MONASH University

DEPARTMENT OF PAEDIATRICS

STUDENT

B O O K L E T

CONTENTS

ABOUT US

The Department of Paediatrics is within the Monash University School of Clinical Sciences at Monash Health.

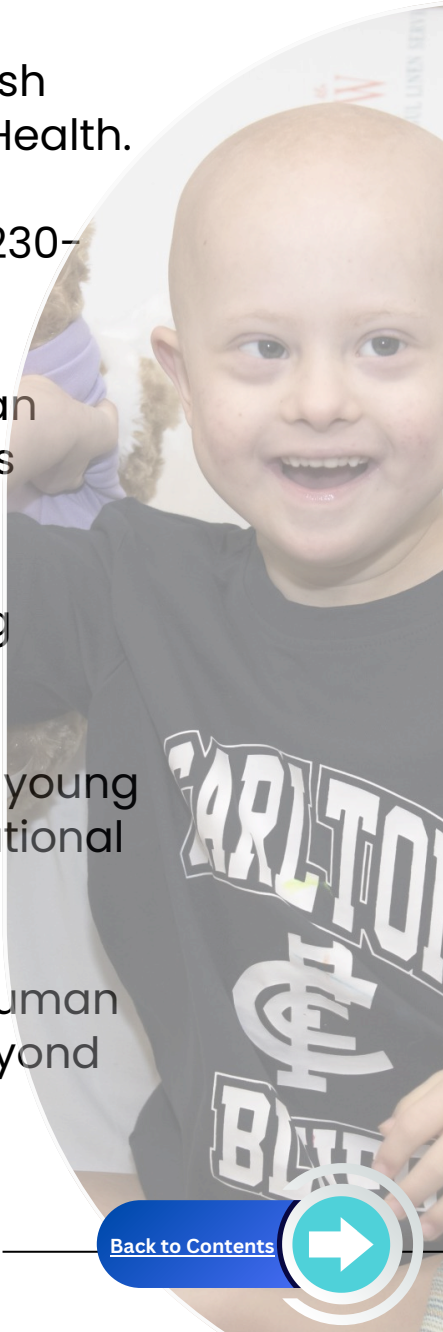
We are located at Monash Children's Hospital, a 230-bed state of the art facility.

Our team consists of a group of incredible clinician researchers, scientific researchers and high-class educators.

We provide the crucial link between world leading research and providing the best clinical care.

Child Health Research is inclusive of newborns to young adulthood and encompasses Laboratory, Translational and Clinical Research.

Child Health Research covers all aspects of the human body from the brain, heart, kidneys, lungs and beyond



MONASH UNIVERSITY DEPARTMENT OF PAEDIATRICS

Level 5, Monash Children's Hosptial
246 Clayton Road, Clayton, VIC 3168

PAEDIATRIC DEPARTMENT

22 PhD

11 HONOURS STUDENTS

26 RESEARCH GROUPS

171 STAFF, ADJUNCTS & AFFILIATES

590 MEDICAL STUDENTS

RESEARCH THEMES

- Cancer
- Cerebral Palsy and Neurology
- Clinical Pharmacology and Trials
- Complex Autism and Neurodevelopment (CAN)
- Digital Health and Informatics
- Emergency Medicine
- Infection, Inflammation and Immunology
- Newborn
- Simulation
- Sleep and Respiratory
- Surgery and Acute Care

RESEARCH STUDENTS

IN PROGRESS

22 PhD Students
11 Honours Students

18

PhD Students completed since 2015

88

BMedSc Hons students completed since 2015

36

BSc and BBioMedSc students completed since 2015

PAEDIATRICS

Producing world-renowned research and highly-regarded medical student education to enrich the lives of unwell children.

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Your comprehensive source for all information requirements

STUDENT PROJECTS

HEAD TO OUR WEBSITE

To find further information on:

- Paediatric Research Projects
- Research Themes
- Our Supervisors
- Current and Past Student experiences and their pathway
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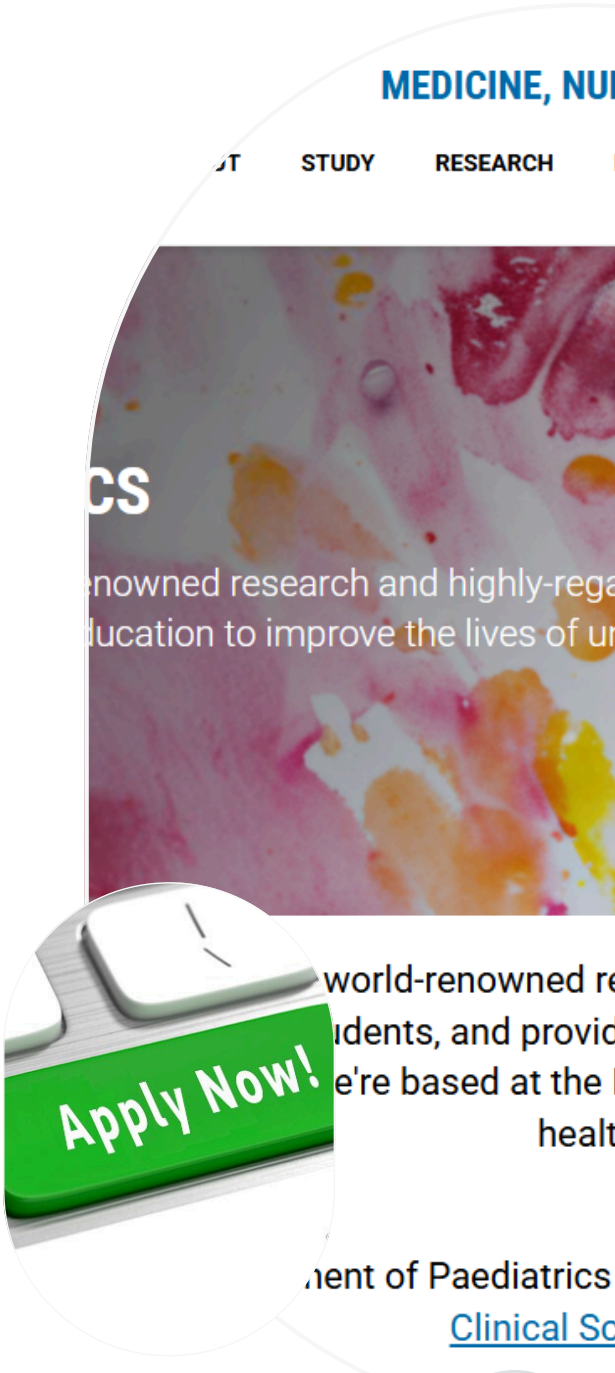

RESEARCH PROJECTS

CANCER

DEFINING THE MECHANISMS OF CHEMOTHERAPY RESISTANCE IN CHILDHOOD AND ADOLESCENT OSTEOSARCOMA

Osteosarcoma is the most prevalent primary malignant tumour of the bone, mainly affecting teenagers and young adults, particularly during growth spurts. Incorporation of neoadjuvant chemotherapy has increased 5-year survival rates from 10% to ~70% for patients with localised disease. However, ~20% of patients present with metastases at diagnosis and a further 25%-50% will develop metastatic disease during their treatment. Despite aggressive multimodal treatments including polychemotherapy (typically methotrexate, doxorubicin and cisplatin [MAP]), surgery, and radiation therapy (where applicable if complete surgical resection is not possible), cure rates for patients with metastatic or relapsed disease are poor, with a 5-year survival rate of <20% and represent a significant clinical challenge. Alarmingly, these survival rates have remained unchanged for decades highlighting the urgent need for improved therapeutic strategies.

Aside from disease at diagnosis, the histological response to induction chemotherapy is the gold standard indicator for patients with osteosarcoma, assessed by percentage of necrotic tissue using the Huvos grading system. However, individual patients' response to induction chemotherapy is variable suggesting inherent resistance and to date there is no reliable way to predict which patients will respond to therapy.

Through direct engagement with sarcoma patients and their families, and via the Australian and New Zealand Sarcoma Association (ANZSA) we have identified two major areas of unmet need and consumer-guided priorities: improved therapeutic strategies to reduce toxicities; and more accurate prognostication to guide individual patient clinical management. This project will work to bridge this gap in translation, by better understanding osteosarcoma biology to identify the mechanisms and molecular signatures of patient response to therapy, and therapeutic strategies to improve response, that will ultimately improve patient survival and survivorship.

Using a functional genomics approach in clinically relevant preclinical models and osteosarcoma patient tissues we will determine the genetic, epigenetic and molecular events underpinning chemo resistance, and identify and validate therapeutic opportunities to overcome resistance.

