat POCD, to the betterment of hundreds of thousands of patients worldwide every year. The successful honours candidate will be an integral part of the study team, assisting clinicians in theatre with the collection of blood samples, and reviewing patients on the ward afterwards to collect further data. They will assist with data audit and cleaning and the analysis of study results.

For more information:

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

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