MRes in Clinical Sciences

Research Projects

Academic Year 2025/26

Please read through the research project choices available below and list your top 4 choices in order on your reply slip

Projects are organised according to Programme (Research) Pathways. Projects can be attributed to more than one pathway; to avoid repetition, projects are only listed once in this booklet. Information about all applicable pathways is provided for each of the projects.

Contents

Cardiovascular and Metabolic Medicine

Project Title	Can ischaemic conditioning trigger vasodilation in a tissue model?
Project ID	77
Supervisor	Richard Rainbow
Pathway	Cardiovascular and Metabolic Medicine
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

High blood pressure is a significant cardiovascular risk factor, with over 7 million people in the UK alone living with hypertension. It is estimated that there are a further 3 - 4 million UK adults who are hypertensive without currently being aware of this. Increased arterial pressure increase the preload and afterload on the heart, essentially meaning that it has to work harder to pump blood around the vascular system. This leads to longer-term changes in myocardial structure, and if left untreated, could ultimately lead to heart failure. In this project, the student will investigate the effects of a phenomenon known as remote ischaemic conditioning on vascular reactivity. Using perfusate isolated from ischaemic hearts, the student will assess the effects of this perfusate on vascular function using a wire-myography model. In patients, ischaemic conditioning has been shown to lower blood pressure for around 2 hours following the stimuli, and so project will investigate this mechanism, and assess whether conditions such as diabetes may block this protective effect.

Project Title	Mapping and Evaluating Practical Implementation Tools in Healthcare AI Ethics Policies and Guidelines: A Systematic Review
Project ID	87
Supervisor	Deirdre Lane
Pathway	Cardiovascular and Metabolic Medicine
Type of Project	Desk based (require bench fee of £1,000)
Project Location	William Henry Duncan Building

Project Description:

As artificial intelligence (AI) technologies become increasingly embedded within healthcare systems, the need for robust and ethical governance is more urgent than ever. Despite the existing policies and guidelines, there is a marked lack of understanding of how these principles are operationalised, using practical mechanisms such as checklists, impact assessments, audit protocols, and other tools for real world monitoring.

This systematic review will aim to identify, categorise, and critically appraise the practical mechanisms currently available to operationalise AI ethics in healthcare. We will explore these tools to describe the ways in which these are adopted, adapted, and assessed across several healthcare contexts and regulatory environments around the world. The study will generate actionable insights to inform policymakers and healthcare providers as well as AI developers to responsibly, transparently, and effectively integrate AI technologies into clinical practice.

This work is connected to the Horizon Europe-funded TARGET project (https://target-horizon.eu/) aiming to build virtual twin-based AI decision tools in healthcare. Depending on the quality of the work completed, there will be the opportunity to contribute to a publication.

Project Title	Diabetic retinopathy in type 1 diabetes initiating hybrid closed loop pump (INSIGHT-1)
Project ID	88
Supervisor	Uazman Alam
Pathway	Cardiovascular and Metabolic Medicine
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	LUHFT and WHD (UoL)

Project Description:

Any prospective student will be attached to a clinical resarch fellow working on the project. The student will work on a specific aspect of the project.
INSIGHT-1 will study in detail the vascular structure of the retina, alongside function of the neuroretina. Current screening of diabetic retinopathy in T1D can be as infrequent as every two years, but more commonly annually. Rapid reductions in HbA1c and increase in time in range, as soon as 1 month is observed with HCL initiation. Therefore, our proposed method of screening at baseline, 3, 6 and 12 months will increase the detection rate of any changes of the neuroretina and provide much needed insight into early worsening of diabetic retinopathy.
RESEARCH QUESTION/AIM(S)
The aim of INSIGHT-1 is to evaluate whether HCL insulin delivery is associated with development of EWDR, and to gain mechanistic insights into the condition.
Objectives
1. To pilot an enhanced eye screening programme, including assessment of the function of the neuroretina in individuals with type 1 diabetes who are newly initiated on HCL.
2. To explore differences in tear growth factors in individuals who develop EWDR and the risk factors associated with EWDR.
3. To develop and test a novel predictive artificial intelligence (AI) model of EWDR.

Project Title	Interaction of blood pressure and oral anticoagulation for stroke prevention in patients with atrial fibrillation.
Project ID	89
Supervisor	Dr Helen Shantsila
Pathway	Cardiovascular and Metabolic Medicine
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD

Project Description:

The project will be a secondary analysis of data collected in the UK, for the Atrial Fibrillation General Long-Term UK extension registry (AF-GEN-UK). The study will assess the clinical implications of interaction between blood pressure and anticoagulation choice on clinical outcomes such as stroke, bleeding and mortality.

Project Title	Childhood Obesity
Project ID	4
Supervisor	Senthil Senniappan
Pathway	Cardiovascular and Metabolic Medicine;
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's Hospital

Project Description:

Assessing various complications in relation to childhood obesity

Project Title	Psychometric Evaluation of a Staff Perception Questionnaire to assess Care Delivery for patients at the end of life.
Project ID	63
Supervisor	Dr Stephen Mason
Pathway	Cardiovascular and Metabolic Medicine; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	The project is with the Palliative Care Unit, based at the William Henry Duncan Building.

Project Description:

This MRes project focuses on the psychometric analysis of a staff perception questionnaire developed by colleagues within the International Collaborative for the Best Care for the Dying Person - https://www.bestcareforthedying.org . The questionnaire evaluates staff perceptions of delivering care using an established clinical model of care - the 10/40 Model - https://www.bestcareforthedying.org/10-40-model. Although the current questionnaire has been purposively developed and possesses 'face' validity, it lacks robust psychometric evaluation.

The primary objective of this project is to conduct a thorough psychometric analysis to assess the reliability and validity of the questionnaire. This involves establishing psychometric properties, such as internal consistency, construct validity, and criterion validity, to ensure the questionnaire accurately measures staff perceptions and provides reliable data.

The study will involve collecting both qualitative and quantitative data from a diverse sample of healthcare staff across different settings and analysing the data using thematic analysis and advanced statistical techniques. By identifying strengths and weaknesses in the questionnaire's design, the project aims to refine and improve the tool, making it more effective for evaluating staff perceptions of care delivery.

Ultimately, this project seeks to enhance the understanding of staff experiences and perceptions, contributing to the development of better care and improving patient outcomes. The findings will inform future research and practice, supporting the ongoing efforts of the International Collaborative in advancing healthcare quality.

Project Title	The Clinical Utility of Cardiac CT Angiogram in Hyperacute Stroke Settings Compared to Standard-of-Care Imaging: A Systematic Review and Meta-Analysis.
Project ID	79
Supervisor	Azmil Abdul-Rahim
Pathway	Cardiovascular and Metabolic Medicine; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD

Project Description:

1. Title: The Clinical Utility of Cardiac CT Angiogram in Hyperacute Stroke Settings Compared to Standard-of-Care Imaging: A Systematic Review and Meta-Analysis.

2. Background

Hyperacute ischaemic stroke, defined as stroke within 24 hours of symptom onset, often results from embolic sources. While standard imaging protocols prioritise brain and neck vascular evaluation, cardiac pathology as a source of embolism is frequently underexplored. Cardiac CT angiography (cardiac CTA) may offer an efficient approach to identify cardiac sources of embolism, enhancing diagnostic accuracy and guiding timely intervention. However, the clinical utility of incorporating cardiac CTA into the initial imaging protocol remains unclear.

This project will undertake a systematic review and meta-analysis to assess the diagnostic and clinical utility of cardiac CTA when incorporated into hyperacute stroke imaging, compared with existing imaging protocols.

3. Methods

The project will proceed in two stages:

i. Protocol Development: A comprehensive systematic review protocol will be drafted and registered with PROSPERO. This will define inclusion criteria, data extraction methods, and prespecified outcomes relevant to diagnostic and therapeutic utility.

ii. Systematic Review and Meta-analysis: A thorough and methodologically rigorous synthesis of available evidence will be undertaken. The analysis will evaluate both diagnostic yield and clinical endpoints, supported by appropriate statistical methods, and risk of bias assessment.

4. Expected Outcome

The student will be expected to draft a systematic review and meta-analysis protocol, to review literature in this area systematically, and to undertake the analyses him/herself under guidance from the supervisor (Dr Abdul-Rahim). A good student who devotes appropriate time and enthusiasm should expect to produce a report that would be suitable for presentation at an international stroke meeting and possibly a manuscript for publication. Depending on the level of support required for systematic review, meta-analysis and writing the student will be offered the chance of co-authorship on any potential publication.

The systematic review and meta-analysis may be extensive and time-consuming, and will require synthesis of varied results. This is expected to yield material that would be readily publishable in its own right. The topic remains topical and will attract discussions. There are several issues that are of interest and value in the project planning and discussion phases. The literature searching, data handling and writing skills will be of generic value for a future research career; any presentation or publication will enhance the curriculum vitae; and an outstanding student may be invited to maintain an association with the department for mentorship through further medical training. Limited clinical involvement will be encouraged to enhance understanding of the issues.

The topic area extends across the major cardiovascular themes of stroke, cardio-embolism, imaging and evidence-based medicine (high quality systematic review and meta-analysis) and thus will be relevant to a range of future career or research interests.

5. Eligible student

The successful student should be able to demonstrate fluent writing skills, an existing facility with statistical techniques and a particular aptitude in learning literature appraisal and data handling techniques. Interested students should contact Dr Abdul-Rahim to discuss their suitability before nominating this project as their choice.

6. Facilities available

The stroke research group is internationally recognised. The supervisor, Dr Abdul-Rahim, is a Fellow of the European Stroke Organisation (ESO). He is a Clinical Senior Lecturer, with excellent research portfolio in cardio-embolic stroke. Postgraduate students associated with the group have been uniformly successful in completing MD or PhD degrees on time, and undergraduate students have a good tra

Project Title	Investigating the Dual Cardioprotective and Antitumour Effects of SGLT2 Inhibitors in Immune Checkpoint Inhibitor Therapy
Project ID	76
Supervisor	Parveen Sharma
Pathway	Cardiovascular and Metabolic Medicine; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	Sherrington Buliding

Project Description:

Background:
Immune checkpoint inhibitors (ICIs) have transformed the treatment landscape of solid tumours by empowering the immune system to eliminate cancer cells. However, these therapies are associated with immune-related adverse events, including cardiotoxicity, which occurs in approximately 1–3% of patients and carries a fatality rate of up to 50%.
Sodium-glucose co-transporter 2 inhibitors (SGLT2i), initially developed for type 2 diabetes, have demonstrated clinical benefits in heart failure and chronic kidney disease. Emerging observational evidence suggests that SGLT2i may not only mitigate ICI-induced cardiotoxicity but also enhance antitumour responses. Despite this promise, the underlying mechanisms of these dual effects remain poorly understood.
Objectives:
To investigate the antitumour properties of SGLT2i and their potential synergism with ICIs.
To elucidate the molecular mechanisms through which SGLT2i confer cardioprotection during ICI therapy.
To examine the immunomodulatory effects of SGLT2i in the context of ICI treatment.
Experimental Approach:
A co-culture model will be employed to simulate the immune-tumour and immune-cardiac interactions under ICI therapy:
Immune + Cancer Cells: To assess antineoplastic effects and immune activation.
Immune + Cardiac Cells: To evaluate immune-mediated cardiotoxicity and the cardioprotective impact of SGLT2i.
Key Outcomes and Methodologies:
Antitumour Activity: Cell viability, proliferation, apoptosis, metabolic assays, and protein expression profiling in cancer cells.
Cardioprotection: Viability, oxidative stress, metabolic function, electrophysiology, and protein expression in cardiomyocytes.
Cytokine Profiling: Quantification of cytokine secretion patterns following ICI and SGLT2i treatment.
Functional Validation: siRNA knockdown of candidate cytokines and proteins to determine their roles in mediating SGLT2i effects.

Project Title	Machine Learning on Patient Data
Project ID	73
Supervisor	Wahbi El-Bouri
Pathway	Cardiovascular and Metabolic Medicine; Eye and Vision Science; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD

Project Description:

Using patient data, students will learn how to develop machine learning models to predict outcomes in diabetes and pulmonary embolism datasets.

Project Title	Interplay of Diet, Exercise, Metabolism, and Gut Health in Muscle and Cardiovascular Function: Implications for Disease and Therapy
Project ID	8
Supervisor	Masoud Isanejad
Pathway	Cardiovascular and Metabolic Medicine; Musculoskeletal and Aging Science; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD, LUHFT

Project Description:

In this project the students will be able to investigate clinical/ biological factors that are linked to health and disease in human. Especially the frailty and sarcopenia (decline of muscle quality, force and mass), heart failure and Cardiometabolic Multi-morbidities. These projects will investigate the mechanism by which muscle quality decline can be prevented in ageing via novelty nutrition, exercise approach, as well as diagnosis and assessment. Students can get involved with data analysis, laboratory experiments, and systematic review. The specific research questions can be subject to change and will be decided according to the student's interests.

Further Reading:

1- Randomised controlled trial combining vitamin E-functionalised chocolate with physical exercise to reduce the risk of protein-energy malnutrition in predementia aged people: study protocol for Choko-Age. (PMID: 38135320).
2- Impact of probiotics on muscle mass, muscle strength and lean mass: a systematic review and meta-analysis of randomized controlled trials (PMID: 36414567).
3- Exercise and nutritional interventions on sarcopenia and frailty in heart failure: a narrative review of systematic reviews and meta-analyses (PMID: 35840310).
4- Frailty alone and interactively with obesity predicts heart failure (PMID: 37165564).
5- Lipid profile, lipid ratios, apolipoproteins, and risk of cardiometabolic multimorbidity in men (PMID: 35049039).

Project Title	Consensus Validation of an Updated Clinical Conversation Guide for Future Care Planning: A Comparative Study Between UK and US Practices
Project ID	62
Supervisor	Dr Stephen Mason
Pathway	Cardiovascular and Metabolic Medicine;Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	The project is located with the team from the Palliative Care Unit, in the William Henry Duncan Building.

Project Description:

This project aims to validate an updated clinical conversation guide designed to promote future care planning and goal-concordant care among healthcare professionals (HCPs) and patient/public engagement (PPE). The conversation guide, originally developed and currently used in practice in the UK, has undergone revisions by the originating team in the US. The primary objective is to assess the acceptability and effectiveness of these changes through expert group consensus.

The validation process involves gathering feedback from a diverse group of experts, including clinicians, researchers, and patient advocates, to ensure the updated guide aligns with best practices and meets the needs of both HCPs and patients. The study will compare the original UK version with the revised US version, focusing on key aspects such as clarity, usability, and relevance to clinical practice.

By conducting this comparative study, the project aims to enhance the conversation guide's utility in facilitating meaningful discussions about future care planning, ultimately improving patient outcomes and ensuring care aligns with patients' goals and preferences. The findings will inform further refinements and broader implementation of the guide across different healthcare settings.

Project Title	New onset atrial fibrillation during acute illness: Which treatments are continued at hospital discharge?
Project ID	90
Supervisor	Ingeborg Welters
Pathway	Cardiovascular and Metabolic Medicine;Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LUHFT (Royal site)

Project Description:

Atrial fibrillation (AF) is the commonest arrhythmia in acute and critical illness and is associated with poor short and long-term outcomes. It often occurs in patients without a previous history of AF, so that the term "new onset atrial fibrillation" (NOAF) had been coined. In the acute setting episodes of AF are often transient and resolve as the patient recovers from the acute condition.

For patients with an established AF, anticoagulation is the mainstay to prevent AF-related ischaemic stroke. However, due to the transient nature of NOAF during acute illness, guidance on long-term anticoagulation is less clear. Although highly effective in preventing AF-related stroke, oral anticoagulants are associated with a higher rate of bleeding events, making risk-benefit evaluations for long-term anticoagulation more difficult in this particular patient group.

The second key component of treating NOAF associated with acute illness is the use of anti-arrhythmics. Several studies and surveys have demonstrated that amiodarone is the most commonly used anti-arrhythmic prescribed for NOAF in the acute setting. However, long-term use is not without side effects and needs close evaluation. Other anti-arrhythmics, including beta-blockers and digoxin, are less commonly used in the acute setting, but are regularly prescribed for patients with arrhythmia in the community.

In this project we will explore local practice with regards to prescription of anticoagulation and continuation of anti-arrhythmic therapy in patients who have experienced an episode of NOAF during acute and critical illness. We will exploit and - where necessary - amend an existing local database to establish local therapy regimes for patients with NOAF.

Comparison will be made with treamtents for patients with a known history of AF.