Supervisor: Assoc/Prof Jason Cain, jason.cain@hudson.org.au
Available Options: PhD/Doctorate, Honours

RESEARCH PROJECTS

CANCER

IDENTIFICATION OF MOLECULAR PROGNOSTIC AND THERAPY RESISTANCE SIGNATURES IN PAEDIATRIC SARCOMAS

Sarcomas are a rare type of cancer that originate in the connective tissue of the body, including fat, muscle, bone, and cartilage. Sarcoma's can develop anywhere in the body and are among the most common types of solid tumours in children. Most predominant in the paediatric and adolescent populations are sarcomas arising in the bone (osteosarcoma, Ewing's sarcoma) and muscle (rhabdomyosarcoma). Incorporation of neoadjuvant chemotherapy has increased 5-year survival rates from 10% to ~70% for patients with localised disease. However, ~20% of patients present with metastases at diagnosis and a further 25%-50% will develop metastatic disease during their treatment. Despite aggressive multimodal treatments including polychemotherapy and surgery, cure rates for patients with metastatic or relapsed disease are poor, with a 5-year survival rate of <20% and represent a significant clinical challenge. Moreover, current standard-of-care treatments often result in lifelong morbidity. To date there is no reliable way to predict which patients will respond to therapy, and which are at high risk of disease recurrence, highlighting the urgent need for patient risk stratification.

We will utilized a defined clinical patient cohort of sarcoma patients treated at Victorian paediatric institutions since 1996. Samples will be acquired for multiomic analysis and data correlated to clinical responses and outcomes.

Collectively, the harmonisation of miltiomic data from a defined cohort of childhood sarcoma patients will provide important information on the mechanisms of tumour progression and therapy resistance as well as identify prognostic biomarkers and biomarkers of predictive response to therapy. This would pave the way for stratification of patients and potential personalised clinical management to improve outcomes and limit long term effects.

Supervisor: Assoc/Prof Jason Cain, jason.cain@hudson.org.au
Available Options: PhD/Doctorate, Honours

RESEARCH PROJECTS

> ADVANCING PRECISION DOSING IN SOLID ORGAN TRANSPLANTATION

Kidney transplantation offers superior quality of life and longevity as compared to dialysis. However, whilst short term outcomes are typically excellent, issues remain, including from the immunosuppressant agents required to prevent organ rejection. These include incomplete effectiveness (with premature graft loss), intolerance, and serious acute and cumulative toxicities. Given substantial dose-response variability with current immunosuppressant dosing strategies, greater precision (individualisation) offers the ability to increase both safety and effectiveness and thus improve long-term patient outcomes.

There already exist more sophisticated approaches to dose individualisation, using a target concentration intervention approach. Bayesian forecasting enriches interpretation of measured drug concentrations (or pharmacodynamic biomarkers) in the individual by leveraging against prior knowledge of the drugs population pharmacokinetic (or pharmacokinetic-pharmacodynamic) characteristics, stored within a pharmaco-statistical model. Robust evidence continues to accumulate of the superiority of such an approach to typical therapeutic drug monitoring.

Nevertheless, barriers to implementation remain, including evidence for therapeutic targets, regulatory oversight, clinician understanding and acceptance, as well as practical aspects.

Using a decade of real-world PK data as well as prospective trial data (genotype-informed Bayesian dosing of tacrolimus), our work is looking to fill in knowledge gaps required for broader implementation of precision dosing of mycophenolate and tacrolimus in organ transplantation.

Supervisor: Dr David Metz, david.metz@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours

RESEARCH PROJECTS

COMPLEX AUTISM AND NEURODEVELOPMENT (CAN)

UNDERSTANDING THE DEVELOPMENT AND OUTCOMES OF CHILDREN WHO LOSE SKILLS BEFORE THEY DEVELOP AUTISM

We are developing a cohort of children who have lost skills and developed autism, sometimes called autistic regression. Using video footage prior to their loss of skills and detailed outcome assessment over time may provide clues to the underpinnings of this presentation and information about prognosis, so keenly sought by parents.

Supervisor: Prof Katrina Williams, katrina.williams@monash.edu
Available Options: PhD/Doctorate, Honours, BMedSc (Hons)

A TRIAL OF EARLY INTERVENTION FOR CHILDREN WHO HAVE LOST SKILLS DURING THEIR DEVELOPMENT

We are recruiting families to a MRFF funded study. Following clinical assessment families will be offered the opportunity to enrol in a randomised controlled trial comparing an online only with a online plus coaching approach. Opportunities exist for PhD studies in all elements of this trial.

Supervisor: Prof Katrina Williams, katrina.williams@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours, BMedSc (Hons)

OUTCOME ASSESSMENT IN A STATEWIDE SCREENING COHORT WITH GENETICALLY LINKED INTELLECTUAL DISABILITY

This project aims to assess outcomes in a statewide screening cohort by examining conditions genetically linked to intellectual disability. It seeks to determine how these conditions can be identified as part of the comprehensive Victorian newborn screening program. It will assess how early detection through screening impacts long-term outcomes across the lifespan.

Supervisor: Dr Mohammed Alshawsh, mohammed.alshawsh@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours, BMedSc (Hons)

RESEARCH PROJECTS

COMPLEX AUTISM AND NEURODEVELOPMENT (CAN)

DESCRIBING OUTCOMES FOR CONDITIONS ASSOCIATED WITH GENETICALLY LINKED INTELLECTUAL DISABILITY AS PART OF A STATEWIDE SCREENING COHORT STUDY

There are over 7,000 rare diseases that on average take ~4 years to diagnose, during which families consult on average 5 doctors and receive 3 misdiagnoses. This diagnostic odyssey has health and economic burden for the children, their families and the health system. Our funded program, called 'EpiGNs' will screen for intellectual disability genetic conditions and also the treatable conditions associated with them, including autism, life threatening obesity and seizures. Genetics conditions screened will be fragile X, Prader Willi, Angelman, Dup15q, Turner, XXY, XXXY and XXYY syndromes. 100,000 infants will be recruited as part of the whole-of-state birth cohort (GenV), with samples collected and stored over 3 years. In its 4th year, EpiGNs is expected to identify ~200 children with genetically linked intellectual disability. Students will focus on defining trajectories for clinical and health-economics outcome measures for these children as compared to the whole population of children recruited into Gen V. Comparisons will be made between physical and developmental milestones, healthcare use and resource utilisation in this period for the infants with these conditions to the whole cohort.

Supervisor: Prof Katrina Williams, katrina.williams@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours, BMedSc (Hons)

UNDERSTANDING COMMUNICATION IN CHILDREN WITH MINIMAL SPOKEN LANGUAGE

One of the most common questions parents of children with minimal spoken language ask is "will my child talk?". Currently clinicians are not able to answer this question as so few studies have followed children's communication development over time and none with sufficiently detailed characterisation to personalise the response for each child. This study is investigating the communication phenotypes (and associated factors) in children who have minimal spoken language. We are also developing a communication intervention for this group of children. Opportunities exist for PhD and honours students to work on various aspects of this project.

Supervisor: Dr Amanda Brignell, amanda.brignell@monash.edu
Available Options: PhD/Doctorate, Honours, BMedSc (Hons), Short Projects

RESEARCH PROJECTS

DIGITAL HEALTH AND INFORMATICS

EVALUATION OF INNOVATIVE DIGITAL MONITORING DEVICES IN NEONATES

Opportunities exist to be involved in this exciting project on innovative digital monitoring devices for neonates. The project will involve evaluation of new devices being developed for neonatal cardiorespiratory and other monitoring. Project will include patient recruitment, data recording, collection, and analysis. Computer assisted analysis will follow acquisition of electronic signals. This project is in collaboration with Monash Engineers.

Supervisor: A/Prof Atul Malhotra, atul.malhotra@monash.edu
Available Options: Honours, BMedSc (Hons)

ADVANCING FETAL SURVEILLANCE FOR EARLY DETECTION OF FETAL DISTRESS: USING AI AND NOVEL PHYSIOLOGICAL SENSING

Current fetal monitoring technologies, such as cardiotocography (CTG), are often inaccurate at detecting fetal distress. This results in either delayed interventions, increasing the risk of brain injury, or unnecessary C-sections, contributing to surgical risks and increased healthcare costs. This project aims to fill this gap by developing new AI-powered software that non-invasively monitors fetal physiological signals to detect signatures corresponding to fetal distress (caused by hypoxia or infection/inflammation) for early detection. This is set to improve clinical decision-making, prevent perinatal brain injury, and ultimately save lives.

Supervisor: Dr Robert Galinsky, robert.galinsky@hudson.org.au
Available Options: PhD/Doctorate, Masters by research, Honours, BMedSc (Hons)

RESEARCH PROJECTS

EMERGENCY MEDICINE

> PAEDIATRIC EMERGENCY MEDICINE

The Paediatric Emergency Department at Monash Medical Centre is involved in a large number of clinical research projects, ranging from single-centre studies, to national and international multicentre randomised clinical trials and observational studies, as well as "big data" studies.

Our department is closely involved with the Australia-NZ Paediatric Research in Emergency Departments International Collaborative (PREDICT) Network, and also collaborates with other research networks globally through the Pediatric Emergency Research Networks (PERN).

Opportunities are available for BMedSc(Hons), Honours, Masters and PhD candidates.
We also provide opportunities for short-term placements as part of undergraduate degrees in Medicine, Science and Information Technology.

Current clinical research topics include acute asthma, management of acute behavioural disturbance, recognition and response to acute deterioration, sepsis, bronchiolitis, neck injury, abdominal pain, fever, febrile convulsions, mental health presentations, and procedural pain and distress.

Supervisor: Dr Simon Craig, simon.craig@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours, BMedSc (Hons), Short Projects

RESEARCH PROJECTS

> NEXT GEN THERAPIES FOR PRE-TERM INFANTS: CAN THE MICROBIOME AND IMMUNE SYSTEM REVEAL NOVEL TREATMENT STRATEGIES?

Direct clinical relevance: high. Hands-on learning opportunities: Various aspects of work with mice and or human specimens, workup of tissues for various downstream applications, flow cytometry, histology, immunohistochemistry, protein detection by ELISA.

Established collaboration with the Monash Health department of Paediatric Surgery to collect human specimen including blood, intestinal and stool samples.

The severe chronic lung disease bronchopulmonary dysplasia (BPD) causes considerable suffering for premature infants and their families and contributes substantially to health care costs. Necrotising enterocolitis (NEC) is a disease of the premature gut that is poorly understood and carries a high mortality. No effective therapy is known for either devastating disease. In view of the importance of inflammation for BPD and NEC, we will assess how effectively innovative anti-inflammatory treatments protect against BPD and NEC. In newborn mice with a BPD-like lung disease, we will quantify if treatments protect against the development of lung pathology as reflected in biochemical and cellular markers of inflammation and loss of alveolarisation and vascularisation on day 3 and 28 of life.

In human specimen (plasma, stool, tissue) we will assess the underlying mechanism of Necrotizing Enterocolitis a devastating intestinal disease of preterm infants.

Supervisor: Prof Claudia Nold, claudia.nold@monash.edu
Available Options: Honours, BMedSc (Hons)

RESEARCH PROJECTS

> CLOSING THE GAPS – ESTABLISHING PEDIATRIC REFERENCE INTERVALS OF PRO- AND ANTI-INFLAMMATORY CYTOKINES

Cytokines have attracted substantial attention as diagnostic biomarkers for infectious and inflammatory diseases in recent years. However, understanding of maturation of the immune system and normal ranges for various patient age brackets in health and disease have not been established.
Cytokines play an important role in maintaining homeostasis on the one hand, and a wide range of childhood diseases on the other hand. Their potential as diagnostic and prognostic biomarkers that may guide treatment in infectious, autoimmune, allergic, and haematological diseases is beginning to be recognised. Studies have suggested that cytokine production is influenced by age; however, larger datasets on cytokine profiles for healthy neonates, infants and children are lacking. The aim of this study is to establish reference ranges for multiple cytokines by measuring their concentrations in the blood of healthy infants and children. You will also explore conditions that influence cytokine production in the paediatric age group.

Direct clinical relevance: High

For Honours, this project will involve the following approaches:
- Obtaining and working up samples in collaboration with clinicians based at the Department of Paediatrics
- Clinical data entry in an electronic database
- ELISA or multiplex protein quantification assays to measure serum/plasma markers in infants and children.

For candidates interested in a PhD, the study's scope is easily expandable to investigate further age groups and diseases.

Supervisor: Prof Marcel Nold, marcel.nold@monash.edu
Available Options: PhD/Doctorate, Honours, BMedSc (Hons)

RESEARCH PROJECTS

BABY MICROBIOME: INVESTIGATING THE HUMAN NEONATAL LUNG AND GUT MICROBIOME AND ITS IMPACT ON HEALTH AND DISEASE

The early life microbiome is highly dynamic in healthy full-term infants as well as in preterm infants. As such, the microbiome is extremely susceptible to external influences that can dramatically affect the short- and long-term health of the infant. In this project, we set out to investigate the underlying mechanisms by which the microbiome of lung and gut interacts with the immune system in early life, and how these interactions affect health and disease.
Using an established clinical study, GLAM & I (The gut and lung and their microbiomes & immunology), this project focusses on the microbiome aspects of this large collaboration. Using established workflows at Monash Children's Hospital, we collect clinical data and multiple sample types from term and preterm infants, including blood, lung lavage, nasal swabs, stool and expressed breast milk from the mothers. This project gives you the opportunity to closely work with the babies and their families and also have the opportunity to gain experience in a diverse set of molecular techniques.

Direct clinical relevance: High
Involvement of the student: Patient consenting and recruitment, sample collection and workup, culturing of cells and bacteria, generation of large omics-datasets and their biased and unbiased analysis

Supervisor: Prof Marcel Nold, marcel.nold@monash.edu
Available Options: PhD/Doctorate, Honours, BMedSc (Hons)

DEVELOPING NEW PRECLINICAL MODELS TO STUDY HOW INFLAMMATION ALTERS PERINATAL BRAIN DEVELOPMENT

IExposure to infection/inflammation during the perinatal period is one of the main causes of impaired neurodevelopment. To develop effective therapeutic interventions against perinatal infection/inflammation we must first understand the pathophysiology of inflammation induced brain remodelling. This project integrates techniques in immunology, physiology, microbiology and neuroscience to develop a clinically relevant model that will advance our understanding of how infection/inflammation alters structural and functional development of the perinatal brain.

Supervisor: Dr Robert Galinsky, robert.galinsky@hudson.org.au
Available Options: Phd/Doctorate, Masters by research, Honours, BMedSc (Hons)

RESEARCH PROJECTS

MOLECULAR CHARACTERISATION OF REGULATION AND MECHANISM OF ACTION OF THE ANTI-INFLAMMATORY CYTOKINE INTERLEUKIN 37

Interleukin (IL)-37 was discovered in silico in 2000, but received very little attention (not even 10 publications) in general and nothing at all was known about its function until 2010, when our group described the powerful anti-inflammatory properties of this cytokine. IL-37 belongs to the IL-1 family of cytokines and imparts a strong inhibition of the production of pro-inflammatory cytokines. Interestingly, this protection from inflammatory responses is not limited to one or a few triggers, but covers a wide spectrum of inflammatory assaults - a rare property, which renders IL-37 a prime candidate for clinical use. However, further research on the mechanism of action of this unusual cytokine is required before such steps can be taken. In this project, we will characterise several aspects of regulation and function of IL-37, including the mRNA and protein expression profile of IL-37 across a spectrum of cell types and the effect of IL-37 on an important molecular regulator of inflammation, the inflammasome.

Direct clinical relevance: medium/low
Hands-on learning opportunities: Culture of primary human blood cells and cell lines, protein detection by ELISA, RNA detection by real-time PCR, flow cytometry, immunohistochemistry.

Supervisor: Prof Marcel Nold, marcel.nold@monash.edu
Available Options: Phd/Doctorate, Honours, BMedSc (Hons)

RARE DISEASES WITHIN PAEDIATRIC GASTROENTEROLOGY

Paediatric gastroenterology encompasses any serious condition of the gastrointestinal tract, liver and pancreas. Many of the conditions within our specialty are individually rare. Even inflammatory bowel disease (IBD), one of the more common diseases in paediatric gastroenterology, includes rare subtypes. This project (or projects) involves studying the epidemiology and/or clinical features of various different conditions within our service. This may include simple audits, or contributions and analysis from national and international cohorts. Depending on the complexity of the projects, they may be suitable for short projects or honours/masters students.

Supervisor: Dr Edward Giles, edward.giles@monash.edu
Available Options: Phd/Doctorate, Masters by Research, Honours, BMedSc (Hons), Short Projects

RESEARCH PROJECTS

INFECTION, INFLAMMATION AND IMMUNIOLOGY

EARLY ONSET SEPSIS IN PREMATURE INFANTS - INVESTIGATING THE DIAGNOSTIC UTILITY OF CLINICAL AND LABORATORY MARKERS

Early onset sepsis (EOS) is defined as that which occurs within the first 48 hours of life in newborn infants. EOS can be devastating; increasing mortality and often leaving the survivors with life-long sequalae. Due to this, zero-risk approach to early antibiotic therapy were used (antibiotic therapy in symptomatic or presence of risk factors in asymptomatic patients); and whilst effective, this strategy led to increased antibiotic use in those infants without sepsis. The EOS Calculator was introduced to better stratify risk in the late preterm or term infants some years ago. However, no current risk predictive tool for very preterm infants are available. Risk factors approach may help to antimicrobial stewardship (reducing empirical antibiotic use) - however, predictive utility could be improved. The aim of this project is to utilise the dataset from Monash Health's EMR (maternal and infant) including serial clinical and laboratory measurements in order to study whether this approach may improve the detection of EOS in very preterm infants.

Supervisor: A/Prof Kenneth Tan, kenneth.tan@monash.edu
Available Options: Honours, BMedSc (Hons)

EARLY ONSET SEPSIS IN LATE PRETERM AND TERM INFANTS - CAN RISK STRATIFICATION BE IMPROVED WITH SERIAL CLINICAL AND LABORATORY MARKERS?

Early onset sepsis (EOS) is defined as that which occurs within the first 48 hours of life in newborn infants. EOS can be devastating; increasing mortality and often leaving the survivors with life-long sequalae. Due to this, zero-risk approach to early antibiotic therapy were used (antibiotic therapy in symptomatic or presence of risk factors in asymptomatic patients); and whilst effective, this strategy led to increased antibiotic use in those infants without sepsis. At Monash Newborn, the EOS Calculator was introduced to better stratify risk in the late preterm or term infants some years ago. This tool has been shown to be effective in promoting antimicrobial stewardship (i.e. to reduce antibiotic use) safely.
The aims of this project are:
1) To investigate the prevalence of EOS in infants >34 weeks gestation at Monash Health sites with the use of the EOS calculator, antibiotic use and true sepsis rates.
2) To investigate if clinical and blood markers in maternal and infant records can contribute to EOS detection.
Methods: To utilise Monash Health EMR in order to obtain a large dataset which will be analyse using statistical methodology or advanced analytics in order achieve the aims of the project.