We will then use an existing publicly available database (TriNetX) to compare local results with national and international practice.

Specific questions to be answered include: 1. Which percentage of patients with NOAF receive anticoagulation at hospital discharge? 2. Which are common reasons to not start anticoagulation in these patients? 3. How does the anticoagulatory regime in patients with NOAF compare with treatment of patients with a known history of AF? 4. Which anti-arrhythmic medication is continued in patients with either preexisting AF or NOAF beyond hspital discharge? 5. How do local results compare to national and international practice?

Learning opportunities for during this MRes project include handling of large data sets, basics of medical statistics and use of common statistical software packages, familiarisation with cardiovascular risk assessment, generation of preliminary data for a full research project, systematic literature review and writeup of results. The student will be integrated into the multi-disciplinary acute care research team at the Critical Care Unit at the Royal Liverpool University Hospital. Experience exist with management of large datasets, securing research funding, clinical research governance, use of the TriNETX database and clinical research studies. Our team consists of research nurses, cardiology and intensive care trainees, research fellows, PhD and MD students.

Project Title	Is enhanced organic anion transport an adaptive mechanism in the inherited metabolic disorder alkaptonuria?
Project ID	95
Supervisor	Dr Brendan Norman
Pathway	Cardiovascular and Metabolic Medicine;Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

The kidney plays a vital role in maintaining homeostasis by removal of a wide range of substrates from the body, including metabolite waste products. This project will focus on kidney function in alkaptonuria (AKU), an inherited disorder caused by mutations in the HGD gene, which encodes an important enzyme that participates in breakdown of the amino acids phenylalanine and tyrosine. Defective HGD enzyme results in accumulation of the metabolite intermediate homogentisic acid (HGA) throughout the body, which directly leads to progressive degenerative disease affecting multiple organ systems. In recent years, our research group has shown that the kidney is indispensable for excretion of the abnormally high circulating HGA in AKU. We have shown that the renal elimination of HGA worsens with age and is likely to contribute to the accelerated disease progression observed in older patients. Our studies have also revealed that renal clearance of HGA exceeds the maximal renal plasma flow, indicating the presence of active transport mechanisms for removal of HGA in the kidney beyond the passive process of glomerular filtration.
This project will investigate the novel idea that fundamental adaptations occur to the kidney transport machinery in AKU for enhanced clearance of HGA. Recent observations in our laboratory support this idea. We have shown that transient inhibition of hepatic HGD with siRNA effectively induces an AKU phenotype with blood HGA concentrations equivalent to HGD knockout mice. Despite this sustained increase in blood HGA with siRNA-induced AKU, urine HGA concentration remains approximately 10-20% of the values observed in mice with established AKU by full HGD gene knockout. We speculate that long-term, permanent HGD deficiency/dysfunction is required for enhancement of kidney organic anion transporter activity observed in AKU.
The student will assess organic anion transporter expression and activity in a range of models, including in vitro cell culture models and from kidney tissue obtained from a mouse model of AKU established in our laboratory. There is scope for a range of transferrable laboratory techniques to be explored, including quantitative gene expression profiling of organic anion transporters by PCR (qPCR), tissue culture models of kidney transport and metabolite analysis using liquid chromatography mass spectrometry (LC/MS).This research has important implications for potential new kidney-targeted treatment approaches in AKU. There is potential for new insights into kidney physiology more generally, given the fundamental role of the kidney in handling of organic acids.

Project Title	Cardiovascular health in people undergoing lung cancer screening
Project ID	31
Supervisor	Freddy Frost
Pathway	Cardiovascular and Metabolic Medicine;Clinical Sciences (General) ;Musculoskeletal and Aging Science
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD and LHCH

Project Description:

Lung cancer screening is a nation screening programme designed to detect lung cancer at an early stage in people who have risk factors (mainly age and smoking). The lung cancer screening programme evaluates thousands of people per year in Cheshire & Merseyside and thankfully very few have cancer. However, many people with risk factors for lung cancer are at risk of cardiovascular disease and coronary artery calcification (a well established risk factor for cardiovascular disease) is frequently seen on CT scans in the lung cancer screening programme. There are clear evidence based guidance on how to reduced CVD risk in the general population however, very little is known about the uptake and applicability of these interventions in a lung cancer screening population.

In this project you will be supported to analyse existing datasets derived from the regional lung cancer screening programme. You will define the epidemiology of cardiovascular disease, cardiovascular risk and cardiovascular risk-prevention treatments in this population. You will also be supported to determine the potential for different treatment intervention strategies to improve cardiovascular outcomes in this population.

Datasets required for this analysis are all in place with appropriate approvals. This project would suit a motivated candidate looked for a data-driven project with an interest in respiratory, cardiovascular disease or epidemiology. We expect this work will lead to presentations at international conferences and you will be supported to write your work up for publication.

Project Title	Digital Twins in Healthcare
Project ID	3
Supervisor	Wahbi El-Bouri
Pathway	Cardiovascular and Metabolic Medicine;Eye and Vision Science; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHDB

Project Description:

Digital twin technologies can replicate processes, disease populations, and interventions. Having been used in the manufacturing industry for decades, digital twins are rapidly developing in the field of healthcare. Example use cases include simulating patient-specific stent and thrombectomy procedures, developing metabolic digital twins, improving patient flow through hospitals by digital twinning of the hospital processes, and developing digital twins of exercise interventions. In this project, you will have an opportunity to work on developing digital twins for given use-cases, or work on applying generative AI models to clinical problems. The project will suit individuals keen to work on the cutting edge of healthcare technology, willing to learn programming, and enthusiastic to apply their ideas, with the appropriate support, to solving clinical problems.

Further reading:

- Laubenbacher, R., Mehrad, B., Shmulevich, I. et al. Digital twins in medicine. Nat Comput Sci 4, 184–191 (2024). https://doi.org/10.1038/s43588-024-00607-6
- Luraghi, G. et al. The first virtual patient-specific thrombectomy procedure, Journal of Biomechanics, 126 (2024). https://doi.org/10.1016/j.jbiomech.2021.110622
- Wahbi K El-Bouri, Ying X Gue, Gregory Y H Lip, 'Rise of the machines': the next frontier in individualized medicine, Cardiovascular Research, Volume 117, Issue 10, 1 September 2021, Pages e129–e131, https://doi.org/10.1093/cvr/cvab220
- Vallée A. Digital twin for healthcare systems. Front Digit Health. 2023 Sep 7;5:1253050. doi: 10.3389/fdgth.2023.1253050. PMID: 37744683; PMCID: PMC10513171.
- B. R. Barricelli, E. Casiraghi, J. Gliozzo, A. Petrini and S. Valtolina, "Human Digital Twin for Fitness Management," in IEEE Access, vol. 8, pp. 26637-26664, 2020, doi: 10.1109/ACCESS.2020.2971576
- P Shamanna, S Joshi, L Shah, M Dharmalingam, A Vadavi, S Damodaran, J Mohammed, M Mohamed, T Poon, A Keshavamurthy, T Mohamed, S Bhonsley, Remission of T2DM by digital twin technology with reduction of cardiovascular risk: interim results of randomised controlled clinical trial, European Heart Journal, Volume 43, Issue Supplement_1, February 2022, ehab849.177, https://doi.org/10.1093/eurheartj/ehab849.177

Project Title	Can ischaemic conditioning protect our hearts from hypertrophy?
Project ID	75
Supervisor	Richard Rainbow
Pathway	Cardiovascular and Metabolic Medicine;Musculoskeletal and Aging Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Ischaemic conditioning, where short periods of ischaemia can protect against a longer and more sustain ischaemic attack, has been shown to protect our hearts from a number of different conditions. In this project, the candidate will assess the protective effects of perfusate from an ischaemic conditioned heart as a method for protecting against hypertrophy. Using a cellular model with isolated cardiac cells, the efficacy of the protectant will be assessed, and the effects of a number of different stimuli will be investigated to determine whether these stimuli, including hyperglycaemia-like extracellular conditions and stress responses, abolish the cardioprotection seen.

Clinical Sciences (General)

Project Title	MRI guided focused ultrasound in movement disorders: a systematic review and metanalysis on different surgical targets used for Parkinson's Disease
Project ID	19
Supervisor	Antonella Macerollo
Pathway	Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	The Walton Centre NHS Foundation Trust

Project Description:

Over the last five years, the use of MRI guided focused ultrasound neurosurgery has been expanded from essential tremor to Parkinson's Disease (PD). However, the use in PD is still in development and different targets of the basal ganglia have been explored.
This project will be mainly focused on the development of a systematic review and metanalysis on the field. However, the student will have the opportunity to see cases of tremor treated with this technology at the Walton Centre, which is one of the two centres hosting this type of surgery in England.
The methodologies include in this project are practical expertise and data analysis. The student will be also co-supervised by Mr Osman-Farah (Consultant Neurosurgeon) and will have the opportunity to have collaboration and support by Dr Steven Lane (Lecturer in Medical Statistics at UoL).

Project Title	Neuroimaging abnormalities in essential tremor: a systematic review and metanalysis
Project ID	20
Supervisor	Antonella Macerollo
Pathway	Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	The Walton Centre NHS Foundation Trust

Project Description:

Essential tremor is very complex syndrome presenting with several motor symptoms in addition to tremor such as balance and gait impairment as well as non-motor symptoms. Advanced therapies for essential tremor include deep brain stimulation and MRI guided focused ultrasound. thalamotomy. However, both procedure are associated with possible side effects including balance and gait difficulties as well as speech impairment. Increasing knowledge about neuroimaging biomarkers that can predict the outcome of the surgery will provide significant guide to clinicians involved in the treatment of this condition.
The student will be supervised by Dr Macerollo and Mr Jibril Osman-Farah (Consultant Neurosurgeon) with the collaboration of Dr Steven Lane (Lecturer in Medical statistics at UoL).

Project Title	Using Mouse Gastruloids to understand BMP Signalling during early mammalian development
Project ID	30
Supervisor	David Turner
Pathway	Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	Willam Henry Duncan Building

Project Description:

We will be using mouse embryonic stem cells, grown as 3D gastruloids to understand how BMP signalling is integrated in early development to control pattern formation and symmetry-breaking. BMP is secreted from the extra embryonic tissues, diffusing to the adjacent pluripotent epiblast where it is critical for normal primitive streak formation, the structure through which epiblast cells ingress to form the mesendoderm. Paradoxically, BMP is also important for maintaining the pluripotent state of the epiblast. What we want to understand in this project, is how different concentrations of BMP, and the timing of BMP stimulation, can modulate the balance between primitive streak formation (and axial development), pluripotentcy, and downstream cell fate.
Our model system, Gastruloids, has the ability to mimic many aspects of early development including gastrulation like processes and symmetry-breaking. It's also exceptionally amenable for experimental perturbation. We will stimulate gastruloids with BMP at key points during the normal protocol and assess, using immunofluorescence and quantitative In Situ Hybridisation Chain Reaction, coupled with high-end microscopy, how gene expression/protein localisation changes, and consequently cell fate. For gastruloid references, see van den Brink et al (2014) in Development, Beccari et al. (2019) in Nature, as well as Balayo et al 2025 in BioRxiv.

Project Title	Exploring Cell Fate and Morphogenesis in Gastruloids Using Engineered Biomaterials
Project ID	38
Supervisor	David Turner
Pathway	Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

his project aims to understand how defined biomaterial cues - such as topography, stiffness, and surface chemistry - influence gastruloid development, cell fate decisions, and morphogenesis. While external physical and chemical stimuli are known to direct cell behaviour, how these signals are integrated in 3D during early embryogenesis remains poorly understood. Gastruloids—3D aggregates of mouse embryonic stem cells - recapitulate key features of early development and provide a tractable alternative to embryos and monolayer cultures. However, the influence of biomaterial properties on gastruloid behaviour has not been systematically explored. By combining biomaterial scaffold design with advanced gastruloid technologies, this interdisciplinary study will investigate how physicochemical signals guide developmental processes, laying the foundation for tuneable, high-fidelity in vitro models of early mammalian development.

Project Title	Cross-National Analysis of Patient and Relative Attitudes Towards Assisted Dying: Insights from the iLIVE Cohort Study
Project ID	64
Supervisor	Dr Stephen Mason
Pathway	Clinical Sciences (General) ;Cardiovascular and Metabolic Medicine; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	This project will be conducted with support from the team from the Palliative Care Unit, based at the William Henry Duncan Building.

Project Description:

This project aims to explore patient and relative attitudes towards assisted dying across 11 countries, utilising data from the iLIVE Cohort Study (see https://www.iliveproject.eu) funded by the EU Horizon program. The study leverages a large quantitative dataset (over 1400 patient entries) to address the research question.

The primary objective is to analyse the diversity of perspectives on assisted dying, considering cultural, legal, and social factors that influence attitudes in different countries. By examining responses from patients and their relatives, the project seeks to identify common themes, variations, and underlying reasons for their views on assisted dying. Advanced statistical methods will be employed to analyse the data, ensuring robust and reliable findings. The study will provide valuable insights into how attitudes towards assisted dying vary internationally, contributing to the broader understanding of end-of-life care preferences and ethical considerations. Should it be wished, findings from the analysis may be further explored in both national and international focus groups.

Ultimately, this project aims to inform policy-making and clinical practice by highlighting the complexities and nuances of assisted dying attitudes. We expect that the findings will be publishable and presented at national in international conference. Further, the findings will support the development of more compassionate and culturally sensitive approaches to end-of-life care, enhancing the quality of life for patients and their families during their final stages.

Eye and Vision Science

Project Title	Extracellular microvesicles and the metastatic niche in uveal melanoma.
Project ID	13
Supervisor	Karen Aughton
Pathway	Eye and Vision Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD, 3rd floor laboratories

Project Description:

Uveal melanoma (UM) is a rare eye cancer affecting approximately 6 adults per million every year. Although the tumour in the eye can be treated successfully in most cases, in around 50% of patients the cancer cells will spread to other sites, most commonly to the liver. Once established in the liver, treatment options are limited, and patient survival is short (≤2 years). A major challenge in drug development for metastatic UM is our limited understanding of the tumour microenvironment. One hypothesis is that tumour cells prepare a 'metastatic niche' in the target organ prior to dissemination to enable colonisation. Key components of this are reported to include tumour derived secreted factors, extracellular microvesicles (EVs), immune cells and stromal factors. In a previous proteomic analysis of primary UM secretome, 46% of identified proteins were predicted to be secreted by exosomes. Exosomes are a subclass of EVs released by normal or diseased cells, and which contain lipids, proteins, and nucleic acids involved in intercellular communication.

This project aims to:

(1) Isolate tumour derived EVs from well characterised UM cell lines according to guidelines defined by the International Society of Extracellular Vesicles.

(2) Undertake bioinformatic analysis of EV proteomic data provided by the Centre for Proteome Research following mass spectrometry to determine enriched pathways and molecular functions linked to their composition.

(3) Undertake functional studies examining the effects on cell behaviour of EVs isolated onto electrospun fibres.

Techniques: Cell culture, Nanoparticle Tracking Analysis, Scanning Electron Microscopy, Western blotting, biomaterials, bioinformatics

Project Title	Preventing Sight Loss from Diabetes in Liverpool: Precision Care through Integrated Data and Advanced Analytics
Project ID	14
Supervisor	Philip Burgess
Pathway	Eye and Vision Science
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD & LUHFT

Project Description:

Data on diabetes and its complications, medical interventions and outcomes exists in disconnected parts of the NHS clinical pathway. We have amalgamated data from people with diabetes in Liverpool from the Diabetic Retinopathy Screening Programme (DESP), hospital eye services (HES) and primary care into a trusted research environment. Our data represents a Diabetes Biobank of >90,000 people linking for the first time all routinely collected clinical data across the whole diabetes life course. We will report the burden and incidence of retinopathy (PDR, DMO & macular ischaemia), treatment and visual outcomes across all stages of the clinical pathway in a whole population (never before achieved for any complication of diabetes). Using a patient advisory group we will determine what are the key phases of the visual life for people with diabetes, critical transition points in the care pathway and health outcomes. We will identify risk factors for high-risk groups and visual loss. We will map causative pathways and key inflection points in the pathway to blindness to identify effective interventions. The impact of our work will be the development of optimised and more personalised care delivered by more efficient NHS services.

Project Title	Evaluation of a stem cell transplant to treat glaucoma
Project ID	41
Supervisor	Dr Carl Sheridan
Pathway	Eye and Vision Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Glaucoma is a ticking time bomb in a progressively ageing population. It is often termed “the silent thief of sight” because it is the leading cause of irreversible blindness worldwide, with a current incidence of 70 million that is expected to rise to ~112 million affected people by 2040. (1) The primary risk factor for glaucoma is increased intraocular pressure (IOP) which causes irreversible damage to the neural retina. Increased IOP is primarily due to dysfunction to the outflow drainage pathway for aqueous humour known as the trabecular meshwork. We have been developing a new regenerative medicine treatment in which we use TM progenitor cells to regenerate the dysfunctional tissue

We are now looking for a project student to help develop this potential new therapy.

We can maintain the anterior segment of an eye for 7 days and we will be adapting this model to assess transplant success.

We are a multi-discipline team (biologists, engineers, and clinical consultants) that will provide training at every stage of the project. We are looking for a student who wants to develop their research skills from laboratory techniques to dissemination of results (publications and conference presentations). Not only will you become part of a team with a translational goal to treat patients with glaucoma., but you will be given the opportunity to engage with patients and the public alike regarding your work. Please feel free to get in contact for an informal discussion about your hopes and expectations from the project. We have high hopes for this new treatment and we want you to help us make a difference.

1. Tham, Y.C., et al., Global prevalence of glaucoma and projections of glaucoma burden through 2040: a systematic review and meta-analysis. Ophthalmology, 2014. 121(11): p. 2081-90.
2. Fan, X., et al., Replacement of the Trabecular Meshwork Cells-A Way Ahead in IOP Control? Biomolecules, 2021. 11(9).
3. Crouch, D.J., et al., Exploiting biomaterial approaches to manufacture an artificial trabecular meshwork: A progress report. Biomaterials and Biosystems, 2021. 1: p. 100011.
4. Hidalgo-Alvarez, V., et al., Biofabrication of Artificial Stem Cell Niches in the Anterior Ocular Segment. Bioengineering (Basel), 2021. 8(10).

Project Title	Novel insight into diurnal variation, ageing and glaucoma
Project ID	42
Supervisor	Dr Carl Sheridan
Pathway	Eye and Vision Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	whd

Project Description:

Glaucoma is the leading cause of irreversible blindness worldwide and with an ageing population the incidence is expected to rise to ~112 million affected people by 2040. (1) The eye maintains its intraocular pressure (IOP) through the steady production and drainage of aqueous humor. Dysfunction of the outflow pathway known as the trabecular meshwork (TM) leads to pathological IOP with damage to the retina at the optic nerve head (ONH). Both the ONH and TM are susceptible to changes in stiffness in which experimental evidence indicates MGP is a key gene altering the mechanical properties of these structures in the development of glaucoma. However there remains fundamental questions regarding the role of MGP in the diurnal variation in expression and how this alters during the life course.

We are in a position to address MGP expression and function in human tissues and cells alongside transgenic aged mouse models. Complete training will given in all cell and molecular biology techniques required.

We are a multi-discipline team (ophthalmology, chronobiology, engineering) that will provide training at every stage of the project. We are looking for a student who wants to develop their research skills from laboratory techniques to dissemination of results (publications and conference presentations).

Please feel free to get in contact for an informal discussion about your hopes and expectations from the project.

1. Tham, Y.C., et al., Global prevalence of glaucoma and projections of glaucoma burden through 2040: a systematic review and meta-analysis. Ophthalmology, 2014. 121(11): p. 2081-90.

2. Borrás T. A single gene connects stiffness in glaucoma and the vascular system. Exp Eye Res. 2017 May;158:13-22. doi: 10.1016/j.exer.2016.08.022. Epub 2016 Sep 1. PMID: 27593913; PMCID: PMC6067113.

Project Title	Molecular analysis of retinal pigment epithelium cells and proteins in the context of age-related macular degeneration
Project ID	46
Supervisor	Emil Carlsson
Pathway	Eye and Vision Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Age-related macular degeneration (AMD) is the most common form of legal blindness in the developed world. The disease is characterised by damage to a monolayer of cells in the retina called the retinal pigment epithelium (RPE), resulting in blurry or distorted central vision or blind spots. The aim of this project is to analyse how certain proteins are used to modulate cellular functions in the RPE, under both basal conditions and when exposed to cellular stress, and the implication for potential dysregylation during onset of retinal disease characterised by RPE dysfunction, e.g. AMD. The project will utilise cell culture models and a range of in vitro molecular biology techniques to investigate RPE cellular responses to AMD-relevant stressors (e.g. oxidative stress) to identify novel proteins/pathways of interest for therapeutic potential.

Project Title	Developing a method of implantation of a tissue-engineered device into the eye
Project ID	48
Supervisor	Lucy Bosworth
Pathway	Eye and Vision Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

The aim of this project is to develop a micro-surgical technique for delivery of a tissue-engineered device into the trabecular meshwork (TM), located in the anterior segment of the eye. The project will primarily use ex vivo porcine eyes held within an Organ Culture Anterior Segment (OCAS) model to develop the delivery method and will transition to human ex vivo eyes for validation. The student will be supported by a team comprising a biomaterials scientist expert in developing electrospun fibre scaffolds and tissue engineering, a TM cell biologist with expertise in Organ Culture Anterior Segment models, and a Consultant Ophthalmologist specialising in glaucoma treatment. This team have already developed a fibre scaffold capable of supporting human primary TM cells and now need to demonstrate insertion of the device into the eye and retention of cell viability and function.
Hands-on training in scaffold fabrication, in vitro cell culture, eye dissection, OCAS model set-up, and micro-surgical techniques will be provided. This project provides the student with an excellent opportunity to understand device development and translation towards clinical use. The student will learn a variety of research skills and softer skills, including time management, scientific report writing and presentations. The project will suit a student interested in micro-surgical techniques and the eye.

Project Title	Identification of Molecular Targets for the Treatment of Age-related Macular Degeneration (AMD)
Project ID	66
Supervisor	Ceniz Zihni
Pathway	Eye and Vision Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Age-related macular degeneration (AMD) is the most common cause of vision loss, affecting over 700,000 adults in the UK. At present there is no treatment to stop the progression of dry AMD, the most common form.
Degeneration of the retinal pigment epithelium (RPE), a specialized multifunctional tissue crucial for eye health is thought to play a major role in the progression of dry AMD. The RPE is composed of polarized cells attached to each other in a sheet. This means the apical section of the RPE membrane, that faces photoreceptors, is different to basal section, that faces the blood supply, specifically the highly vascularized choriocapillaris within the choroid. The RPE's basolateral membrane is in contact with the Bruch's membrane, which separates it from the fenestrated endothelium of the choriocapillaris, allowing for nutrient and waste exchange between the RPE and the blood. In advanced AMD, the Bruch's membrane can become thickened, fragmented, and more permeable due to the accumulation of deposits like drusen. A loss of adhesion at the RPE basement membrane, through poorly understood mechanisms, contribute to the progression of the disease.

The project aims to determine how adhesions at the RPE basement membrane are controlled in health and dysregulated in disease to identify molecular targets to prevent progression of dry AMD. A variety of laboratory techniques and transferable skills ranging from molecular biology, cell biology to imaging, data analysis, presentation and writing reports will be used during the investigation. It is anticipated that the research project will contribute to a larger body of research potentially leading to publications and the development of therapeutic technologies.

Project Title	Retinal Biomarkers in Cerebral Visual Impairment: A Retrospective Audit of OCT and MRI Imaging in Paediatric Patients.
Project ID	67
Supervisor	Paul McNamara
Pathway	Eye and Vision Science
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's and relevant desk space on campus.

Project Description:

This project offers an opportunity to contribute to a highly impactful clinical research study based at Alder Hey Children's Hospital, one of Europe's leading paediatric centres. The research aims to improve the diagnosis and care of children with Cerebral Visual Impairment (CVI) — the most common cause of childhood visual impairment in the UK. CVI results from early brain injury and affects how visual information is processed, often leaving children with structurally normal eyes but significant functional visual challenges. Diagnosis is currently complex and often delayed, typically requiring advanced brain imaging under general anaesthetic in young children.

This retrospective audit will review existing clinical imaging and data from children diagnosed with CVI at Alder Hey. The focus is on identifying whether changes in the eye's Nerve Fibre Layer (NFL) and Ganglion Cell Layer (GCL), detectable through non-invasive Optical Coherence Tomography (OCT), correspond with abnormalities in brain structure visible on MRI and tractography. These retinal changes are believed to result from retrograde trans-synaptic degeneration — a secondary effect of brain injury on the visual pathways.

The student will gain hands-on experience with a wide range of clinical research methods, including:

-Reviewing ophthalmic imaging (OCT) and neuroimaging (MRI/tractography)
-Analysing anonymised clinical data within NHS research governance frameworks
-Conducting structured clinical audits and contributing to imaging analysis protocols
-Applying basic statistical techniques and data presentation tools
-Collaborating with a multidisciplinary team including ophthalmologists, paediatric neurologists, and neuroradiologists

The findings from this audit will directly inform the design of an upcoming pilot study at Alder Hey, which aims to validate OCT as a non-invasive, low-cost biomarker for brain injury in children with CVI. The student will be encouraged to remain involved in the pilot phase, offering a unique opportunity to contribute to early-stage clinical research with real-world applications.

The potential clinical impact of this work is significant. If OCT can reliably reflect brain-based visual impairment, it could transform the way CVI is diagnosed — enabling earlier intervention, reducing the need for high-cost or high-risk imaging, and ultimately improving outcomes for affected children. This project is well suited to students with an interest in paediatrics, neuroscience, vision science, or clinical research, and offers the chance to work within a nationally recognised paediatric research environment.

Project Title	Development of a validated patient reported outcome measure (PROM) for patients with vitreoretinal interface (VRI) disorders
Project ID	70
Supervisor	Teresa Sandinha
Pathway	Eye and Vision Science
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD

Project Description:

Vitreoretinal interface (VRI) disorders are increasingly recognised as an important cause of reduced central vision; in particular, epiretinal membrane (ERM) is a common indication for retina surgery. These disorders have their peak incidence in those aged 60-70 years and are thought to result from a pathological alteration of the process of vitreoretinal separation, which develops as part of normal ageing.(1) Visual acuity alone does not completely represent a patient's visual impairment due to ERM, and other measures of visual function, in addition to psychosocial and functional impacts, and expectations from surgery, also need to be assessed.(2,3) However, patient-reported outcomes (PROs), the patient's perspective of their own health, are rarely considered. There is a paucity of PRO data available; hence, the need for standardisation of a core outcome set (COS) for VRI disorders. Our group was funded by NIHR Medical Research Council to define a minimum standard set of patient-reported outcomes important for patients with ERMs and to determine if the existing validated patient-reported outcome measures (PROMs) adequately capture the outcomes identified as important to patients. There is no history of this approach being developed in retinal surgery. We have now developed a core outcome set for ERMs using a modified Delphi process. In addition, our recent systematic review (4) did not identify any vitreoretinal-specific PROMs, despite PROMs being widely used in other ophthalmic subspecialties, such as cataract and glaucoma.

Therefore, the aim of this project is to develop a psychometrically robust PROM to assess the core PROs in people living with ERM.

You will have the opportunity to learn about qualitative methods in research and you will work as a part of a multidisciplinary team (ophthalmic surgeon, orthoptist, psychologist, health economists, social scientists, patient and public members). Ethical approval will be in place for you to undertake this study. It is expected that you will contribute to at least one publication from your studies and that you will present your findings at a national or international conference.

References (Further reading) :

1. Chua PY, Sandinha MT, Steel DH. Idiopathic epiretinal membrane: progression and timing of surgery. Eye (Lond). 2021:36:495-583.
2. Patel PJ, Steel DH, Hirneiß C, Brazier J, Aly A, Lescrauwaet B, Group MS. Patient-reported prevalence of metamorphopsia and predictors of vision-related quality of life in vitreomacular traction: A prospective, multi-centre study. Eye. 2019;33(3):435-44.
3. Braithwaite T, Calvert M, Gray A, Pesudovs K, Denniston AK. The use of patient-reported outcome research in modern ophthalmology: Impact on clinical trials and routine clinical practice. Patient Related Outcome Measures. 2019;10:9.
4. Yoganathan A, Sandinha T, Shamdas M, Diafas A, Steel D. Patient-reported outcome measures in vitreoretinal surgery: A systematic review. Eye. 2022:1-11

Project Title	Recombinant PSG protein variants for use in eye disease therapy
Project ID	74
Supervisor	Carl Sheridan
Pathway	Eye and Vision Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	whd

Project Description:

Background: The pregnancy-specific glycoproteins (PSGs) are CEACAM family members that are predominantly expressed in the placenta and are found at high levels in the maternal bloodstream during pregnancy (reviewed in Moore et al., 2022). PSGs have a range of immunomodulatory and tissue repair activities that make them candidates for use in therapy as evidenced by their efficacy in cellular and animal models of, for example, colitis, encephalitis, graft versus host disease, stroke, and wound healing (Moore et al., 2022; Malone et al., 2022; Moore et al., 2025). The cellular activities of PSGs include activation of TGFβ in the extracellular matrix, induction of IL-10 expression, Treg cell differentiation, macrophage programming to the M2 phenotype, and re-epithelialization of wounds (Moore & Dveksler, 2014; Moore et al., 2022; Moore et al., 2025).

You will work with academic and clinical colleagues and a new spin out company assessing the potential of new Ophthalmology focused therapeutics. A rewarding cross discipline project in which all required training will be given. (Contact Dr Sheridan or Dr Hamill for more details)

Project aims: Assessment of activity of engineered PSG protein variants in cellular assays using cell lines and primary tissues relevant to eye diseases (e.g. corneal ulcer, conjunctival wound healing) with a particular focus on re-epithelialization.

Expected outcomes: Identification of PSG variants with enhanced stability and activity relevant to use in therapy. Co-authorship of resulting publication.

Project Title	Quantitative analysis of Clinical Cardiac Images in Comparison to AI
Project ID	96
Supervisor	Yalin Zheng
Pathway	Eye and Vision Science; Cardiovascular and Metabolic Medicine; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD

Project Description:

Medical imaging, such as MRI, CT and ultrasound, plays a significant role for the management of cardiovascular diseases. There is sheer volume of images to be reviewed by radiologists posing a challenging to the NHS. Recent years AI has shown great potential in the analysis of medical images for the detection and diagnosis problems. This project aims to analyse cardiac images and evaluate the performance of AI approaches.
Retrospective cardiac images will be subject to the analysis. Key structures, such as left ventricle, will be manually delineated. The marked structures will be compared with the results of AI program for concordance.
Training on CVD and related clinical knowledge, literature review, use of software programs such as imageJ and SPSS and quantitative data analysis, and report writing. Knowledge on image analysis, statistical methods, and recent AI techniques will be provided.
This project will provide an insight of the accuracy and reliability of AI programs and their roles in healthcare.

Project Title	Investigating Retrotransposons as Molecular Drivers of Endothelial Ageing
Project ID	93
Supervisor	Reinhold Medina
Pathway	Eye and Vision Science; Cardiovascular and Metabolic Medicine; Musculoskeletal and Aging Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Healthy blood vessels are vital for organ function, but as we age, they deteriorate, contributing to pathology like dementia, cardiovascular disease, and diabetic complications. The fundamental building blocks of blood vessels are endothelial cells, and the ageing of these cells, known as endothelial senescence, plays a key role in vascular decline. Our lab recently uncovered a new gene signature that identifies senescent endothelial cells, suggesting that RNA sensing and interferon pathways are activated.

Based on these findings, we hypothesise that retrotransposon transcription, particularly from endogenous retroviruses (ERVs), ancient viral elements embedded in the human genome, triggers RNA sensing in non-infected senescent cells. Under normal conditions, our cells suppress ERV activity through epigenetic mechanisms. However, recent studies suggest that in senescent cells, these silencing processes can break down, leading to ERV expression. This project aims to investigate whether these mechanisms also occur in human endothelial senescence.

We are seeking a highly motivated student with a keen interest in ageing biology to join our dynamic research team in the Department of Eye and Vision Sciences, and explore an intriguing idea: could ancient viral elements hidden within our DNA, known as ERVs, be triggering ageing in blood vessel cells? Working alongside an experienced and supportive team of postdoctoral scientists, the student will develop a broad set of research skills, including cell culture, PCR, immunostaining, microscopy, and flow cytometry. This is an exciting opportunity to contribute to cutting-edge research on endothelial cell ageing and its role in disease.

Project Title	Superresolution imaging of laminins in 2D and 3D corneal epithelial models
Project ID	9
Supervisor	Kevin Hamill
Pathway	Eye and Vision Science; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

The laminin family of proteins are core components of a structured region of extracellular matrix known as the basement membrane. This structure plays many roles including as foundations for cell attachment, as the "road" for cell migration, and as signalling hubs directing differentiation and proliferation. Indeed, almost all adherent cell behaviour are modulated by laminin-mediated effects.