Supervisor: A/Prof Kenneth Tan, kenneth.tan@monash.edu
Available Options: Honours, BMedSc (Hons), Short projects

RESEARCH PROJECTS

NEWBORN

> NEONATAL RESUSCITATION VIDEO REVIEW – EVERY HIGH SCHOOL TEAM WATCHES VIDEO OF THEIR GAMES, SHOULDN'T WE?

We are looking for an HONS student in 2025 to join our multidisciplinary team that uses video review of neonatal resuscitations to improve preparation and training for these emergencies. In addition to engage in exciting, clinically-based, research, this project affords the opportunity for a student to be fully immersed in the NICU experience by attending the births, joining rounds, and learning sessions.

Ten percent of babies born world-wide and over 97% of very preterm babies (less than 32 weeks at birth) will need help breathing at birth. Neonatal resuscitation is a common emergency that is difficult to study because the need for resuscitation is unpredictable, the babies are small, and the monitoring of the babies during the emergencies is difficult. Every baby born must transition from depending on the placenta and mother for oxygen to using their own, liquid filled lungs for the first time at birth. These resuscitations are stressful and quick paced, with multiple decisions and actions taken by a team of neonatal nurses and doctors in a compressed period of time. The consequences of being poorly supported during a neonatal resuscitation can lead to death and significant morbidities. In addition to gaps in knowledge about how to best support the newborn at birth, there are gaps in understanding how the treating team can best be prepared and coordinated during neonatal resuscitation. It is widely understood that clinician's recall during neonatal resuscitation is inaccurate, making it more difficult to learn valuable lessons for NICU staff who respond to these emergencies.

Neonatal Resuscitation Video Review (NRVR) simple tool that offers solutions to these challenges and may improve outcomes for these fragile newborns. Since 2019 at Monash Newborn, neonatal resuscitations have been video recorded and reviewed in formal learning sessions and structured debriefs in an ongoing quality improvement project, the only NRVR program in Australia. In the last several years, our team has been joined by talented HONS students who have done projects using the videos to evaluate components of the Apgar score to predict the intensity of the resuscitation, redefined the normal values of heart rate and oxygen saturation at birth in the era of delayed cord clamping, and explored the benefits of NRVR for ongoing professional development of NICU staff.

Despite positive publications video recording and reviewing emergencies in emergency medicine, surgery, obstetrics, and neonatology, there is still reluctance to adopt NRVR as a tool. More work to validate NRVR and improve care during neonatal resuscitation is required. We hope that you are interested in joining our team!

Supervisor: Dr Douglas Blank, doug.blank@monash.edu
Available Options: Honours, BMedSc (Hons)

RESEARCH PROJECTS

NEWBORN

CHRONIC LUNG DISEASE IN VERY PRETERM INFANTS AND HOME OXYGEN THERAPY

Very preterm infants may suffer from chronic lung disease; this is defined as a need for continuing oxygen or respiratory support at 36 weeks' corrected gestational age. These infants usually require prolonged ventilation and may require ongoing respiratory and oxygen therapy post discharge from hospital. The Australia and New Zealand Neonatal Network is comprised of all the NICUs in the two control and records the population of all infants who require intensive care including the group <32 weeks gestation.
This project will involve learning advanced skills in large dataset analytics to investigate the infant population at risk for CLD and require home oxygen along with the population trends.

Supervisor: Assoc/Prof Kenneth Tan, kenneth.tan@monash.edu
Available Options: Masters by Research, Honours

RURAL RESIDENCE AND PERINATAL OUTCOMES

There is emerging evidence from overseas quality network that disparities in health outcomes is influenced by social determinanta of health. For perinatal health outcomes recent studies from overseas, including from the CQPCC in California indicates that low birthweight may be associated with the rurality of maternal residence.

This project will investigate outcomes such as severe FGR at any gestation, very preterm births and low birthweights for the Victorian population utilising the Victorian perinatal dataset (administered by CCOPMM).https://www.safercare.vic.gov.au/about/ccopmm.

The student will learn data analytics skills including risk modelling and utilising geo-coded data.

Supervisor: Assoc/Prof Kenneth Tan, kenneth.tan@monash.edu
Available Options: Phd/Doctorate, BMedSc (Hons)

RESEARCH PROJECTS

NEWBORN

FEEDING AND NUTRITIONAL PRACTISES AND GROWTH OUTCOMES FOR EXTREMELY PRETERM INFANTS

Clinical practise around the management of nutrition for extremely preterm infants may vary across NICUs. This may include the use of probiotic supplementation, types of breastmilk fortification, availability of pasturised donor milk and so on. This may affect not only the extrauterine growth of these infants but also their risks for sepsis or necrotising entercolitis.
This study will investigate clinical practise around feeding and nutrition across the NICUs at Monash Children's Hospital (Melbourne) and Southmead Hospital (Bristol, United Kingdom). The student will be learn to utilise clinical epidemiological methods to investigate the effect of clinical practise on inpatient outcomes for these infants, based on datasets from clinical registries that the NICUs participate in.

Supervisor: Assoc/Prof Kenneth Tan, kenneth.tan@monash.edu
Available Options: BMedSc (Hons)

STIMULATING BREATHING AT BIRTH IN PRETERM NEWBORNS

Every day, >2450 preterm infants die, the majority due to the inability to breathe independently at birth. Consequently, these infants require respiratory support at birth, which increases the risk and severity of brain inflammation and injury, leading to adverse long-term neurological outcomes, including Cerebral Palsy. Our groundbreaking research has identified that respiratory centres within the brainstem, which controls and regulates breathing, are inhibited by exposure to inflammation around the time of birth, particularly pro-inflammatory cytokines and prostaglandin E2. This, for the first time, has given us a target to mitigate the influence of inflammation on brainstem respiratory centres, thus improving respiratory and neurological outcomes of preterm newborns.

Our research will test a number of clinically relevant inhibitors in preclinical models to determine whether they reduce brainstem inflammation and injury and improve respiratory function, and subsequent neurological outcomes. These studies will allow for a comprehensive development of skills in surgery, physiological monitoring, molecular and histological assessments of inflammation and injury

Supervisor: Professor Graeme Polglase, graeme.polglase@monash.edu
Available Options: PhD/Doctorate, Honours, BMedSc (Hons), Short projects

RESEARCH PROJECTS

NEWBORN

DEVELOPMENT OF FACE PERCEPTION IN PRE-TERM INFANTS (THE BABYFACE STUDY)

The study aims to understand how preterm babies develop the ability to recognise and understand faces. Exposure to faces and facial expressions are thought to promote the development of face perception, which has been linked to development of speech and social skills such as cooperative play and recognising emotions. Children born preterm have been reported to have slower development of face perception. We will recruit babies born before 32 weeks and at full-term. We will record their brain response to socio-visual stimuli (videos of human faces with and without face-masks) using multi-channel NIRS (near infrared spectroscopy) after 6 months of term-equivalent age. The data will allow understanding of face perception which is critical for play and speech in babies. It also gives insight into how the infant brain response is affected by mask-wearing (mandatory in hospitals since COVID-19).

Supervisor: A/Prof Flora Wong, flora.wong@monash.edu
Available Options: PhD/Doctorate, Honours, BMedSc (Hons)

IMPROVING RESUSCITATION OF PRETERM INFANTS

Every year, 13.4 million babies are born, and 900,000 will die, making it the leading cause of death in children <5 years of age globally. Half of preterm infant deaths occur within 24 hours of birth, highlighting their vulnerability during the transition to newborn life. The main cause of newborn mortality is poor or insufficient respiratory function at birth. As a consequence, preterm infants often require respiratory support at birth, and prolonged (weeks) of respiratory support in the neonatal intensive care unit. Importantly, respiratory support increases lung inflammation and injury, increasing the risk of long-term respiratory consequences such as chronic lung disease (bronchopulmonary dysplasia). Our research focus is to reduce lung injury at birth by improving the provision of respiratory support at birth. Our research includes optimisation of non-invasive respiratory support, nasal high flow and continuous positive airway pressure, improving the interfaces used to deliver respiratory support, determining the correct oxygen levels the reduce lung injury, and identifying the best way to provide positive pressure ventilation which doesn't impact on lung inflammation and injury. These studies combine large animal preclinical models, with advanced imaging, physiological measures and the latest molecular and histological assessments. Our goal is to reduce preterm morbidity and mortality globally.

Supervisor: Professor Graeme Polglase, graeme.polglase@monash.edu
Available Options: PhD/Doctorate, Masters by research, Honours, BMedSc (Hons)

RESEARCH PROJECTS

SIMULATION

SIMULATION-BASED EDUCATION FOR BEHAVIOURAL EMERGENCIES IN CHILDREN AND YOUNG PEOPLE

This project utilises an innovative solution to a major health care problem. Behavioural emergencies, such as aggression and self-harm, are increasing in frequency in acute health care settings. As well as a physical threat to the safety of children, other patients and health care staff, there are negative consequences for the immediate and ongoing physical and mental health of children, families and clinicians.