This project focuses on the corneal epithelium where defects to the major laminin, laminin 332, leads to blistering (genetic disease junctional epidermolysis bullosa or autoimmune disease cicatricial pemphigoid) or can cause erosion formation (map-dot fingerprint syndrome) or slow wound repair.

Recently we have developed new tools to allow the study of laminin 332 biology. Specifically, we have created a series of expression constructs that, when introduced into cells, leads to expression of fluorescently tagged laminin chain. Moreover, the fluorophores we have used have some extra features that open up some advanced imaging options. They photoconvert from green to red, meaning we can identify old vs new and as use the most advanced light microscopy approaches, superresolution approaches such as photoactivation localisation microscopy (PALM). We have also tagged both ends of the protein with different tags, allowing questions to be answered about dynamics and reorientation. Finally, unlike anything published to date, we have designed these constructs for long-term expression, allowing them to be used in more physiologically complete 3D models.

In this project, we will take these new tools and use them to establish 2D and 3D models of the cornea where the laminin can be imaged in real time. You will quickly and easily learn cell culture and core cell biology approaches and then we will progress from 2D to 3D and from standard fluorescence microscopy to the cutting edge approaches available at UoL. The outcomes will be interesting and valuable, and therefore highly publishable. The tools have been tested and work as we hoped, therefore you will definitely generate plenty of data. You will be supported in the work throughout, including by the imaging specialists in the centre for cell imaging. Therefore this project would be suitable for people with no or limited lab experience.

Project Title	Analysis of PPG/ECG by AI for the Early Detection of Cardiovascular Diseases
Project ID	99
Supervisor	Yalin Zheng
Pathway	Eye and Vision Science; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD

Project Description:

Cardiovascular diseases (CVDs) pose a significant global health burden, responsible for a substantial portion of mortality worldwide. Early detection and intervention are paramount in improving patient outcomes and reducing healthcare costs. Photoplethysmography (PPG) has emerged as a promising technology, particularly when integrated into smart wearable devices, for non-invasive monitoring of cardiovascular parameters. Recent advancements in artificial intelligence (AI) have further augmented the potential of PPG in early detection of CVDs. This project aims to explore the use of AI to analyse PPG/ECG signals towards the early detection of CVDs.

Project Title	Analysis of Corneal confocal microscopy Images using AI for Systemic Disease
Project ID	100
Supervisor	Yalin Zheng
Pathway	Eye and Vision Science; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD

Project Description:

The alteration of corneal nerve morphology has been hypothesis as an early sign of systemic diseases, such as diabetes and peripheral neuropathy. In vivo confocal microscopy (IVCM), see Figure right, has been used to image many different structures of the ocular surface at magnifications beyond what is possible using traditional slit lamp bio-microscopy. This advantage of IVCM makes it possible to image the cornea at resolutions comparable to ex vivo histochemical methods. IVCM is a rapid and non- invasive technique, and has improved understanding of the pathophysiology of both ocular and systemic disease.

Patients affected by systemic disease will receive, as part of their ophthalmic assessment, IVCM of the cornea. Computational modelling techniques will be used to quantify nerve density (and length), tortuosity, variations in nerve thickness, Langhans cells, as well as temporal changes in nerve fibres such as migration patterns. Statistical analysis will be performed to study their relations to disease. Data gathered in this project will likely form the basis of a peer reviewed publication.

An understanding of IVCM technique and simple eye anatomy will be developed. Training will be given for image analysis, comparison and statistical methods, and the use of several pieces of software which are very often used in medical image research, including in-house annotation software, MATLAB and statistical packages. Depending on progress, there is possibility for further training in artificial intelligence (AI).

Image-based deep learning has the immense potential to diagnose and stratify diabetic neuropathy using corneal nerve images. It has potential for generalized applications in biomedical image interpretation and clinical decision making.

Project Title	Analysis of OCTA Images by using AI for Age-related Macular Degeneration
Project ID	97
Supervisor	Yalin Zheng
Pathway	Eye and Vision Science; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD

Project Description:

Optical coherence tomography angiography (OCTA) is a new imaging technique that uses reflectance from red blood cells in vessels coupled with amplitude decorrelation and phase variance to detect areas of high/low flow and produce an image of retinal vasculature. It opens a new avenue for the investigation of vessel morphology having a potential role to play in the management of eye disease.
The aim of this project is to assess morphological features of retinal blood vessels in OCTA related to age-related macular degeneration (AMD).
OCTA data will be collected from patients with AMD. Retinal blood vessels images will then manually delineated. The marked vessels will be analysed to estimate their quantitative features for characterising the underlying disease.
An understanding of OCTA technique and simple eye anatomy will be developed. Training will be given for image analysis, comparison and statistical methods, and the use of several pieces of software which are very often used in medical image research, including in-house annotation software, MATLAB and statistical packages. Depending on progress, there is possibility for further training in MATLAB/ Python and artificial intelligence (AI).
This project will play a key role in the transition in qualitative analysis of OCTA images towards quantitative image analysis. The identified features of vessels may have great potential for the better management of a wide range of retinal and choroidal diseases.

Project Title	Can OCTA Be Used to Diagnose Dementia by AI?
Project ID	98
Supervisor	Yalin Zheng
Pathway	Eye and Vision Science; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD

Project Description:

Optical coherence tomography angiography (OCTA) is a new imaging technique that uses reflectance from red blood cells in vessels coupled with amplitude decorrelation and phase variance to detect areas of high/low flow and produce an image of retinal vasculature. It opens a new avenue for the investigation of vessel morphology having a potential role to play in the diagnosis of dementia. The aim of this project is to differentiate dementia from normal healthy by analysing OCTA images.

Retrospective OCTA data will be collected from people with dementia and healthy populations. Retinal blood vessels images will then be manually delineated. The marked vessels will be analysed to estimate their quantitative features, which will used to diagnose dementia.

An understanding of OCTA technique and simple eye anatomy will be developed. Training will be given for image analysis, comparison and statistical methods, and the use of several pieces of software which are very often used in medical image research, including in-house annotation software, MATLAB and statistical packages. Depending on progress, there is possibility for further training in MATLAB/ Python and artificial intelligence (AI).

This project will play a key role in the understanding of retinal vasculature and their relations to dementia. This will provide future directions in the relevant field.

Musculoskeletal and Aging Science

Project Title	Improving patient outcomes following mandibular reconstruction after oral cancer: novel finite element methods for better surgical design
Project ID	1
Supervisor	Alana Sharp
Pathway	Musculoskeletal and Aging Science ; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	WHD

Project Description:

Within Cheshire & Merseyside over 1,000 individuals a year are diagnosed with head and neck cancer, with some central city wards having disease incidence 4 times the UK average. Surgical management of locally advanced oral cancer tumours commonly involves complex reconstruction, restoring both facial form and vital functions of daily living following surgical resection of the mandible.

Extensive surgical reconstruction frequently alters both the mandibular shape and its inherent strength. Changes in muscular function/ability, can result in weakening of the construct, and its capability to withstand forces such as those generated during chewing (occlusal forces).

Currently, there is limited understanding and a lack of evidence detailing contributors to force concentration, which consequent risk of mechanical (plate) or biological (healing osteotomy) failure. This may be due to inaccuracies of design or unrecognised flaws in reconstruction design (e.g., angles of osteotomy, position of osteotomy). Here, our main aim is to address the question: how does variation in reconstructive design and construct form influence the function of the temperomandibular joint, the reconstructed maxillo-mandibular unit and the related muscular elements during functional loading?

Our objectives involve building finite element (FE) models (pre- and post-surgery) from cadaveric and patient-derived CT scans to characterise biomechanical behaviour of complex mandibular reconstructions and to provide an accurate determination of the functional loadings of the mandible and its reconstructive element.

Project Title	Mechanical Control of Metabolic activity
Project ID	15
Supervisor	Tobias Zech
Pathway	Musculoskeletal and Aging Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	Nuffield Wing

Project Description:

Many solid tumors and fibrotic tissues are characterised by their stiff and dense extracellular matrix and changes in metabolism that are required for survival in this environment. The stiff matrix promotes tumour growth and metastatic spread, causes drug resistance, and regulates the metabolic reprogramming of cancer cells. However, how changes in cellular metabolism and matrix adhesion are connected in pancreatic ductal adenocarcinoma (PDAC) is not understood. With this proposal we are going to explain how changes in matrix stiffness promote growth and survival signals in PDAC tumour cells. Cells can interact with their extracellular matrix environment through integrin-based adhesion complexes (IACs). Work in our labs has examined the global composition of IACs in stiff versus soft matrix microenvironments. We identified a novel adhesion protein called SKT (Sickle Tail Protein Homolog; KIAA1217) as one of the very few proteins that showed preferential enrichment in stiff microenvironments. Low SKT expression correlates with a very beneficial prognosis in PDAC patients. We found that SKT interacts with the mTORC2 complex, a key regulator of metabolic pathways, providing a direct link to cell metabolism and survival. With this project, we will investigate how SKT and mTORC2 orchestrate the metabolic changes that sustain the proliferation of pancreatic tumour cells in stiff matrix. Through a combination of metabolomic profiling, 3D matrix imaging and PDAC models, we will uncover this connection and understand how and why PDAC survives and grows in dense and stiff matrix environments.
The projects specific aims are:
1.) Identify the metabolic alterations caused by stiffer PDAC microenvironment.
2.) Explain how adhesion signalling regulated mTORC2 activation steers metabolic phenotype of cancer cells in stiffer ECM environments
These connected but independent aims will benefit scientist and clinical scientist working in the fields of cell-matrix adhesion research, metabolism, pancreatic cancer, the tumour microenvironment. Alterations in tumour metabolism are a very active area of research and current drug development. Very little is currently known how changes in sensing the extracellular matrix influences tumour metabolism. Findings from this project will create an important link between the two fields of research that can be exploited by future drug discovery projects in industry or academic settings.

Project Title	Assessment of wrist motion following surgical procedures in a cadaveric model
Project ID	26
Supervisor	Mr Ashley Newton
Pathway	Musculoskeletal and Aging Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD mainly, some time in LUHFT

Project Description:

This project presents an exciting opportunity for a student interested in surgery, orthopaedics or anatomy to learn more about functional wrist motion and its response to surgery. The project involves a continuation of established work assessing wrist mechanics and motion in a robot activated cadaveric model following surgical procedures such as partial wrist fusions and wrist replacements. The work will be expected to result in academic publications and presentations. The precise project can be tailored to the needs of the individual.
The project will involve laboratory work preparing and analysing the specimens, as well as data analysis. Supervision will be between Consultant Hand and Wrist surgeons and University Scientists. We can offer further opportunities depending on interest including time in the operating theatre or involvement with associated projects or audits as required for career development.
We are happy to be contacted for further information (ashley.newton2@liverpoolft.nhs.uk). There may be potential to accommodate two students on complimentary projects depending on demand.

Project Title	Exploring extracellular vesicles (EV)-mediated intercellular communication between joint cells
Project ID	27
Supervisor	Mandy Peffers
Pathway	Musculoskeletal and Aging Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Articular joint is a complex organ comprised of multiple tissues highly specialized in their structure and function. Articular cartilage covers the ends (epiphyses) of long bones, synovial membrane (synovium) lines and protects the joint cavity and produces synovial fluid which lubricates the joint and nourishes surrounding tissues, bones provide the structural element, and finally, ligaments and tendons connect and stabilize the joint. Cells within and between tissues constantly communicate with each other, and this intercellular communication is imperative for joint homeostasis. Alterations in intercellular communication can drive pathological changes and the development of joint diseases. Extracellular vesicles (EVs) represent a newly discovered mean of intercellular communication. EVs are membrane-derived vesicles produced and released into the extracellular space by parental cells where they are taken up by the recipient cells. Their cargo comprises proteins, lipids, DNA, and various RNA species. The process of EV production, loading and release by the parental cell is cell-type and condition-specific. Several studies reported changes in EV protein and RNA content in response to various stimulation of the parental cells (e.g. inflammation) and showed that EVs can affect gene and protein expression programs of recipient cells thus affecting their viability and function. However, studies investigating EV-mediated intercellular communication in greater detail are missing. We are developing a method to track EV-mediated exchange of proteins between parental and recipient cells using SILAC (Stable isotope labelling using amino acids in cell culture) and mass spectrometry (MS)-based quantitative proteomics.
In this project, we aim to develop a proof-of-concept protocol for the detection of parental EV proteins in the recipient cells using a SILAC technique and MS. Firstly, we will grow cells in the culture medium containing amino acids labelled with stable heavy isotopes, L-Lys-2HCl (13C6) and L-Arg-HCl (13C6) thus labelling all proteins of the parental cells. EVs produced by these cells will be then isolated and applied to recipient cells cultured in the regular, light culture medium containing normal amino acids. We will then analyse the cellular proteome of the recipient cells using the MS, identifying the heavy labelled proteins originating from the parental EVs. We will then use this novel methodology to explore the EV-mediated cross-talk between in vitro cultured chondrocytes and synoviocytes in the context of articular joint.

Project Title	Exploring ribosome heterogeneity in ageing joint cells
Project ID	28
Supervisor	Mandy Peffers
Pathway	Musculoskeletal and Aging Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Since the discovery of ribosomes in the mid-1950s, scientists contemplated the possibility of ribosome heterogeneity in terms of their composition and activity. However, only recent advances in next-generation sequencing and proteomics revealed the level of diversity of ribosomes. Ribosome heterogeneity arises from ribosomal RNA (rRNA) sequence variation, rRNA post-transcriptional modifications (PTMs), incorporation of ribosomal protein (RP) paralogs, alterations in RP stoichiometry, and RP post-translational modifications. Ribosome heterogeneity has been documented at the level of different species, developmental stages, tissues, within a single cell, in disease and distinct growth conditions. While rRNA-based ribosome heterogeneity has been studied relatively extensively over the last decade, RP-based mechanisms of differential ribosomal composition received only very limited attention.

In this project, we will explore the RP-based ribosome heterogeneity in joint cells and its regulation during ageing. We will human chondrocytic SW1353 cell line to set up a method to isolate pure ribosomes. This will involve culturing SW1353 cells and obtaining cellular extracts which will be ultracentrifuged through sucrose cushions to isolate pure ribosomes. Isolated ribosomes will be then analysed by mass spectrometry (MS). Once set up, we will use this method to isolate ribosomes from equine primary joint cells (chondrocytes and synoviocytes) isolated from young and old donors. By comparing ribosomal protein composition of ribosomes isolated from young and old cells we will investigate the roles of RP-based ribosome heterogeneity in ageing. This will be supplemented by ribosome functional readouts such as translation capacity using SUnSET assay.

Project Title	The Anatomy and Biomechanics of Mouse Skeletal Muscle Ageing
Project ID	45
Supervisor	James Charles
Pathway	Musculoskeletal and Aging Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD- biplanar x-ray facility Centre for Preclinical Imaging

Project Description:

Using laboratory mouse models of human skeletal muscle ageing, this project will use a combination of magnetic resonance imaging (at the centre for Preclinical imaging) and gait analysis (using bi-planar radiography) to quantify the impacts of ageing on muscle structure and locomotion. Then, using a previously built computational biomechanical model of the mouse hindlimb, the impacts of ageing on individual muscle outputs (e.g. forces) and whole-body outputs (e.g. energetic cost) will be predicted through computer simulations. This work will lead to the development of a unique model of muscle ageing, which can be widely shared and used for future research into treatments and interventions for the negative impacts of human ageing.

Project Title	Mapping the Ageing Proteome: The Ageing Protein Atlas
Project ID	78
Supervisor	Prof Mandy Peffers
Pathway	Musculoskeletal and Aging Science
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

The Human Protein Atlas has transformed our understanding of tissue-specific protein expression and is widely used in guiding future research. However, no such comprehensive resource exists to understand how tisues gae at the protein level. Our production of a dedicated Ageing Equine Protein Atlas will enable researchers and clinicians to explore tissue specific protein expression, the effects of healthy ageing as well as improving our understanding of equine biology and age-related protein changes.

Ageing affects tissue integrity, inflammation, and regeneration, which are reflected at the proteomic level. By cataloguing protein expression across a range of equine tissues from young (3-5 years old) and old (15+ years old) horses, this atlas will to provide foundational data for future studies.

This project will support the development of the Ageing Equine Protein Atlas by generating and analysing proteomic data from a range of equine tissues. The focus will be on understanding how protein expression patterns change with ageing as well as understanding tissue specific protein profiles.

The work will begin with sample processing, including tissue dissection and protein extraction from biological material collected from horses of different ages. Tissue-specific protocols will be designed and optimised for a more comprehensive protein coverage. Samples will be digested using standard proteomic workflows (e.g., Trypsin/Lys-C) and analysed using liquid chromatography-tandem mass spectrometry (LC-MS/MS).

The resulting raw data will be processed and quantified, followed by statistical and bioinformatic analysis in R. Protein profiles will be mapped and the effects of ageing will be determined using differential abundance analyse and clustering analysis.

Finally, a key component of the project will be the development of a user-facing web platform, where processed data will be visualized and made accessible to the wider research community. This will involve integrating visual summaries (e.g., interactive plots) and downloadable datasets into an online resource, utilising R Shiny, HTML and CSS coding languages.

You will develop a range of useful wet and dry skills in a well supported environment with direct supervison from an expereinced researcher. There is scope to concentrate your skill dvelopment on the areas you are interested in (wet lab skills including mass spectrometry proteomics) and dry skills such as coding, and bioinformatics. You will also have the opportunity to be a co author on relevant manuscripts from the project.

Project Title	Aquaporins: a gap in our understanding of neurodegenerative disease biology
Project ID	2
Supervisor	Dr Caroline A Staunton
Pathway	Musculoskeletal and Aging Science ;
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD building

Project Description:

Disruption of the neuromuscular junction (NMJ), loss of motor units and a decreased number of muscle fibres is characteristic of sarcopenia. Despite strong associations between the losses of muscle fibres and motor axons, a cause–effect relationship has not been established. My work identified that elevated levels of Hydrogen Peroxide (H2O2), a key Reactive Oxygen Species (ROS) is key to this process and this proposed work will examine the cell types involved in sarcopenia (those at the NMJ), but also look at other neurological diseases and how such mechanisms are disrupted in other cell types whereby redox signalling is imperative.

It is proposed that the major route of passage of H2O2 across cell membranes is by channels called "Aquaporins" (AQPs). Data I generated has identified that AQPs facilitate H2O2 movement in muscle fibres. Our next-generation sequencing results identified age-related changes in multiple AQP isoform mRNA levels in muscle fibres of mice, indicating the potential importance of AQPs in the development of sarcopenia. We now believe such changes could be altering redox signalling in other cell types in other neurological conditions and that different reactive oxygen/nitrogen species are also involved and travel through similar routes to exert pathological effects.

Project Title	Development of a Joint-on-a-Chip Model to Compare Osteoarthritis-Associated Molecular Changes Across Horses, Dogs, and Humans : A One Medicine Approach
Project ID	23
Supervisor	Dr Emily Clarke
Pathway	Musculoskeletal and Aging Science; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	Wiliam Henry Duncan Building and Leahurst Veterinary School Campus

Project Description:

Background: Osteoarthritis (OA) is a degenerative joint disease that affects millions of humans and animals, including horses and dogs. Despite species differences, OA progression shares common molecular pathways, including inflammation, extracellular matrix degradation, and cellular senescence. However, the degree to which these molecular changes are conserved across species remains unclear. Traditional in vitro and in vivo models have limitations in replicating the complex joint microenvironment. Organ-on-a-chip technology offers a promising alternative by integrating biomechanical and biochemical cues in a controlled microphysiological system. This project aims to develop a joint-on-a-chip model for horses, dogs, and humans to evaluate species-specific and conserved molecular pathways in OA pathogenesis.
Methods: Joint-on-a-Chip Development: Microfluidic chips will be designed to mimic the synovial joint environment, incorporating chondrocytes, synoviocytes, and osteoblasts from horses, dogs, and humans. Mechanical loading will be applied to simulate physiological joint movement. OA Induction and Analysis: OA-like conditions will be induced using inflammatory cytokines (e.g., IL-1β, TNF-α). Molecular changes will be assessed using RT-qPCR, proteomics, and metabolomics to identify conserved and species-specific OA biomarkers. Data will be analysed to determine shared and unique molecular pathways across species, providing insights into potential translational therapeutic targets. This study will establish a multi-species joint-on-a-chip model to better understand OA pathophysiology and its cross-species molecular signatures. Findings may improve translational approaches for OA treatment in both veterinary and human medicine.

Project Title	Age-Related Changes in Extracellular Vesicle Cargo from Equine Tendon (SDFT, DDFT, CDET)
Project ID	22
Supervisor	Dr Emily Clarke
Pathway	Musculoskeletal and Aging Science; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	William Henry Duncan Building and Leahurst Veterinary School Campus

Project Description:

Background and Hypothesis: Tendon injuries are a common and often career-limiting issue in horses, with aging being a key factor influencing tendon structure and function. Extracellular vesicles (EVs) have emerged as critical mediators of cell communication, carrying bioactive molecules such as proteins, lipids, and nucleic acids that contribute to tissue homeostasis and repair. However, how the cargo of EVs varies between different tendons and how these changes are influenced by aging remains poorly understood. Investigating the composition of EVs from equine tendons at different life stages may provide insights into age-related alterations in tendon biology and potential therapeutic targets for tendon repair and regeneration.

Methods: Tendon tissue will be collected post-mortem from five young (≤5 years) and five old (≥15 years) horses. EVs will be isolated from tendon explants of key tendons, including the superficial digital flexor tendon (SDFT) and deep digital flexor tendon (DDFT), using ultracentrifugation and characterized according to MISEV2024 guidelines. The cargo composition of EVs, including proteins and microRNAs, will be analyzed using proteomics and RT-qPCR. Differences in EV cargo between tendons and age groups will be statistically assessed to identify key age-related changes.

Project Title	Is the current return to running criteria safe following anterior cruciate ligament (ACL) reconstruction?
Project ID	25
Supervisor	Rachel Oldershaw
Pathway	Musculoskeletal and Aging Science; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	LUFT

Project Description:

This project offers the opportunity to work alongside clinical physiotherapists and orthopaedic surgeons in the Therapies Department at Aintree University Hospital. Projects will be conducted in collaboration with international experts.

The human anterior cruciate ligament (ACL) in the knee joint is highly vulnerable to injury and may require surgical reconstruction to restore joint stability. Clinical practice guidelines recommend strength, power, and reactive strength assessment, both pre-operatively and post-operatively, to guide rehabilitation and mitigate the risk of second ACL injury and post-traumatic osteoarthritis. A minimum of 70% limb symmetry on strength and countermovement jump testing is recommended before returning to running after ACL reconstruction. However, it is unclear whether these guidelines are safe with regards to exacerbating symptoms or sustaining new knee injuries, therefore prospective data is required. Premature return to running may delay rehabilitation and return to play schedules, whilst symptoms and reinjury can have a negative impact on the patients both physically and psychologically.

The project will be a prospective, within-participant, repeated measures design study. Patients with an MRI-confirmed ACL injury or surgically reconstructed ACL will be tested using specialised equipment (e.g., dynamometry and force plates) to determine between limb symmetry and absolute values. Specific benchmarks will be used to guide progression of rehabilitation (e.g., >70% isometric strength symmetry to commence a graduated running programme) and relevant patient reported outcome measures will be completed at pre-defined intervals. The data acquired in this study will be submitted for publication in peer-reviewed journals and used to refine clinical practice guidelines for ACL reconstruction rehabilitation pathways.

Students will receive training in clinical research methodologies, including working within a Health Research Authority (HRA)- approved project, testing, statistical analyses, and gain knowledge in the of specialised testing equipment following ACL reconstruction (dynamometry and force plate analysis) and statistical analyses of the relevant data.

Further reading:

Rambaud AJM, Ardern CL, Thoreux P, Regnaux JP, Edouard P. Criteria for return to running after anterior cruciate ligament reconstruction: a scoping review. Br J Sports Med. 2018;52(22):1437-44; Brinlee AW, Dickenson SB, Hunter-Giordano A, Snyder-Mackler L. ACL Reconstruction Rehabilitation: Clinical Data, Biologic Healing, and Criterion-Based Milestones to Inform a Return-to-Sport Guideline. Sports Health. 2021:19417381211056873; Kotsifaki R, Korakakis V, King E, Barbosa O, Maree D, Pantouveris M, et al. Aspetar clinical practice guideline on rehabilitation after anterior cruciate ligament reconstruction. Br J Sports Med. 2023.

Project Title	The complement system in OA: Examining the importance of innate immune system factors in osteoarthritis
Project ID	68
Supervisor	David Wilkinson
Pathway	Musculoskeletal and Aging Science; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

This project will use in vitro and ex vivo techniques to study the important emerging role of the complement cascade in cartilage and osteoarthritis (OA), leading to increased understanding of disease and opening new pathways to therapeutic intervention.

Osteoarthritis is one of the major causes of disability globally. Central to the disease is the breakdown of the articular cartilage on the surface of the joint. Cartilage protects the joint from compression and once lost, causes significant pain. The matrix metalloproteinases (MMPs) are a family of enzymes which drive the loss of the cartilage collagen, but despite this, MMPs are difficult to target with drugs, and attempts to do so have so far been unsuccessful. The serine proteinases are a different family of proteinases which have emerging roles in the destruction of cartilage in OA, and more tractable drug targets as demonstrated for other disorders. The lab of the project supervisor studies serine proteinases and their role in this disease (Wilkinson et al., 2021; 2022).

The complement cascade is an essential part of innate immune system, with a role in pathogen defence and inflammation. Using chemical 'fishing rods' to capture and identify active serine proteinases from cartilage cells, we identified several components of the complement. Complement has previously been linked to osteoarthritis (Wang et al 2011) and increasing evidence indicates that these complement factors are promising biomarkers for the disease (Zhou et al., 2023).

This project will seek to understand the role of complement proteinases, using a combination of protein biochemistry, cell biology and OA samples – both cells and synovial fluid. We will explore which complement factors are made under different conditions and from which joint tissue they derive. The project will use techniques such as cell and explant culture, histology/immunohistochemistry, ELISA, real-time PCR, confocal microscopy, small interfering RNA (siRNA) gene silencing and activity based probes. We will examine correlations between complement proteinase activities and OA disease progression. There is good scope to develop the project and shape the research, based on interesting observations or the student's own interests.

Working within the department of Musculoskeletal and Ageing Sciences in the Institute Life Course and Medical Sciences (ILCaMS), the project will be supervised by a team at the University of Liverpool, led by Dr David Wilkinson. This project is a great opportunity for a student with a life sciences degree or intercalating from a clinical programme, to develop strong interdisciplinary skills in mechanism-driven research. Students will be well-supported in a welcoming and supportive lab, supervised with the right expertise throughout.

Wilkinson DJ et al., 2022. FEBS J. Jan;289(1):121-139
Wilkinson DJ, 2021, Biochem Soc Trans. Apr 30;49(2):1013-1026
Wang et al., 2011. Nat Med. 2011 Nov 6;17(12):1674-9.
Zhou et al., 2023 Sci Adv. 2023 Jan 25;9(4):eabq5095.

Project Title	Locating active destruction in osteoarthritis: visualising cartilage breakdown in situ
Project ID	69
Supervisor	David Wilkinson
Pathway	Musculoskeletal and Aging Science; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Osteoarthritis (OA) is a disease of the joint which primarily affects older people. Although a disease of the whole joint, the destruction of the cartilage at the end of the long bones is central to OA. Although historically described as a disease of 'wear and tear', OA is actually driven by enzymes called proteases. Metalloproteinases are considered the classical drivers of cartilage destruction. More recently, a role for serine proteases has also been described (Wilkinson et al., 2019, Wilkinson et al., 2022).

Classical methods rely on antibody-based technologies to study proteases in OA. However, these do not discern between active or inactive forms. Our lab has recently been exploring the use of chemical tools to visualise active proteases by fluorescence. However, we have not yet explored their use in frozen cartilage tissue sections, to visualise where protease activity is located. Cartilage is separated into zones (superficial zone, middle zone and deep zone) each with differences in extracellular matrix and chondrocyte organisation. Studying how proteolysis differs in different regions is potentially highly impactful. Similar methods have been used to locate protease activity in other tissues (e.g. Withana et al., 2016).

In this project, we will use several methods, including fluorescence based activity-based probes and in situ zymograms to visualise active proteases in OA tissues, and examine how this differs in OA cartilage compared to intact cartilage sections. We will also compare immunohistochemical staining of ECM neo-epitope antibodies (which bind only to cleaved/degraded ECM) to determine sites of 'active' destruction. This exciting project has the potential to better understand cartilage breakdown driven by various catabolic stimuli and in osteoarthritis, leading to new avenues for therapies. There is also scope to mould the project depending on the candidates expertise and interests.

The project would be well suited to a life sciences graduate or intercalating clinician. They will join a supportive and inclusive environment and they be well-supported by the primary supervisor and other lab members.

Wilkinson et al., 2019 Br J Pharmacol. 2019 Jan;176(1):38-51.
Wilkinson et al., 2022. FEBS J. Jan;289(1):121-139
Withana et al., 2016 Nat Protoc. 2016 Jan;11(1):184-91.

Project Title	Regulation of neutrophil gene expression in inflammatory MSK disease by microRNAs
Project ID	5
Supervisor	Dr Helen Wright
Pathway	Musculoskeletal and Aging Science; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Neutrophils are innate immune cells that play an essential role in the first line host response to infection. However, inappropriate neutrophil activation in auto-immune disease drives the inflammatory response through secretion of cytokines and chemokines, and damages host tissue by degranulation of proteolytic enzymes (e.g. MMP8, elastase). Neutrophil production of reactive oxygen species (ROS) further damages host tissues, and the externalisation of post-translationally modified proteins and DNA in neutrophil extracellular traps (NETs) leads to the production of auto-antibodies e.g. auto-antibodies to cyclic citrullinated peptides (ACPA) in Rheumatoid Arthritis (RA) and dsDNA antibodies in Systemic Lupus Erythematosus (SLE).

Neutrophil gene expression is altered during inflammation leading to altered and pathogenic cell function. We have carried out extensive transcriptomics analysis of in vitro and ex vivo activated neutrophils from a range of inflammatory auto-immune diseases. Our bioinformatics analysis predicts that altered cell signalling and expression of microRNAs are regulating gene expression in neutrophils. The aim of this project will be to analyse microRNA sequencing data to identify genes significantly different in RA and SLE, and to validate the expression of these genes in a new cohort of patients. The student will be trained in neutrophil isolations, RNA extractions, qPCR, bioinformatics analysis of RNAseq data and statistical analysis of experimental data.

Project Title	Role of TIMP and MMP-13 in Equine Mesenchymal Stem Cells: Advancing Osteoarthritis Therapy in Racehorses
Project ID	21
Supervisor	Dr Emily Clarke
Pathway	Musculoskeletal and Aging Science; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	William Henry Duncan Building, and Leahurst Veterinary School Campus.

Project Description:

Mesenchymal stem cell (MSC) therapy is a widely utilised regenerative treatment for equine musculoskeletal conditions, including osteoarthritis (OA). OA is a major cause of lameness in Thoroughbred horses, with 70% of the racehorse population suffering from lameness due to articular inflammation during their career. This prevalence varies based on factors such as training intensity, age, and racing frequency. Optimising MSC therapy for OA requires identifying functional markers that link their mode of action to therapeutic efficacy.
In human MSC studies, functional markers including TIMP-1 (Tissue Inhibitor of Metalloproteinases-1) and MMP-13 (Matrix Metalloproteinase-13) have been associated with two distinct therapeutic mechanisms: chondrogenesis and trophic repair. Early-passage MSCs with high MMP-13 expression and elevated TIMP-1 secretion are hypothesised to be ideal for autologous OA therapies aimed at chondrogenesis and engraftment. Conversely, late-passage MSCs with low or absent MMP-13 expression but sustained high TIMP-1 secretion may be better suited for allogeneic therapies focused on repair via paracrine mechanisms (2). Subsequently, a commercial spin off company has been established at the University of Liverpool called Trophicell TM. This project explores the applicability of these findings to equine MSCs, by first determining the expression patterns of these markers on equine MSCs, ultimately aiming to enhance the effectiveness of OA treatment of racehorses.
Methods
Ethical approval is secured for the use of equine bone marrow- and adipose-derived MSCs. MSCs will be cultured from three biological donors at early (P1 and P5) and late passages (P10 and P15). Cells will be collected in Trizol for RNA extraction, followed by cDNA synthesis. Gene expression analysis of TIMP-1 and MMP-13 will be performed using quantitative polymerase chain reaction (qPCR). Data will be analysed statistically using univariate methods with GraphPad Prism Software V.8.