High-risk behaviours and aggression are often the child's attempt to communicate fear and frustration which can be magnified in the hospital setting. Children with more complex needs, including autism, are at increased risk for prolonged or abandoned investigations or treatments, poorer health outcomes and psychological trauma from hospital management processes. Acute care paediatric staff report a lack of confidence managing aggression in children, especially those with complex neurodevelopmental or mental health needs.

A complex problem which requires a confident, well-trained workforce: In order for children at high-risk for behavioural emergencies to be treated safely and with dignity in hospital, staff need to understand risk-factors and employ individualised communication techniques that are suitable for the developmental level of each child. A comprehensive training program providing practice of skills and reflection on performance is needed. This training program uses simulation to replicate the clinical experience via multidisciplinary team training providing repetitive practice of de-escalation and restraint skills without patient or staff risk. We are currently delivering and evaluating the effect this training has on staff confidence and performance in preventing and managing behavioural emergencies.

Supervisor: Dr Marijke Mitchell, marijke.mitchell@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours

RESEARCH PROJECTS

SIMULATION

DEVELOPMENT AND EVALUATION OF A NATIONAL PAEDIATRIC SURGERY SIMULATION-BASED EDUCATION PROGRAMME FOR CONSENT

Project combined with Prof Debra Nestel (Simulation Professor at Monash University).
The initial project will center on the translation of a simulation programme in the consent process to improve patient and parental outcomes.
Recruitment of paediatric surgical junior staff nationally into the trial via ANZAPS.
This is a very topical research process and will also involve the recording of the different consent conversations, correlation with clinician and parent recall and also the impact of a simulation medical educational intervention on the outcomes.

Supervisor: Prof Ram Nataraja, ram.nataraja@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours

USE OF WEARABLE TECHNOLOGY TO IMPROVE THE ERGONOMICS IN THE PAEDIATRIC SURGICAL OPERATING THEATRE, PHASE 2

There has been a wealth of novel technology including those devices that have been developed by. Monash University.
The aim of this project will be to harness this novel technology and apply it to the surgical operating room to improve the health and also ergonomics of all the operating room staff. This will build on a very successful pilot project that was completed in 2022.
There is great interest in this form of research at present and Monash Children's Simulation is leading the way with novel wearable technology and also other technology both in the simulation-based educational and clinical domains

Supervisor: Prof Ram Nataraja, ram.nataraja@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours

RESEARCH PROJECTS

SLEEP AND RESPIRATORY

> TEMPERATURE CHANGES DURING SLEEP IN CHILDREN WITH SLEEP DISORDERED BREATHING

The quality and quantity of sleep are very closely related to variations in body temperature: falling asleep generally occurs in the period when there is a decrease in internal temperature while spontaneous morning awakening is associated with an increase in body temperature. Variations in body temperature are associated with sleep in a causal manner, any practice that generates distal vasodilation, such as thermally by using a hot water bottle, or wearing socks or non-thermally by turning off lights, lying down, physical and/or cognitive relaxation, can promote more rapid sleep onset. Conversely, when distal skin temperatures are reduced , such has being in a cold draft, or having a cold bath, this promotes vigilance and wakefulness. Studies in adults have shown that sleep or alertness could be improved in a non-drug induced manner by simple thermal modifications without any side effects. Sleep, in terms of both quantity and quality, is of paramount importance for a child's neurological development, health and even survival. This raises the question of whether the relationship between body temperature and sleep is similar in children.

Sleep disordered breathing describes a range of severities of breathing disruption which ranges in severity from simple or primary snoring at the mild end to obstructive sleep apnoea (OSA) at the severe end. Primary snoring affects up to 35% of children while OSA occurs in 1-6% of children. OSA results in increased effort of breathing to overcome the partial obstruction of the upper airway and has been demonstrated to be associated with increased metabolic rate and energy expenditure during sleep. This study aims to provide proof-of-concept data that there is a difference in body temperature during sleep in children with more severe forms of OSA. Such data would open opportunities for investigation of easily-obtained temperature data for diagnosis of management alternatives in paediatric OSA.

This study will analyse time synchronised temperature recordings made using a small ibutton during sleep to determine the effects of sleep state and stage, sleep disruption and SDB severity on temperature across the night. Students will have the opportunity to be involved in overnight clinical sleep studies, collecting and analysing the temperature data recorded and matching this to sleep state and sleep disordered breathing severity recorded during the sleep study.

Supervisor: Prof Rosemary Horne, rosemary.horne@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours, BMedSc (Hons)

RESEARCH PROJECTS

SLEEP AND RESPIRATORY

> UNDERSTANDING EXCESSIVE DAYTIME SLEEPINESS IN CHILDREN

Children who experience excessive daytime sleepiness are referred to the Melbourne Children's Sleep Centre for assessment of idiopathic hypersomnolence or narcolepsy. Narcolepsy is a neurological disorder that affects your ability to wake and sleep. People with narcolepsy have excessive, uncontrollable daytime sleepiness. They may also suddenly fall asleep at any time, during any type of activity. Usually when you fall asleep you go through stages of non rapid eye movement (NREM) sleep, however people with narcolepsy go into REM sleep almost immediately in the sleep cycle and sometimes while they're awake. Idiopathic hypersomnia is similar in presentation to narcolepsy, but patients with this condition have no sleep-onset REM period, and naps are unrefreshing. Children with excessive daytime sleepiness are referred for an overnight sleep study at the Melbourne Children's Sleep centre, the following day children undergo a Multiple Sleep Latency Test where they are given the opportunity to try to nap every two hours throughout the day. There are two things being looked at: how long it takes the child to go to sleep and what type of sleep do they have when they go to sleep.

There have been case reports and small studies demonstrating autonomic dysfunction in adults with idiopathic hypersomnolence, there are few studies in children. Narcolepsy is associated with low hypocretin 1 levels. Hypocretins are involved in regulation of heart rate and blood pressure. This study will use heart rate variability as a non invasive measure of autonomic control to examine differences in autonomic control between children diagnosed with narcolepsy, idiopathic hypersomnolence and control children.
Students will have the opportunity to be involved in sleep studies and will analyse heart rate and sleep data collected from clinically referred children with and without excessive sleepiness.

Supervisor: Prof Rosemary Horne, rosemary.horne@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours, BMedSc (Hons)

RESEARCH PROJECTS

SLEEP AND RESPIRATORY

BAD SLEEP IS BAD FOR YOUR CARDIOVASCULAR HEALTH

The research of my group focuses on sleep in infants and children. This is of the utmost importance to the health of every baby and child. Sleep is the primary activity of the brain during early development. By the age of 2 years a child has spent a total of 13 months sleeping! Between 2 and 5 years of age children spend equal amounts of time asleep as awake. A common cause of sleep disruption in childhood is partial or complete upper airway obstruction, termed sleep disordered breathing, with the hallmark feature being snoring. The repetitive airway obstruction leads to intermittent periods of hypoxia, with perhaps even more damaging rapid re-oxygenation after release of the obstruction, which is known to lead to brain injury. Repetitive events also cause surges in blood pressure, which leads to hypertension. In this project we will examine the effects of sleep disordered breathing on vascular stiffness. Vascular stiffness reflects the compliance of the large conductance vessels and is an important contributor to increased cardiac stress and a risk factor for adverse cardiovascular events. It is a non-invasive method of assessing vascular dysfunction. Students will be involved in analysing the physiological data collected during overnight clinical sleep studies and will have the opportunity to participate in these in the Melbourne Children's Sleep Centre, Monash Children's Hospital to understand how the data are collected.

Supervisor: Prof Rosemary Horne, rosemary.horne@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours

OPTIMISING SCREENING, DIAGNOSIS AND MANAGEMENT OF OBSTRUCTIVE SLEEP APNOEA

The literature providing evidence of the high prevalence and significant impacts of snoring and obstructive sleep apnoea (OSA) in children is recent and increasing. Sleep studies are the gold standard for accurately defining the severity of OSA, informing treatment decisions, monitoring the progress of disease and monitoring treatment with airway pressure support or surgical intervention, respectively. Currently in-laboratory PSG (Level 1 PSG, hereafter L1 PSG) is used to screen, diagnose and monitor OSA in children. These studies are funded by the Australian government. However, L1 PSG has limited availability, high cost and significant inconvenience to families. Younger children (under 6 years) and those with neurodevelopmental disability comprise approximately 60% of the population referred for L1 studies yet these same children have the lowest tolerance for L1 PSG studies. . Simplified and unattended home sleep studies (Level 3, hereafter L3 studies) are widely used in Europe and offer an attractive option to reduce costs, facilitate the diagnostic process and expedite appropriate treatment, but there is limited evidence in highly selected populations as to their accuracy, clinical efficacy and cost effectiveness. This study is a clinical trial designed to evaluate the clinical, comparative- and cost-effectiveness of L3 sleep studies for both diagnostic and treatment monitoring pathways of OSA in children.