Project Title	Profiling the active protease degradome from multiple tissues of the knee joint – a “One Health” approach to osteoarthritis
Project ID	36
Supervisor	David Wilkinson
Pathway	Musculoskeletal and Aging Science; Clinical Sciences (General)
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Osteoarthritis (OA) is a major health burden, affecting over 10 million people in the UK alone. Central to the disease is the pathological destruction of cartilage, the rubber-like tissue that covers the end of bones. Despite historically being described as ‘wear and tear’, it is clear that OA is an active disease, with contribution from many tissues of the joint, beyond just cartilage including synovium, ligament, bone, meniscus and fat pad. This disease is true of all mammalian joints particularly those of ageing humans and companion animal such dogs who now have a longer lifespan.

Cartilage destruction is driven by 'molecular scissors' called proteases. In particular, metalloproteinases such as the major collagenase MMP-13 drive collagen destruction. However, proteases do not act in isolation, and a role for serine proteases have also emerged in the pathways leading to tissue breakdown. Most studies examine proteases using antibodies through techniques such as ELISA or western blotting. However, proteases exist in many inactive forms, including pro-enzymes requiring activation, inhibited and degraded proteases. It is therefore essential that we determine which are active, when they are active, and from which tissue in the joint they are derived. This whole joint information can then provide in-depth data which could lead to more tissue-specific directed therapies.

In this novel multispecies project, we will profile active proteinases from different tissues of the knee joint, using both human and canine fresh and frozen tissue samples. The project will use a combination of protein and cell biology, tissue histology, activity-based probes, gel-based activity assays and fluorescence confocal microscopy. We anticipate that this research will yield high quality data suitable for impactful publication and such a ‘One Health’ approach will inform OA research in both humans and companion animals.

The project would be well suited to a range of candidates including life sciences graduates, intercalating medical or veterinary students, or those from other medical/biomedical disciplines. The project will be supervised by Dr David Wilkinson, an expert in OA and protease biology, and Professor Eithne Comerford, a veterinary clinican scientist with strong research expertise in musculoskeletal biology and the contribution of different joint tissues such as ligament to healthy and diseased joint knee joint ageing.

Project Title	Analysing migratory cell behaviour in a model of peritoneal scarring
Project ID	103
Supervisor	Bettina Wilm
Pathway	Musculoskeletal and Aging Science; Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	Sherrington Building

Project Description:

In >50% of patients, abdominal surgery causes injury to the peritoneum which can lead to post-surgical adhesions, fibrotic bands of tissue connecting peritoneum wall and visceral organs. Adhesions can cause bowel obstruction and chronic pain, and need further surgical treatment.

The peritoneum is the tissue that lines the abdominal body cavity and the visceral organs, including intestine, liver, pancreas. The peritoneum is covered by a thin epithelial-like layer of cells, the mesothelium.

It is not fully understood which cells and molecular mechanisms contribute to the formation of the post-surgical scar. We hypothesise that epithelial-to-mesenchymal transition (EMT) of mesothelial cells is involved in the formation of fibrotic scars.

Our overarching aim is to develop therapeutic strategies to prevent adhesion and fibrotic scar formation.

In this project, you will be trained setting up and analysing a peritoneal explant in vitro model. We have observed that different types of cells migrate out of the explant, with different behaviours. In your project, you will characterise the cells the migrate out, by performing live cell imaging and digital analysis of cell movement, direction and shape. This will be complemented with end-point analysis using candidate marker expression to characterise the cell types. You will challenge the explant cultures by adding growth factors and signals known to play a role in EMT and scarring, and compare cell behaviour and characteristics with control samples.

This work will provide you in training in microdissection, in vitro culture, microscopy, live cell imaging and image analysis. Large dataset handling skills are welcome.

Reading:

Herrick SE, Wilm B. (2021). Post-Surgical Peritoneal Scarring and Key Molecular Mechanisms. Biomolecules 11, 692-708. (invited review) doi: 10.3390/biom1105069228.

Namvar S, Woolf AS, Zeef LA, Wilm T, Wilm B, Herrick SE. (2018) Functional molecules in mesothelial-to-mesenchymal transition revealed by transcriptome analyses. J Pathol 245(4):491-501. doi: 10.1002/path.5101.

Kawaguchi M, Bader DM, Wilm B. (2007) Serosal mesothelium retains vasculogenic potential. Dev. Dyn. 6(11):2973-9

Women and Children's Health

Project Title	Assessing ASD across global settings
Project ID	10
Supervisor	Melissa Gladstone
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's NHS Foundation Trust

Project Description:

We have created a new tool - the ASD OSSDx tool which has previously been piloted in Liverpool as well as in South Africa and Kenya. This project would be to do a next stage of validation of the tool in a small cohort of children in Liverpool and connecting with the teams in South Africa and Kenya.

Project Title	Adversity and child development in global settings.
Project ID	11
Supervisor	Melissa Gladstone
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

We have data from a number of countries across the world that looks at child development and the factors that affect that. This would be a secondary data analysis of data from Malawi, South Africa, Gambia or other settings where we have data on child development but also on a number of other factors that affect children's development.

Project Title	The molecular pathophysiology of chronic nonbacterial osteomyelitis
Project ID	12
Supervisor	Amandine Charras
Pathway	Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	Institute in the Park close to Alder Hey hospital

Project Description:

Chronic nonbacterial osteomyelitis (CNO, sometimes also referred to as chronic recurrent multifocal osteomyelitis or CRMO) is a rare inflammatory bone disease, that most frequently affects children and young people. In CNO/CRMO, the bone becomes inflamed, and it can cause significant pain, deformity and can cause bones to break (especially when the vertebral spine is affected). The disease is difficult to diagnose and treat because there are no reliable tests, and no treatments are currently licensed to treat CNO/CRMO. Thus, there is a major need to understand the disease mechanisms in CNO/CRMO and to develop treatments that can then be tested in clinical trials.

We have recently discovered mutations in the gene "P2RX7" in a large group of patients with CNO/CRMO (PMID: 38401466). Once activated by extracellular ATP, this receptor leads to $Ca2+/Na+$ influx and $K+$ efflux. $Ca2+$ influx and $K+$ efflux are important for critical cellular processes including phagocytosis, apoptosis, NLRP3 inflammasome activation and cytokine secretion. Our preliminary work suggests that CNO-associated P2X7R variants play a key role in increasing NLRP3 inflammasome activation and pro-inflammatory cytokines release (gain-of-function mutation) or prolonging survival (loss-of-function mutation) of monocytic cells. A more extensive description of molecular pathways affected, and the role of variants identified in patients will enable new possibilities for more personalised treatment to be explored. This project aims to understand in-depth mechanism affected by these mutations. The influence of P2RX7 mutations will be tested for effects on calcium mobilisation, mitochondrial damage/ROS generation and MAPK-ERK1/2 pathway and their interplay with the NLRP3 inflammasome.

Techniques used in the project will include cell culture, molecular and cell biology (RNA extraction, RT conversion, qRT-PCR, Western-Blot, ELISA), LDH assays, ROS generation (MitoSOX), Calcium assay, use of a combination of inhibitors (calcium pathway inhibitor, mitochondrial ROS inhibitor, MAPK inhibitor).

Training and Support: The student will be based in state-of-the-art laboratories within the Institute in the Park. Data will be discussed at weekly group meetings. Journal clubs and seminars are scheduled weekly, and the student will participate in both. The team is currently made up of 2 PhD students, 4 postdocs, 2 MSc and 1 MReS students and a shared technical team of which 2 technicians are on site on a permanent basis, in addition to more senior members.

References

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6- Hofmann SR, Kapplusch F, Girschick HJ, Morbach H, Pablik J, Ferguson PJ, et al. Chronic Recurrent Multifocal Osteomyelitis (CRMO): Presentation, Pathogenesis, and Treatm

Project Title	Sleep quality in children and young people with chronic diseases.
Project ID	16
Supervisor	Dr Christopher Grime
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's Hospital

Project Description:

There is lots of research associating sleep disordered breathing (specifically obstructive sleep apnoea) with asthma in adults. This association is not as clearly defined in children and young people (CYP) in whom there is a shift in focus towards sleep quality rather than sleep-related breathing disorders. The increased use of screen-based devices (smart phones, tablets etc.) associated with the COVID-19 pandemic during periods of social isolation, has led to their perceived and documented negative impact on sleep in CYP. There is very little published work examining sleep quality in children and young people with and without asthma.

This exciting research opportunity will allow the student to work with the renowned sleep, LTV and asthma teams at Alder Hey to assess baseline information (actigraphy and sleep diaries) collected as part of routine clinical care on the quantity and quality of sleep for children and young people with chronic diseases such as asthma and the potential impact of screen-based devices. It is envisaged that this will lead to potential interventions to improve sleep and monitor the impact on asthma outcome measures in CYP.

Project Title	Evaluating Amniocentesis in the Fetal Cardiology Clinic: genetic insights and clinical implications
Project ID	17
Supervisor	Sophia Khan
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's Hospital and St Marys

Project Description:

Congenital heart defects are often associated with chromosomal and genetic abnormalities. Amniocentesis is an invasive test used to detect genetic abnormalities and inform parental decision making. In the UK a karyotype and microarray is performed on all amniocentesis samples and if certain criteria are met than a rapid prenatal exome sequencing panel (R21) is also performed.
This project will review the fetal cardiology database to
1) identify which patients are offered amniocentesis and the rate of uptake
2) identify factors associated with a positive amniocentesis result
3) review the criteria for R21 testing
The results from this will allow a review of current practice with the potential to better inform prospective parents and aid their decision making.

Project Title	Evaluating young people's mental health in schools in collaboration with Liverpool FC Foundation
Project ID	18
Supervisor	Dan Hawcutt
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

A longstanding collaboration between Liverpool FC Foundation and local/regional schools has screened pupils for mental health difficulties and implemented a programme to support those in need. These data need to be analysed and reported to show how it has created an impact.

Project Title	Assessing parents experience of receiving a diagnosis of fetal congenital heart disease
Project ID	24
Supervisor	Sophia Khan
Pathway	Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	AHCH and St Marys I have put laboratory as there will be patient contact and funds to pay for purchasing validated questionnaires and potentially for interview transcription.

Project Description:

Background

In the UK all pregnant women are offered a fetal anomaly screening program (FASP) scan at 20-22 weeks gestation. The FASP scan includes views of the fetal heart and if an anomaly is detected the
women will be referred to a fetal cardiologist clinic. At these clinics they will be scanned by a cardiologist, receive a diagnosis and be given information to enable planning and decision making. This can be a difficult and anxious time for families and this research project is identify if there are specific factors which increase or can alleviate parental anxiety when attending these appointments. Identifying these may allow for adjustments in clinical practice to improve patients experiences and outcomes.

Project Hypothesis

The experience for prospective parents receiving an antenatal diagnosis of congenital heart diseases (CHD) varies between individuals and is influenced by factors related to the diagnosis itself and to the prospective parents emotional state , willingness to receive the information and social and cultural factors.

Project Design

This project will use questionnaires to survey parents who have previously attended the St Marys Fetal Cardiology Clinic and received an antenatal diagnosis of CHD.

A likert scale (strongly agree to strongly disagree) will be used to record responses and quantify overall factors.

Semi structured interviews will also be conducted with parents who received an antenatal diagnosis of congenital heart disease. Transcriptions of these interviews will be coded to identify themes for a framework analysis.

The project will be co-supervised by Sophia Khan- Paediatric and Fetal Cardiologist at Alder Hey and St Marys Hospital Manchester and Lora Capobianco - Academic Psychologist. The ethical approval is currently being applied for, to be in place by the start of the project. We have also undertaken Patient and Public Involvement and Engagement (PPIE) which have shown that there is an acceptability of this research proposal and it is perceived to be off value.

During the MRes year students can also obtain clinical experience of Paediatric and Fetal cardiology.

Project Title	Transforming rare kidney diseases for children
Project ID	29
Supervisor	Louise Oni
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's Hospital, Institute in the Park laboratories.

Project Description:

Kidney disease is hugely under recognised, and it is a major chronic health problem. Patients with kidney disease are on a journey to kidney failure which results in a life dependent on a dialysis machine. They have a poor quality of life, and the only real hope of change is a kidney transplant which improves their quality of life but it is not a cure. Kidney disease affects patients of all ages and the rates of chronic kidney disease are rising rapidly. This requires a large team approach to tackle research questions to try to transform the outcome. Currently, Liverpool is a really exciting place for kidney research. The region has united all researchers to create a critical mass that has generated lots of fresh energy and it has recently been awarded a large £10.4M grant to lead a national rare kidney disease centre called the UK Kidney Ecosystem.

You will be part of this exciting group based at Alder Hey Children's Hospital and you will conduct a project looking at inflammatory kidney diseases in children. In this group you will get experience in recruiting patients, collecting biosamples, and full support to conduct a project that can either be based in the laboratory or could be based on data. The project will tailored to meet your needs and interests. It is expected that you will have the opportunity to see patients in clinic or on ward round at Alder Hey Children's Hospital if desired. Ethical approval is already in place for you to undertake this study and the supervisors champion a positive research environment to allow you to thrive. Due to the clinical exposure, the project would be best suited for an enthusiastic medical student as it would require hepatitis B immunity and a criminal record check. It is expected that you will gain experience in writing papers and that you will present your findings at a conference. We have a track record of successfully bringing intercalating medical students through into future academic careers and we look forward to meeting you if you are interested.

If you would like to hear more, please email louise.oni@liverpool.ac.uk

Project Title	Supporting the Alder Hey Youth Forum Sibling project
Project ID	32
Supervisor	Dan Hawcutt
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey (across the whole hospital)

Project Description:

Siblings are affected by their brother/sister's hospital stays. Alder Hey Youth Forum is working to improve this through setting up a "Sibling befriending service". The project will involve understanding and collating the evidence around how best to support siblings, and collecting and collating the data relating to this project. It will involve working with children and families, getting their views and understanding the literature.

Project Title	AI-related technology for maternity care: a systematic review and meta-analysis
Project ID	33
Supervisor	John Allotey
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Department of Women's and Children's Health, William Henry Duncan Building

Project Description:

This project aims to conduct a systematic review and meta-analysis to evaluate the role of AI-related technologies in maternity care. The review will focus on examining the effectiveness, safety, and potential benefits of AI applications in antenatal and postnatal care, including early detection of complications, personalised care plans, and improving overall healthcare outcomes for mothers and babies. The project will provide details on the current state of AI integration in maternity care, identify knowledge gaps, and inform future directions for research and clinical implementation.

Project Title	Music interventions in paediatric hospital spaces
Project ID	34
Supervisor	Jacky Waldock
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Institute in the Park at Alder Hey Children's Hospital & Department of Music on main campus

Project Description:

This project will enable you to explore the tangible impacts of music interventions on the health of infants on neonatal units, while developing qualitative research skills essential for understanding patient experience—a crucial competency in modern medical education. The interdisciplinary nature of the work will provide exposure to specialist areas including neonatology, sociology, and music, fostering collaborative skills while offering insights into how environmental factors influence healing. For those interested in evidence-based medical humanities, this research will create an opportunity to contribute meaningfully to family-centred care practices, potentially influencing clinical guidelines, while developing transferable research skills applicable across your future medical career.

This work will offer a unique opportunity to develop diverse research skills by combining systematic review methodology with primary qualitative research, creating a comprehensive understanding of both "what works" and "how it works" in real clinical contexts. The project's dual methodology will allow you to contribute to the evidence base while simultaneously developing practical recommendations for clinical implementation, bridging the gap between research and practice.

The aims of this research will be to:

- Systematically evaluate existing evidence regarding music interventions in neonatal intensive care unit (NICU) settings
- Explore lived experiences of parents, staff, and music therapists implementing music interventions
- Identify factors influencing successful implementation across diverse NICU environments
- Develop evidence-based, contextually informed recommendations for clinical practice

The systematic review will adhere to PRISMA guidelines for transparent reporting, ensuring methodological rigor and comprehensive search strategies. A mixed-methods approach will integrate quantitative outcome measures with qualitative experiential data to provide contextually rich understanding.

Given the novelty of this research and the relatively limited existing evidence base, it is expected that you will present your findings at a national or international conference and gain at least one publication from your studies.

Should you require any further information, please contact either Dr Jacky Waldock (Jacqueline.Waldock@liverpool.ac.uk) or Prof Paul McNamara (mcnamp@liverpool.ac.uk).