Supervisor: A/Prof Gillian Nixon, gillian.nixon@monash.edu
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RESEARCH PROJECTS

SLEEP AND RESPIRATORY

> LONG-TERM CONSEQUENCES OF RESPIRATORY INSTABILITY ON NEURODEVELOPMENTAL AND CARDIOVASCULAR OUTCOMES IN PRETERM INFANTS.

In Australia about 26,873 infants are born preterm each year. Despite an increase in survival, developmental morbidity has not improved, with more than half of surviving infants born < 28 weeks of gestation growing up with significant neurodevelopmental impairment. Even infants born moderately or late preterm (> 32 weeks of gestation) are at double the risk for neurodevelopmental disability at 2 years of age compared to term born peers, with impairments being mainly in the cognitive domain. With the rising rate of preterm birth world-wide, focus on hitherto unrecognised and untreated central apnoea and periodic breathing will determine if this common problem contributes to adverse outcomes. This study will answer important clinical questions: How do the falls in cerebral oxygenation associated with these immature breathing patterns affect neurodevelopmental outcomes? Which infants should be screened? Which infants may need treatment? Such a study would make a significant contribution to improving outcomes and reducing the long term consequences of preterm birth. Sleep studies were conducted in infants on 4 occasions: at 32-36 weeks postmenstrual age (PMA) whilst in the intensive care or special care nursery, at 36-40 weeks PMA in the Melbourne Children's Sleep Centre if they have been discharged home or in the special care nursery if they have not been discharged and at 3- and 6-months post term corrected age (CA). At 6 months and 2 years of age developmental assessments were conducted. Breathing patterns, sleep and arousal will be assessed and autonomic control assessed using heart rate variability. We hypothesise that respiratory events including short apnoeas and periodic breathing which are currently not detected or treated, will be associated with impaired neurodevelopmental outcomes and cardiovascular control in healthy preterm infants.

Supervisor: Prof Rosemary Horne, rosemary.horne@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours

RESEARCH PROJECTS

SLEEP AND RESPIRATORY

> UNDERSTANDING THE AETIOLOGY OF OBSTRUCTIVE SLEEP APNOEA IN CHILDREN BY EMPLOYING PHYSIOLOGICAL ENDOTYPING METHODS

Obstructive sleep apnoea (OSA) is a condition characterised by repetitive collapse of the upper airway during sleep and affects both adults and children. Understanding of the different aetiology of OSA makes targeted therapy with the highest chance of efficacy possible for individuals. Our world leading methods for defining this "endotype" (upper airway collapsibility, muscle compensation, loop gain/respiratory control, and arousal threshold) from routinely collected sleep study data (polysomnography or PSG) have been shown in adults to predict the efficacy of treatment interventions such as upper airway surgery and medications. We have recently shown that this method can be applied to children and now plan several studies investigating the prevalence of these endotypes in children referred for investigation of possible OSA and the change in these physiological parameters after surgical treatment.

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RESEARCH PROJECTS

WATCHPAT AS A DIAGNOSTIC DEVICE FOR OBSTRUCTIVE SLEEP APNOEA IN CHILDREN

Obstructive sleep apnoea (OSA) affects 1-5% of otherwise healthy children and high rates of children with certain medical comorbidities such as Down Syndrome and obesity. The diagnosis is made by polysomnography (PSG), an expensive and time-consuming test that involves collection of many channels of physiological data overnight, most commonly in an inpatient sleep laboratory setting. Alternatives to PSG that are accurate and easy to perform are desirable, to enhance access to appropriate diagnosis and treatment for children with suspected OSA, in the interests of reducing the morbidity of the condition, especially cardiovascular, behavioural and cognitive/learning impacts.

One such alternative to PSG is the WatchPAT device (Itamar Medical Ltd., Caesarea, Israel). WatchPAT is a small watch-like device attached to the patient's wrist with a probe on the fingertip. It derives data based on a change of peripheral arterial tone (PAT). The PAT signal is a non-invasive measure of the arterial pulsatile volume changes at the fingertip: the signal reduction and the consequent accelerated pulse rate reflect sympathetic activation occurring with repetitive autonomic arousals typically seen in OSA. This device has been widely studied in adults and validated against in-laboratory polysomnography, but fewer studies involving small numbers have examined the WatchPAT in children. Given the limited and conflicting evidence base in children and an observed increase in use of WatchPAT as a diagnostic device in the community, we aim to validate the use of WatchPAT in children with suspected OSA against the gold standard of in-laboratory polysomnography (sleep studies).

Supervisor: A/Prof Gillian NIxon, gillian.nixon@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Masters by Coursework, Honours, BMedSc (Hons)

RESEARCH PROJECTS

TESTICULAR TISSUE PERCENT OXYGEN SATURATION (%STO2) MEASURED BY TRANS-SCROTAL NEAR INFRARED SPECTROSCOPY IN CHILDREN UNDERGOING ORCHIDOPEXY.

Rationale for the study
Surgery for the treatment of undescended testes may lead to some adverse long-term effects upon the structures of the inguinal canal, including damage to the blood vessels, which might eventually result in reduced testicular function or in the worse scenario to testicular atrophy.
Study population
Infants and children undergoing orchidopexy for undescended testes.
Clinical outcomes
Near infrared spectroscopy %StO2 readings obtained from testes before surgery, in the immediate post-operative period, at 1-month and 6-month follow-up will be correlated with the size of the testicle using Prader orchidometer.

Supervisor: Dr Maurizio Pacilli, maurizio.pacilli@monash.edu
Available Options: Honours, BMedSc (Hons)

TESTICULAR TISSUE PERCENT OXYGEN SATURATION (%STO2) MEASURED BY TRANS-SCROTAL NEAR INFRARED SPECTROSCOPY IN CHILDREN UNDERGOING LAPAROSCOPIC AND OPEN INGUINAL HERNIA REPAIR.

Rationale for the study
Open surgery for the repair of inguinal hernia may lead to some adverse long-term effects upon the structures of the inguinal canal, including damage to the blood vessels, which might eventually result in reduced testicular function or in the worse scenario to testicular atrophy.
Laparoscopic inguinal hernia repair has the potential advantage of reducing the damage to the blood vessels preserving the testicular function.
Study population
Neonates, infants and children undergoing inguinal hernia repair via open or laparoscopic technique.
Clinical outcomes
Near infrared spectroscopy %StO2 readings obtained from testes before surgery, in the immediate post-operative period, at 1-month and 6-month follow-up will be correlated with the size of the testicle using Prader orchidometer.

Supervisor: Dr Maurizio Pacilli, maurizio.pacilli@monash.edu
Available Options: Honours, BMedSc (Hons)

RESEARCH PROJECTS

> IDENTIFYING RESEARCH PRIORITIES FOR PAEDIATRIC SURGERY IN AUSTRALIA AND NEW ZEALAND

Paediatric surgeons manage a spectrum of conditions, from the neonatal period up to 16-18 years of age; however much of the scientific evidence for relevant treatment pathways is of low quality. For many conditions, treatment varies from centre to centre and even from surgeon to surgeon, often based on expert opinion; children with the same condition might have surgery in one unit but watchful waiting in another. Underlying this variation are differences in opinion, and insufficient high-level evidence with few prospective randomized studies. Such studies may be challenging to design, fund and recruit into, and are more likely to succeed if there is a collaborative approach.

As a result, much of the paediatric surgical literature is populated with case studies or retrospective case-series rather than quality randomised controlled trials.

For laboratory-based research, the increased regulation and small case numbers has limited the availability of normal and disease-specific tissue specimens from children, meaning that researchers are often reliant on animal models with questionable applicability to human disease.

In Australia and New Zealand specific challenges for research in Paediatric Surgery include:

- Collaboration: Bringing together paediatric surgeons, researchers, and policymakers through collaborative research for large-scale studies is often difficult due to geographical distances and variations in local health policies.
- Funding limitations: securing adequate funding for child-focused research can be difficult, especially for long-term studies. Raising awareness about the need for child-focused research among government bodies, industries, and philanthropic organisations might help secure better funding.
- Data Collection: Gathering reliable data from children requires age-appropriate methods and tools, which can be complex and resource-intensive. Developing creative ways to design prospective randomized studies, including age-appropriate tools and inclusive protocols, could help overcome recruitment and data collection barriers.
- Policy Impact: Translating research findings into actionable policies that benefit children and families is often a slow and challenging process.

This study includes two parts:

- Literature review aiming at identifying current areas of research for Paediatric Surgery in ANZ
- Scoping survey of the Australian and New Zealand (ANZAPS) members to ascertain consensus on what paediatric surgeons, working in ANZ, consider to be areas of priority for research

We hope that this study will form the basis for collaborative research to standardise the diagnosis and management of paediatric surgical conditions.