Project Title	Sound making and music listening in paediatric healthcare settings
Project ID	35
Supervisor	Jacky Waldock
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Institute in the Park at Alder Hey Children's Hospital & the Dept of Music on campus

Project Description:

This project will give you with an opportunity to engage with an emerging field at the intersection of environmental medicine and patient centred care. By synthesizing evidence on sound environments and clinical outcomes, you will develop advanced research skills in evidence evaluation and critical appraisal, while gaining insights into how environmental factors, often overlooked in traditional medical education, impact health outcomes.

The interdisciplinary nature of this review will allow you to collaborate with specialists across music, psychology, and clinical practice, broadening your professional network while developing a holistic understanding of healing environments. For those interested in specialties ranging from psychiatry to intensive care, understanding the relationship between sound and music exposure and physiological responses will provide valuable foundational knowledge applicable throughout their clinical careers.

Aims:

1. This systematic review will:

a) Examine the relationship between acoustic environments and measurable recovery rates across various clinical settings as well as synthesizing evidence on emotional regulation mechanisms facilitated through intentionally designed soundscapes, particularly focusing on anxiety reduction and psychological wellbeing during hospitalization.

b) Evaluate how acoustic design elements impact healthcare providers' stress levels in various clinical environments, measuring both subjective experiences and objective stress markers. Communication efficiency within teams will be analysed in relation to sound environment characteristics, examining how noise levels and acoustic clarity influence information transfer accuracy and collaborative care delivery.

2. This research will offer the opportunity for fast qualitative methodology, carrying out semi-structured interviews with staff to gain further insight with the goal of suggesting future sound interventions to support staff wellbeing.

Methodological Framework

The systematic review will adhere to PRISMA guidelines for transparent reporting, ensuring methodological rigor and comprehensive search strategies. A mixed-methods approach will integrate quantitative outcome measures with qualitative experiential data to provide contextually rich understanding. The interdisciplinary analysis will connect findings across sound studies, architecture, and clinical medicine to develop holistic insights. Both quantitative metrics of sound characteristics and qualitative assessments of human experience will be systematically evaluated to establish sonic relationships.

Given the novelty of this research and the relatively limited existing evidence base, it is expected that you will present your findings at a national or international conference and gain at least one publication from your studies. Should you require any further information, please contact either Dr Jacky Waldock (Jacqueline.Waldock@liverpool.ac.uk) or Prof Paul McNamara (mcnamp@liverpool.ac.uk).

Project Title	Acceptability and clinical utility of salivary androgen profiles in home monitoring of children and young people with the adrenal disorder 'congenital adrenal hyperplasia'.
Project ID	39
Supervisor	Jo Blair
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's Hospital

Project Description:

Saliva is an ideal medium in which to measure hormones. Samples can be collected at home with minimal inconvenience to patients and families and avoid the discomfort and stress of blood tests. Samples can be returned to the hospital laboratory by post. We recently reported a high degree of acceptability and reliability of saliva sampling in healthy children and young people (CYP), and those with two medical diagnoses.1

CYP with the adrenal gland disorder 'congenital adrenal hyperplasia' (CAH) currently monitor their condition by collecting four blood samples on blotting paper over 24 hours. Samples are collected by finger prick. Patients and families describe this process as inconvenient and painful, and the volume of blood sample that is collected is often insufficient for analysis. Some families do not collect any samples at all, which compromises the quality of care we can provide their children.

In this study, you will help us to determine whether we can replace these painful finger prick blood tests with saliva samples. Your supervisor, Professor Jo Blair, and other members of the CAH clinical team will support you to recruit patients from CAH outpatient clinics. You will explain the purpose of the study and participate in obtaining informed assent or consent from patients and consent from parents, where required. You will show participants how to collect saliva samples. The next time a blood spot profile is required, the participant will collect a saliva sample immediately before each finger prick blood test. At the end of the sampling day, the participant and their carer will complete brief acceptability questionnaires to report their experience of collecting finger prick and saliva samples. The questionnaires, blood spot and saliva samples will be returned to the biochemistry laboratory at Alder Hey Children's Hospital by post. The saliva sample will be analysed for a range of adrenal gland hormones, including the hormone measured in the finger prick blood test (17-hydroxyprogesterone). We aim to recruit 25 out of 54 CYP with who attend CAH clinics at Alder Hey, to this study.

The primary aims of this study are to determine: (1) whether saliva samples are collected reliably in this cohort of patients and (2) CYP and carer preference for blood tests or saliva sampling (3) how closely blood spot and salivary 17 hydroxyprogesterone concentrations correlate. There is some evidence that 17 hydroxyprogesterone is not the best hormone for monitoring CYP with CAH,2 and your project will also generate important and novel data to help us to understand whether another androgen might be more informative. Our data from healthy CYP suggest that it may be possible to collect a single saliva sample first thing in the morning rather than multiple samples across the day.3 The data from this study will give further evidence of whether this is also true for CYP with CAH.

This project will be carried out under Alder Hey's collaboration with the Liverpool Centre for Cardiovascular Science. We have a weekly supervision meeting as a group, and 1:1 meetings with students as required. Together, we have successfully supported a number of undergraduate MPhil and MRes projects. All our students have completed their degrees and given oral and poster presentations at national and / or international meetings. Data have been published in peer reviewed scientific journals. Our students have also been awarded the Wolfson Foundation intercalated degree research fellowships and 'The Best MRes project' at the University of Liverpool.

References
1. Buckingham-Woodhouse O, Jones L, Park J, Dliso S, Bright O, Hawcutt DB, Shantsila A, Lip GYH, Blair J. Saliva Sampling in Children and Young People: Acceptability and Reliability Data From Three Exploratory Studies. Clin Endocrinol (Oxf). 2025 Jan 28. doi: 10.1111/cen.15205. Epub ahead of print. PMID: 39873239.
2. Bacila IA, Lawrence NR, Badrinath SG, Balagamage C, Krone NP. Biomarkers in congenital adren

Project Title	What are the optimal collection methods for saliva samples used for the analysis of adrenal gland hormones?
Project ID	40
Supervisor	Joanne Blair
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's Hospital

Project Description:

Saliva is an ideal medium in which to measure hormones. Samples can be collected at home with minimal inconvenience to patients and families and avoid the discomfort and stress of blood tests. Samples can be returned to the hospital laboratory by post. We recently reported a high degree of acceptability and reliability of saliva sampling in children and young people (CYP).1

We have documented salivary adrenal gland hormones concentrations in a number of different patient cohorts.2-6 Our next project will recruit a large number of healthy CYP to define robust reference ranges for a range of hormones only recently described. It is important that the study protocol is as simple as possible, to optimise recruitment and minimise disruption to participating families. It is also important to generate evidence to inform the manner in which saliva samples should be collected in clinical practice.

The secretion of adrenal gland hormones shows a diurnal profile, with hormone profiles that are thought to peak 30 minutes after waking. For this reason, we ask patients to wait for 30 minutes after waking before collecting the first sample of the morning. It is important that saliva samples are not contaminated with blood, and for this reason we ask patients to abstain from brushing their teeth or eating within an hour of collecting a saliva sample. These time requirements for sampling (waiting for 30 minutes after waking and avoiding eating and brushing teeth for an hour before sampling) can be challenging and may deter some families from participating in a research project. In this study you will determine whether or not they are necessary. Your study findings will inform the design of our future research and how saliva samples will be collected in clinical practice.

You will be supported by your primary supervisor, Professor Jo Blair, to recruit healthy ten children age 5-11 years and ten young people age 12-18 years. Each participant will be asked to collect saliva samples:

1. On waking and 30 minutes after waking
2. Immediately before and after brushing their teeth, rinsing their mouth with water before each sample is collected
3. Immediately before and after eating a crunchy food, such as breakfast cereal, toast, biscuits or crackers, rinsing their mouth with water before each sample is collected

Hormone concentrations in each of these paired samples will be compared. A difference in hormone concentration greater than twice the intra-assay coefficient of variation of the assay will be considered significant.

This project will be carried out under Alder Hey's collaboration with the Liverpool Centre for Cardiovascular Science. We have a weekly supervision meeting as a group, and 1:1 meetings with students as required. Together, we have successfully supported a number of undergraduate MPhil and MRes projects. All our students have completed their degrees and given oral and poster presentations at national and / or international meetings. Data have been published in peer reviewed scientific journals. Our students have also been awarded the Wolfson Foundation intercalated degree research fellowships and 'The Best MRes project' at the University of Liverpool.

References:

1. Buckingham-Woodhouse O, Jones L, Park J, Dliso S, Bright O, Hawcutt DB, Shantsila A, Lip GYH, Blair J. Saliva Sampling in Children and Young People: Acceptability and Reliability Data From Three Exploratory Studies. Clin Endocrinol (Oxf). 2025 Jan 28.
2. Buckingham-Woodhouse O, Park J, Dliso S, Bright O, Hawcutt D, Shantsila A, Lip GYH, Blair JC. Clinical utility of salivary androgen profiles as a diagnostic tool in premature adrenarche: a pilot study. Arch Dis Child. 2025 Feb 22:archdischild-2024-328202.
3. Park J, Titman A, Bright O, Dliso S, Shantsila A, Lip G, Adaway J, Keevil B, Hawcutt D, Blair J Salivary testosterone, androstenedione and 11-oxygenated 19-carbon concentrations differ by age and sex in children. In press, Clin Endocrinol
4. Jones L, Park

Project Title	Exploring Women's Perspectives of Future Cardiovascular Disease Risk after Placental Dysfunction
Project ID	43
Supervisor	andrew sharp
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LWH

Project Description:

Cardiovascular disease is the leading cause of death in women globally. Women who develop placental dysfunction during pregnancy, such as preeclampsia and fetal growth restriction, are at higher risk of death from cardiovascular disease in later life. National and international guidance support the need for women to be informed of their risk but it is unclear how this should be done and when is the best timing. It is crucial the views of women are understood to allow us to develop the most effective health intervention strategies.
This MRES project will involve exploring the views of women who have had placental dysfunction with regards to their understanding of their risk and how best any health interventions can be targeted. This will be done through questionnaires and focus group interviews with women antenatally, in the postpartum period and also in subsequent pregnancies.

Project Title	The Long-Term Impact of Pregnancy Complications on the Future Health of Mother and Child
Project ID	44
Supervisor	andrew sharp
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LWH and AHCH

Project Description:

Many pregnancy complications, such as hypertension, fetal growth restriction and preterm birth, are association with an increased risk to the mother and offspring of future cardiovascular disease. The risk of many pregnancy complications are also influenced by ethnicity and socioeconomic status, as is cardiovascular risk. This project will consist of 2 themes of work, one analysing the maternal risks and the other the risks to the children. Using large public health datasets, through collaboration with public health researchers, you will examine the risk of a range of pregnancy complications on a women's risk of cardiovascular disease or death. You will also explore the impact differing ethnicity and socioeconomic status has on the risk. In collaboration with paediatric researchers at Alder Hey you will also look at the 10 year outcomes of children that were born small (small for gestational age and fetal growth restriction). You will explore the rates of lung disease and risk factors for metabolic syndrome such as obesity whilst taking into consideration any impact prematurity may have played on the observed outcomes.

Project Title	Understanding how Hormones affect fibroids; developing new treatments
Project ID	53
Supervisor	Dharani Hapangama
Pathway	Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	WHD

Project Description:

Uterine Fibroids (also known as leiomyoma) are the most common benign tumour of the uterus found in women of reproductive age. They can cause heavy menstrual bleeding, and bleeding after childbirth. Due to lack of effective medical treatments, fibroids have become the main reason for hysterectomy in the world. Novel and effective treatments for fibroids will improve the lives of women living with fibroids.
There is an interesting observation suggesting that hormonal contraceptives are a protective factor against developing fibroids, and we aim to use multiple techniques from immunohistochemistry and cell culture etc to find out if/how these contraceptives hormonal treatments affect the fibroids (e.g. Hormone receptor expression, induction of cell proliferation in culture of myometrial cells) and also look for fibrotic changes in unaffected myometrium between women using/not using contraceptives.

Project Title	Understanding the role of immune environment in uterine fibroids
Project ID	54
Supervisor	Dharani Hapangama
Pathway	Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	Liverpool Women's Hospital

Project Description:

Uterine Fibroids (also known as leiomyoma) are the most common benign tumour of the uterus found in women of reproductive age. They can cause heavy menstrual bleeding, and bleeding after childbirth. Due to lack of effective medical treatments, fibroids have become the main reason for hysterectomy in the world. Novel and effective treatments for fibroids will improve the lives of women living with fibroids.
Immune environment in the myometrium from where fibroids are originated from and immune cell profile of the fibroid tissue may unravel why some women develop fibroids while other do not. Characterisation of the fibroid immune cell profile using multiple techniques and examining the immune cell profile of different types of fibroids between patients, between fibroids of the same patient, as well as comparing to matched and healthy control myometrial samples is planned in the project. This work will be guided by the spatial transcriptomic data generated by our group.

Project Title	Oesophageal atresia and trachea-oesophageal fistula – exploring themes and outcomes from 20 years of clinical experience.
Project ID	56
Supervisor	Rebecca Thursfield
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

Oesophageal atresia and/or tracheo-oesophageal fistula (OA-TOF) describes a constellation of congenital abnormalities affecting 1:3000 live births, in which there is a failure of the normal separation of the proximal foregut into ventral respiratory and dorsal gastrointestinal (GI) tubes. In the majority of cases, preservation of the native oesophagus with primary oesophageal anastomosis to restore continuity is possible and considered by most as the preferred outcome. However, in an important minority, native oesophageal length is insufficient to achieve continuity, most typically so-called long gap OA. In such cases, a range of surgical techniques are used to overcome the lack of oesophageal length, variably using stomach, jejenum or colon to bridge the gap. In modern times, in the absence of other comorbidities, survival for babies born with oesophageal atresia/trachea-oesophageal fistula is expected but whilst mortality is low morbidity is high and lifelong.

GI symptoms are reported in over 70% of individuals and respiratory symptoms in over 50%. Focus group studies reveal that children and adults regularly get food stuck at the site of the oesophageal join causing pain and the feeling of sudden breathlessness. This may be dislodged by walking, tapping manoeuvres or ingesting carbonated fluids but sometimes dislodgement is not possible without surgical intervention. Some babies require frequent surgical procedures to dislodge the food bolus and to use balloon interventions to stretch and dilate any oesophageal narrowing. Sleep disturbance due to gastro-oesophgeal reflux is common and can range from nightly vomiting, pain impacting duration and quality of sleep and the need to sleep upright to minimise this. Misdiagnoses of respiratory symptoms are common with patients reporting being treated for asthma for many many years without any clinical benefit or improvement in their symptoms. The lack of knowledge of the morbidity faced in the general and medical population feeds into these misdiagnoses and misconceptions.
Common to other rare diseases, evidence-based quality data to support best practice management for OA-TOF are lacking. In joint international guidelines 34 /46 statements had "low", "very low" or "no" levels of evidence to support recommendations demonstrating gaps in knowledge and the need for better quality research in this field.

Despite such a degree of symptoms, expertise in this condition in adult sector is exceedingly sparing and very little provision for this group. In order to drive forward change, data are needed to demonstrate the clinical need and influence development of standards of care and subsequent commissioning of specialist services.
At Alder Hey, we have recently designed a clinical database to capture this information for patients born with OA-TOF. There are around 300 patients who were transferred to Alder Hey in the neonatal period for management of this condition over the past 20 years.
The student undertaking this project will have the opportunity to join the OA-TOF multidisciplinary team, becoming involved in in-patient and out-patient care of these patients at Alder Hey. This would include newborn babies undergoing their initial diagnosis and surgery, establishment of feeding before discharge home, routine follow up in out-patients and exposure to elective and emergency admissions for management of symptoms.

There are currently no data published/available from large cohorts in the UK. This project will use the new database to explore outcomes and themes. This will form the UK's largest dataset and be extremely informative informing local and national guidance.
This is a great opportunity to learn about this multisystem conditions and gain skills in database analysis in a way that in anticipated to make a difference and drive forward research in this group of patients whilst learning about clinical management of this group.

Project Title	Can defining the metabolomic signature of uterine fibroids help improve this poorly understood disease?
Project ID	57
Supervisor	Dr Andrew Davison
Pathway	Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	Liverpool Woman's Hospital, Centre for Woman's' and Children's Health and Royal Liverpool Hospital, Liverpool Clinical Laboratories

Project Description:

Uterine Fibroids (also known as leiomyoma) are the most common benign tumour of the uterus found in women of reproductive age. They can cause heavy menstrual bleeding, and bleeding after childbirth. Due to lack of effective medical treatments, fibroids have become the main reason for hysterectomy in the world. Bleeding after childbirth is the reason for a quarter of maternal deaths and fibroids significantly contribute to this. Preliminary research from our team has shown secretions from fibroids have an effect on blood vessels and myometrial contractility. Novel and effective treatments for fibroids will improve the lives of women living with fibroids.