Supervisor: Dr Maurizio Pacilli, maurizio.pacilli@monash.edu
Available Options: Masters by Research, Honours, BMedSc (Hons)

RESEARCH PROJECTS

SURGERY AND ACUTE CARE

EVALUATION OF A STRESS REDUCTION PROGRAMME FOR ACTIVE SURGEONS USING WEARABLE TECHNOLOGY

Stress and the ways that medical professional deal with it has received a renewed interest in recent times
With novel wearable technology the stress levels of an individual can be monitored and different factors that affect it can be determined
The aim of this project is the establishment of a baseline stress level for surgeons of various seniority and also speciality. Once established a targeted intervention will be occur and its impact assessed

Supervisor: Prof Ram Nataraja, ram.nataraja@monash.edu
Available Options: PhD/Doctorate, Masters by Research, BMedSc (Hons)

REMOTE SURGICAL ASSISTANCE IN LOW RESOURCE SETTINGS USING WEARABLE AUGMENTED REALITY HEADSETS

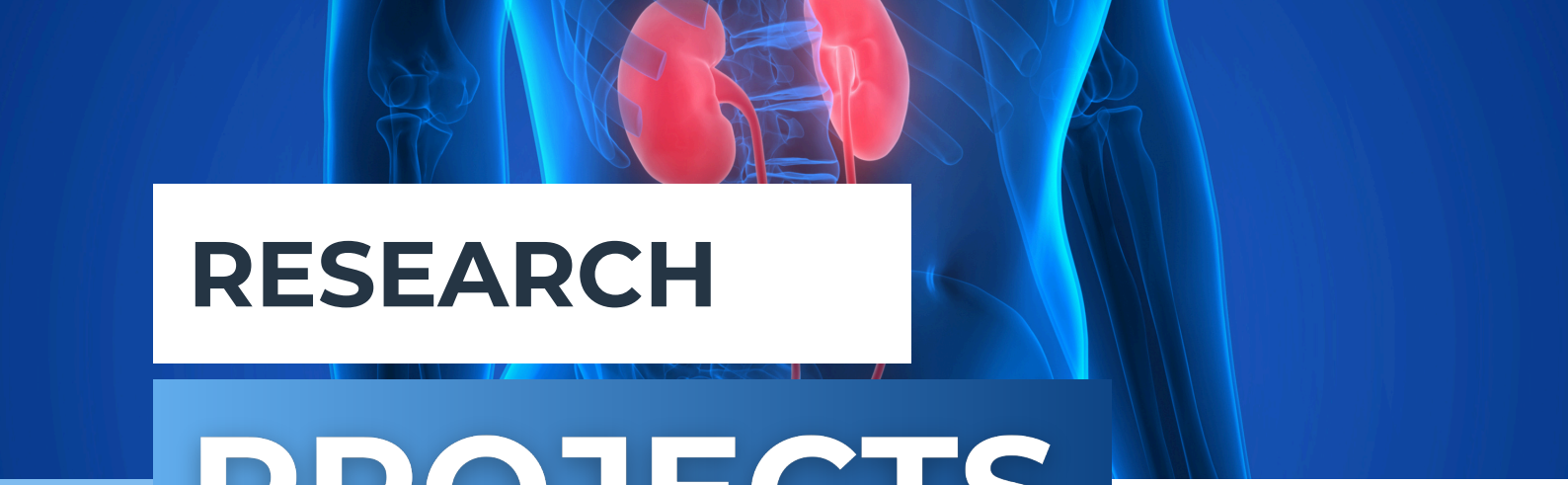
Global Surgery has changed in focus since the publication of the Lancet Commission. There is an increased focus on the upskilling and increased support of surgeons in low resource settings. This project builds on initial successful trials utilising HoloLens at MCS to perform a feasibility study for remote surgical assistance in a low resource setting.

Supervisor: Prof Ram Nataraja, ram.nataraja@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours**,** BMedSc (Hons)

VALIDATION OF A 3D PRINTED AND MOULDED HIGH FIDELITY AND REALISM SIMULATOR FOR PAEDIATRIC LAPAROSCOPIC INGUINAL HERNIA REPAIR

There is a requirement for paediatric surgical specific models and simulators to be used in a laparoscopic bench trainer for the acquisition of essential skills prior to direct patient contact. This is in a simulation-based safe environment that allows the learner to use deliberate practice to acquire skills in their own time. We have developed a number of different models over the last few year that have been validated and published but there is a requirement for more in the future.
We have a high fidelity and high realism inguinal hernia simulator to be used as a laparoscopic inguinal hernia simulator for paediatric surgical training which requires testing for the final stages of development and then expert testing prior to a clinical trial with paediatric surgical trainees.

Supervisor: Prof Ram Nataraja, ram.nataraja@monash.edu
Available Options: PhD/Doctorate, Masters by Research, Honours**,** BMedSc (Hons)



RESEARCH PROJECTS

UROLOGY

ARTIFICIAL INTELLIGENCE IN THE PAEDIATRIC UROLOGY THEATRE

The intraoperative period is a data-rich environment that is currently poorly captured by didactic operation reports. Intra-operative events have substantial impacts on recovery, postoperative complications and ultimate outcomes. Despite this minimal data are currently recorded, analysed or collected in this setting.

Hypospadias represents a highly variable phenotype, with a spectrum of surgical techniques for treatment. Further to specific techniques there is "devil in the detail" of how these techniques are performed on a case-be-case basis. Furthermore, even amongst world leading and experienced units hypospadias surgery retains a challenging and variable complication profile.

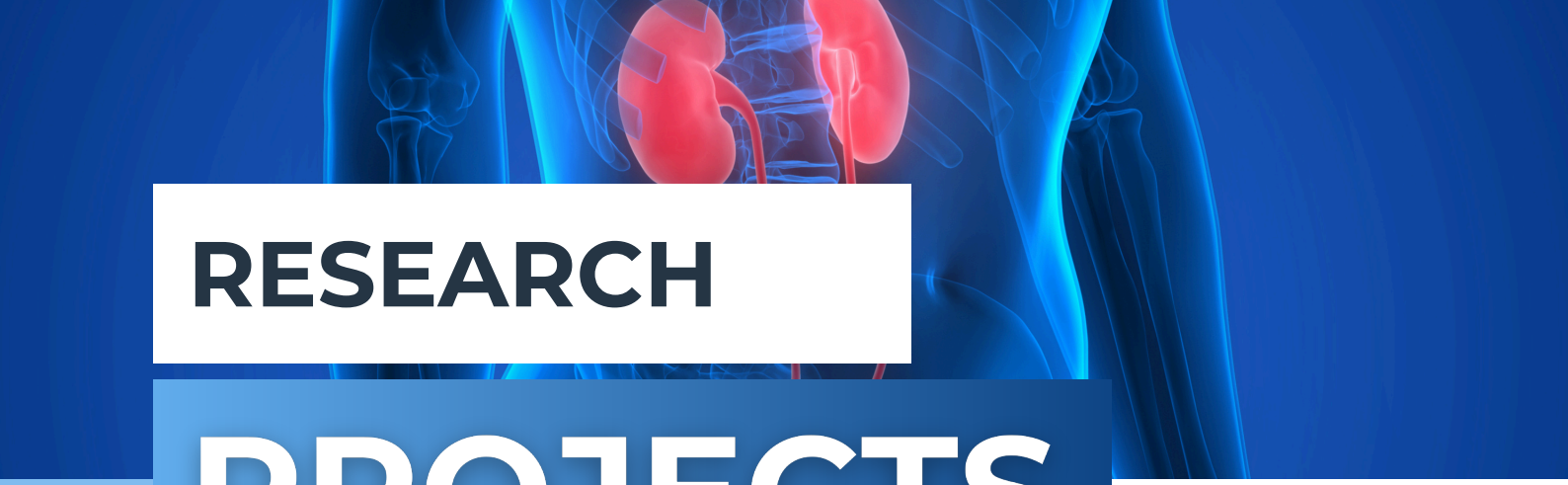
These factors produce a fertile-ground for future studies. This project involves establishing and utilising captured surgical videos of consecutive patients and the integrated use of AI and surgical supervision to analysis operative techniques and ultimate outcomes. The systematic and methodological analysis of surgical techniques in hypospadias has great potential to deepen understanding of the cause of complications and success. This represents a significant tool in education, audit, quality improvement, and establishing an evidence-base with a greater richness then has currently been realised.

Supervisor: A/Prof Kiarash Taghavi, kiarish.taghavi@monash.edu
Available Options: PhD/Doctorate, Masters by research, BMedSc (Hons)

EXPLORING PEDIATRIC BLADDER HEALTH: DEVELOPMENT, DIAGNOSTICS, AND THERAPEUTICS

The pediatric bladder can be influenced by various poorly understood factors, despite ongoing efforts by international organizations, such as the International Children's Continence Society (ICCS), to standardize definitions and interventions.
This project aims to:
1. Investigate Bladder Development: Explore the developmental processes of the bladder that may lead to functional pathologies.
2. Evaluate Novel Diagnostic Approaches: Assess current innovative methods for bladder diagnostics to enhance accuracy and patient comfort.
3. Examine Neuropharmacology and Therapeutics: Review the neuropharmacological mechanisms of the bladder and evaluate emerging therapeutic options.
Through this research, we seek to deepen our understanding of paediatric bladder health and improve diagnostic and treatment strategies.

Supervisor: A/Prof Kiarash Taghavi, kiarish.taghavi@monash.edu
Available Options: Honours, BMedSc (Hons)



RESEARCH PROJECTS

UROLOGY

THE EVOLVING ROLE OF ROBOTIC SURGERY IN PAEDIATRIC UROLOGY

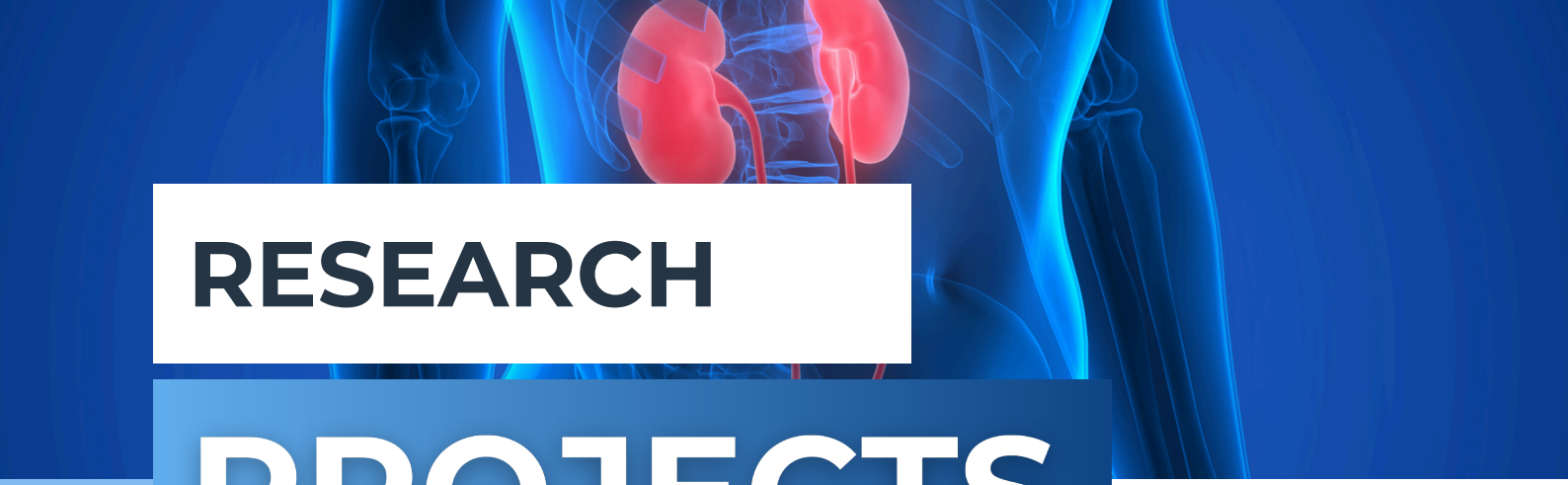
Minimally invasive surgery is experiencing rapid advancements in techniques, technology, and applications. Previous studies have focused on the implementation of robotic surgery in paediatric populations, including comprehensive reviews and evaluations of prospective robotic surgical databases in paediatric surgery and urology.

Looking ahead, future research initiatives will focus on several key areas. One avenue is the development of a bi-national multi-centre robotic paediatric urology database, which would facilitate the collection and analysis of data across institutions to enhance our understanding of robotic surgical outcomes in children.

Additionally, there is a critical need to investigate the training and education of paediatric surgical trainees in robotic surgery. Establishing structured research programs aimed at improving training methodologies and educational resources will be essential to ensure that the next generation of surgeons is well-equipped to utilize these advanced techniques effectively.

By addressing these areas, we can further advance the field of paediatric robotic surgery and improve patient outcomes through enhanced training and collaborative research efforts.

Supervisor: A/Prof Kiarash Taghavi, kiarish.taghavi@monash.edu
Available Options: Honours, BMedSc (Hons)



RESEARCH PROJECTS

UROLOGY

LONG-TERM OUTCOMES OF ANTENATAL HYDRONEPHROSIS IN RELATION TO ADULT PYELOPLASTY

Background:
Antenatal hydronephrosis (ANH) occurs in approximately 1% of pregnancies. While many affected infants undergo monitoring and are discharged without intervention, 30-60% will ultimately receive a pathological diagnosis. Moreover, around 50% of severe cases may require surgical intervention, such as pyeloplasty, during childhood.

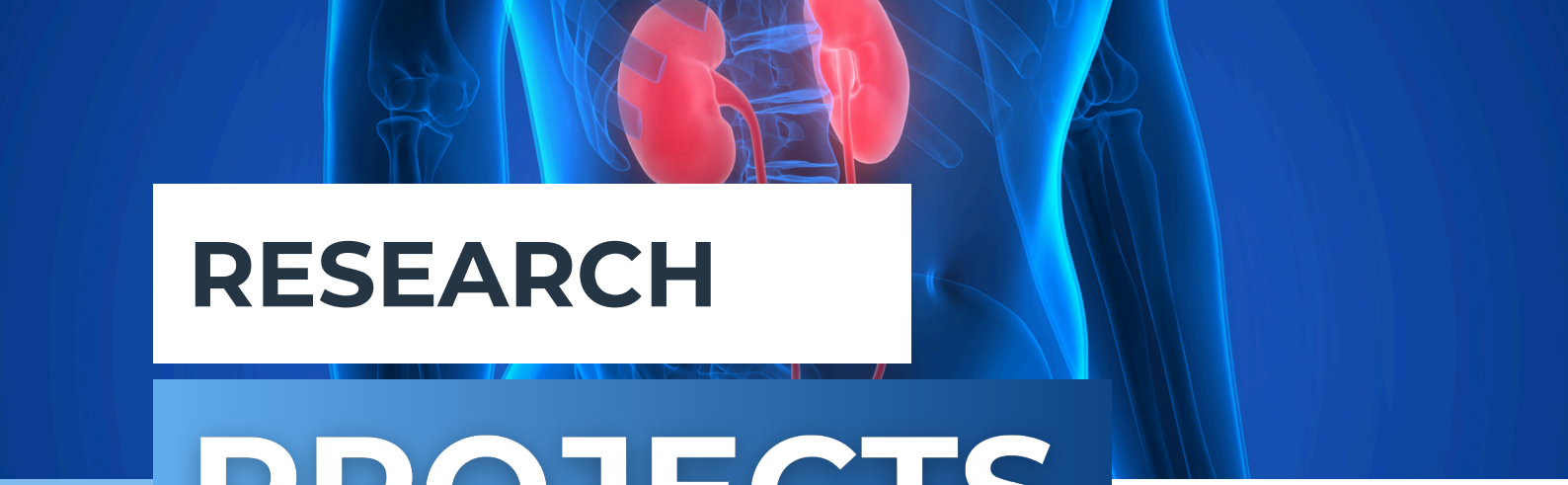
Rationale:
Despite the prevalence of ANH, there is a significant gap in the literature regarding the long-term outcomes for individuals diagnosed with ANH and their subsequent need for surgical treatment in adulthood. This study will focus on a specific sample frame: adults who have undergone pyeloplasty. By investigating this population, we aim to assess the prevalence of ANH in childhood among those requiring surgical intervention and the extent and results of the investigations they received during childhood.

Objectives:
This study will systematically review adults who have had pyeloplasty over several decades. We will explore the following key questions:

- What percentage of these adults had a diagnosis of antenatal hydronephrosis during childhood?
- To what extent were their conditions investigated during childhood?
- What details of their investigations and clinical presentations can inform our understanding of the relationship between childhood ANH and adult surgical requirements?

Hypothesis Generation:
The primary goal of this research is to generate hypotheses regarding potential predictive factors associated with the necessity for pyeloplasty during childhood. Specifically, we will investigate whether certain indicators observed during childhood can serve as reliable predictors for the surgical intervention in adulthood.

Supervisor: A/Prof Kiarash Taghavi, kiarish.taghavi@monash.edu
Available Options: Masters by research, BMedSc (Hons)



RESEARCH PROJECTS

UROLOGY

> EVALUATING SURFICAL OUTCOMES OF ORCHIDOPEXY IN INFANTS AND CHILDREN: A STUDY AT MONASH AND ROYAL CHILDREN'S HOSPITALS

Study Overview:
This research focuses on children undergoing orchidopexy at two prominent hospitals in Victoria: Monash Children's Hospital and the Royal Children's Hospital. The primary objective is to define the expected outcomes for infants and children scheduled for this procedure.

Sampling Frame:
The study will utilize a sampling frame comprising all children booked for orchidopexy at both hospitals over a two-year period. This comprehensive approach will ensure a robust dataset for analysis.

Outcomes of Interest:
The following key outcomes will be collected for analysis:

Age Metrics:
Age at referral
Age at booking
Age(s) at the time of surgery

Procedural Details:
Type of procedure performed, categorised as:
Examination Under Anesthesia (EUA) only
Inguinal orchidopexy
Laparoscopy (including excision of testicular remnant)
One-stage or two-stage orchidopexy

Surgical Outcomes:
Operative findings
Incidence of testicular atrophy upon follow-up
Early need for re-operation (if applicable)

Significance of the Study:
By systematically collecting and analysing these outcomes, this study aims to provide valuable insights into the effectiveness and implications of orchidopexy in paediatric patients. Understanding these factors can inform clinical practices and enhance decision-making processes for healthcare professionals involved in paediatric urology.

Supervisor: A/Prof Kiarash Taghavi, kiarish.taghavi@monash.edu
Available Options: Masters by research, BMedSc (Hons)

We look forward to welcoming you to the Department of Paediatrics, Monash University