Mass spectrometry based metabolomic analysis has seen huge growth in the last decade, and its application to Woman's Health offers real promise to clinicians, and ultimately patients as it has the potential to identify novel diagnostic and prognostic biomarkers of disease, and identify novel therapeutic targets. In this project, we will aim to determine the metabolomic signature of fibroids and assess how this relates to the effect they have on myometrial contractility and vascular reactivity. There is very little known in this area and this research will significantly advance our understanding of the metabolic activity fibroids and will offer insight into potential novel therapeutic targets.

Strong collaborative links between the University of Liverpool, Liverpool Woman's Hospital and the Royal Liverpool Hospital enables this exciting opportunity for a student to experience the entire research pipeline from recruiting patients in a clinic to performing laboratory and data analysis, and interpreting data in the clinical context of the study. Moreover the student will get first hand experience of how a clinical and academic laboratory works.

Project Title	Understanding the lesion type specific differences in endometriosis to propose new treatment strategies
Project ID	58
Supervisor	Dharani Hapangama, Katie Jones
Pathway	Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	Liverpool Women's Hospital

Project Description:

Endometriosis causes chronic pain, inflammation and infertility. It affects ~190 million women globally, with an estimated societal cost of £8,500 per woman annually. Despite its prevalence, impact on quality of life and cost, we have only a basic understanding of endometriosis pathophysiology. The most common form is peritoneal endometriosis, where endometrium-like cells usually located in the lining of the uterus form 'lesions' on the lining of the pelvis ('peritoneum'), while other 2 forms are also described where lesions are located on the ovaries (ovarian) and invading deep in to underlying organs (deep infiltrating). Treatment options are limited, with recurrence rates as high as 70% following surgical removal of lesions. We urgently need more effective medical treatments that preserve fertility and improve the quality of life for women living with this condition.
In this project aims to understand the differences in the lesion types examining their immune cell composition, presence of fibrosis and abnormalities in the vasculature. Laboratory techniques such as immunohistochemistry, PCR and immunofluorescence staining will be used, to study the human tissue samples. The study will be guided by the recently generated spatial transcriptomic data.

Project Title	Characterisation of the fibroid immune cell profile.
Project ID	59
Supervisor	Professor Dharani Hapangama
Pathway	Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	LWH, research department

Project Description:

Uterine fibroids are common, non-cancerous tumours which occur in the muscle wall of the uterus. Fibroids can be classified into types based upon their location in the myometrium. While fibroids are known to be very heterogenous in cellular composition, there is limited research around the immune cell profile and how this may affect their pathophysiology. This protect aims to elucidate the immune cell profile of different types of fibroids between patients, and between fibroids of the same patient. Drawing comparisons to matched, and healthy control, myometrial samples.

Project Title	Determining the molecular fingerprint of premalignant lesions in endometrial cancer for early diagnosis and screening
Project ID	60
Supervisor	Chris Hill, Andrew Davison, Dharani Hapangama
Pathway	Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	Liverpool Women's Hospital

Project Description:

Endometrial cancer is the sixth most common cancer among women, with ~417,000 new cases diagnosed globally in 2020. Women have a 3% lifetime risk of developing endometrial cancer. While mortality rates for other cancers are declining, endometrial cancer related mortality is increasing. Early diagnosis is crucial for timely treatment and improved survival rates. Atypical endometrial hyperplasia describes the premalignant transformation of the lining of the womb, which will progress to endometrial cancer in 60% of cases. Early detection of atypical endometrial hyperplasia would allow for clinical intervention before malignant transformation, thus significantly reducing the incidence of endometrial cancer. We hypothesise that determining the molecular changes associated with premalignant changes in the endometrium will provide an opportunity to intervene in cancer prevention. We aim to study healthy postmenopausal, atypical endometrial hyperplasia and endometrial cancer to detect protein and transcriptional changes in the pursuit of preventative screening and novel treatment strategies for endometrial cancer. In addition to the markers identified from the work by the group, an initial systematic review will determine further important markers to analyse in these samples during the study.

Project Title	Investigating the effects of hormonal treatment on uterine fibroids.
Project ID	61
Supervisor	Prof Dharani Hapangama
Pathway	Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	LWH

Project Description:

Uterine fibroids are common, non-cancerous tumours which occur in the muscle wall of the uterus. Fibroids can be classified into types based upon their location in the myometrium. Women who present with fibroid are often prescribed hormonal treatment options in attempts to halt fibroid growth and alleviate the associated symptoms. A recent questionnaire study has suggested that hormonal contraceptives are a protective factor for fibroids.

This project aims to determine the effects of hormonal treatment on uterine fibroids, looking at hormone receptor expression as well as proliferation/apoptosis markers. Samples will include those from women with fibroids using/not using hormonal treatments, as well as control healthy myometrium from women using/ not using, hormonal treatments.

Project Title	The management and impact of twin pregnancy on maternal and neonatal outcomes
Project ID	65
Supervisor	andrew sharp
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LWH

Project Description:

Twin pregnancy carries significant risks for the fetus and the mother, including preterm birth, neurodisability and maternal health concerns like preeclampsia.
We wish to expand and examine our existing database of >200 twin pregnancies to identify the incidence of twin related problems in Liverpool. We will also review how twin care is delivered across the UK.
We will explore the impact of being a twin on childhood outcomes and the impact of mode and timing of birth on these outcomes. We will also look to provide up to date twin specific neonatal outcomes to inform prematurity counselling

Project Title	Ensuring children with heart disease grow well
Project ID	71
Supervisor	Fiona Cameron
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

This project will involve a literature review of nutrition/growth in babies and children who are born with heart problems. It will also involve a research project looking at the experiences of families of children who have heart conditions and attend a specialist clinic that we run to help these children grow better. We will also try to understand if the type of heart problem affects growth more than others. This project would suit those interested in a career in paediatrics, cardiology, gastroenterology and nutrition. The student will be based in the gastro team at Alder Hey, spending time with our doctors, dieticians and speech and language therapists. We would also encourage spending time with the cardiology team and attending theatre lists to see gastrostomies placed to see the actual patient journey. Your clinical supervisor would be Dr Fiona Cameron, Consultant Paediatric Gastroenterologist and lead for the cardiac MDT feeding clinic. Our previous audit of this clinic was presented at a national meeting by our previous medical student and the abstract published in a peer review journal. We are currently preparing a manuscript on our findings for publication.
Alder Hey is a quaternary centre for heart surgery, managing some of the most complex children across the Northwest. Children with complex heart conditions often grow poorly, which can be due to increased demand from their heart condition or difficulty drinking their milk. This can lead to delays in having their heart operations due to difficulty reaching specific weight criteria. Recognising these difficulties, the cardiac MDT feeding clinic was established in 2008 to support these patients. The team includes a paediatric gastroenterologist, dietician and speech and language therapist. It is the only specialist clinic of its kind within the UK offering a holistic approach to feeding and nutrition in children with complex heart conditions across the Northwest. Our recent audit has shown that this clinic helps children improve their feeding and reduce the need for gastrostomy feeding, as well as improving their growth. For families, it has the benefit of seeing several professionals in the same clinic appointment, therefore, reducing the number of hospital visits/time off work parents/carers have.
For more information, please contact Dr Cameron (Fiona.cameron@alderhey.nhs.uk).

Project Title	Artificial nutrition in children with significant neurodisability- is this the right thing to do?
Project ID	72
Supervisor	Fiona Cameron
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

This project will involve a systematic review looking at the evidence for the use of artificial nutrition in children with significant neurodisability and the outcomes. We are trying to understand if artificial nutrition is the right thing to do for these children or if it will it lead to increased suffering for the child/young person. We also want to ask the families of these children their views on how to manage nutrition and symptoms, particularly when feeding is difficult. This project would suit those interested in paediatrics, nutrition, ethics, palliative care and neurology. It will be based within the gastro team at Alder Hey and involve working with dieticians, advanced care practitioners, doctors, nurses and the palliative care team. The student will attend our neurofeeding and GI dystonia clinics. They will also spend time with our ACP and dietetic colleagues while they support families through these difficult discussions. The clinical supervisor for the project will be Dr Fiona Cameron, Consultant Paediatric Gastroenterologist. An audit of our experience managing patients like this has already been presented, highlighting that there is no evidence as to how best to manage these patients.

Survival of premature infants and those with underlying genetic conditions is improving due to improved care. However, children are often left with severe neurological impairment (SNI) and highly complex medical needs. Life expectancy amongst children with SNI is increasing due to better care which has led to more children experiencing severe issues with feed intolerance. Gastrointestinal (GI) symptoms are common, including retching, vomiting, pain/discomfort, constipation/loose stools and blood in stools. The management is increasingly difficult, balancing improving symptoms with the ethical dilemmas of palliation or artificial nutrition (PN), depending on the best interests of the child.

For more information, please contact Dr Cameron (Fiona.cameron@alderhey.nhs.uk).

Project Title	The WISH study: The development, piloting and application of a Women's Wellbeing Integrated Score for Health in Malawi.
Project ID	81
Supervisor	Dr Mary McCauley
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LUHFT

Project Description:

This will be a desk based study using existing databases in Liverpool and in Malawi to perform secondary data analysis to:

• Develop an innovative and integrated women's health score with severity measures.

• Apply the WISH score to existing cross sectional and cohort databases in Malawi with an aim to:

(i) Identify gaps in variables measured;

(ii) Pilot and assess the feasibility of the WISH scoring criteria to assess the prevalence of and trends over time for medical, infectious, obstetric, gynaecological, sexual, psychological, and social ill-health measurements, before, during, and after pregnancy.

Project Title	Systematic review of the prevalence, determinants, factors associated, impact of quality of life and treatment options of heavy menstrual bleeding for women living in low-and middle-income countries.
Project ID	82
Supervisor	Dr Mary McCauley
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LUHFT

Project Description:

Globally, one in four women suffer with heavy menstrual bleeding, that can cause significant anaemia. Fibroids are common benign tumours of the uterine wall and are the leading cause for heavy menstrual bleeding. The prevalence of fibroids in high income countries is estimated to affect 50% of women.
However, there is lack of data regarding the prevalence of fibroids, heavy menstrual bleeding and associated anaemia across low-and middle-income countries.This will be a desk based review to conduct a systematic review of studies from low and middle income countries that have explored heavy menstrual bleeding.

Project Title	Systematic review of what interventions are available for women living with female genital mutilation (FGM) in low- and middle-income countries.
Project ID	83
Supervisor	Dr Mary McCauley
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LUHFT

Project Description:

This will be a desk based systematic review exploring the impact of female genital multilation (FGM) on a woman's health and wellbeing and what interventions are available for women living with FGM in low- and middle-income countries, and how effective are these interventions to improve a woman's quality of life?

Project Title	Systematic review of the impact of innovative methods of community engagement and public and patient involvement to improve health education and promotion regarding mother -to child transmission of HIV, syphilis and Hepatitis B in low- and middle income c
Project ID	84
Supervisor	Dr Mary McCauley
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LUHFT

Project Description:

The mother to child transmission of HIV, syphilis and Hep B is still a problem in low and middle-income countries. This will be a desk based study to explore the impact of innovative methods of community engagement and public and patient involvement to improve health education and promotion using methods such as art, plays, radio, village announcers, songs, and stories.

Project Title	Systematic review of how to improve referral pathways between different healthcare level facilities for women and their babies during and after childbirth in low-and middle income country settings.
Project ID	85
Supervisor	Dr Linda Mipando
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LUHFT

Project Description:

Poor referral pathways are a major barrier to women and their babies to receive good quality clinical care to prevent morbidity and mortality in low and middle income countries. This will be a desk based review to explore what innovations have been implemented with regards to referral processes to improve maternal and newborn outcomes.

Project Title	Systematic review of congenital syphilis cohorts to identify clinical features most associated with newborn babies symptomatic of congenital syphilis.
Project ID	86
Supervisor	Dr Mary McCauley
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LUHFT

Project Description:

This will be a desk based study to review existing cohorts to identify clinical features most associated with newborn babies symptomatic of congenital syphilis.
We will then design and validate a clinical proforma based on these results.

Project Title	Systematic review exploring definitions, roles, impact, measures of sustainability and equitability of partnerships with regards to international medical volunteering at undergraduate level.
Project ID	91
Supervisor	Dr Mary McCauley
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LUHFT - desk based

Project Description:

This will be a systematic review on the impact and sustainable effectiveness of international medical volunteering regarding undergraduate placements (medical students, midwifery students, nursing students) in low-resource settings and the systematic review can assess several measurable outcomes such as:

Healthcare System Improvements:

- Patient health outcomes (e.g., recovery rates, reduced morbidity/mortality).
- Increased access to healthcare services.
- Improvements in local healthcare infrastructure (e.g., equipment, facilities).

Knowledge and Skill Transfer:

- Enhanced skills and knowledge of local healthcare providers.
- Uptake of new medical techniques or practices introduced by volunteers.

Volunteer-Related Outcomes:

- Long-term personal and professional development of volunteers.
- Retention of volunteers in global health or underserved areas after their experience.

Program Sustainability and Integration:

- Continuity of care after volunteers depart.
- Reduction in reliance on external medical aid.
- Successful integration of volunteering efforts into local health strategies and priorities.

Ethical and Cultural Impact:

- Effects of medical volunteering on local autonomy and decision-making.
- Cultural sensitivity and appropriateness of interventions.

This systematic review will contribute to the development of a core outcome set to assess the effectiveness of international medical volunteering at undergraduate level in low-resource settings in a structured and collaborative approach.

Project Title	Systematic review to assess the definitions, roles, impact and effectiveness of international medical volunteering at postgraduate level in low resource settings.
Project ID	92
Supervisor	Dr Mary McCauley
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Desk based LUHFT

Project Description:

This will be a systematic review on the impact and sustainable effectiveness of international medical volunteering regarding postgraduate placements in low-resource settings and the systematic review can assess several measurable outcomes such as:

Healthcare System Improvements:

- Patient health outcomes (e.g., recovery rates, reduced morbidity/mortality).
- Increased access to healthcare services.
- Improvements in local healthcare infrastructure (e.g., equipment, facilities).

Knowledge and Skill Transfer:

- Enhanced skills and knowledge of local healthcare providers.
- Uptake of new medical techniques or practices introduced by volunteers.

Volunteer-Related Outcomes:

- Long-term personal and professional development of volunteers.
- Retention of volunteers in global health or underserved areas after their experience.

Program Sustainability and Integration:

- Continuity of care after volunteers depart.
- Reduction in reliance on external medical aid.
- Successful integration of volunteering efforts into local health strategies and priorities.

Ethical and Cultural Impact:

- Effects of medical volunteering on local autonomy and decision-making.
- Cultural sensitivity and appropriateness of interventions.

This systematic review will contribute to the development of a core outcome set to assess the effectiveness of international medical volunteering at post graduate level in low-resource settings in a structured and collaborative approach.

Project Title	The impact of CFTR modulator therapy on the behaviour of children with CF
Project ID	94
Supervisor	Kevin Southern
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	AHCHNHSFT
Project Description: Systematic review	

Project Title	A mixed methods evaluation of the GLOWM Enhancing the Welfare of Women patient education videos
Project ID	101
Supervisor	Dr Kate Lightly
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Online with optional face-to-face meetings at Liverpool Women's Hospital/Liverpool University Campus.

Project Description:

The Global Library of Women's Medicine has recently launched its Enhancing the Welfare of Women project https://www.glowm.com/wow-contents: a series of health care education videos and online patient information texts, aimed at women in low-income settings, which can be translated into any language and viewed in four different ethnicities. This project aims to work with a national and international team to evaluate the impact of this work using various methods, including literature review, social media, Google Analytics, surveys, and qualitative methods, e.g. interviews/focus groups and present the output at conferences and in peer-reviewed journals.

Project Title	Understanding how haemolysis during cardiovascular surgery affects kidney health in children.
Project ID	102
Supervisor	Bettina Wilm
Pathway	Women and Children's Health
Type of Project	Laboratory (require bench fee of £3,000)
Project Location	We are located in the Sherrington Building

Project Description:

During some surgeries, especially those correcting major blood vessels, organs will need to be artificially perfused. This perfusion of blood can damage red blood cells which leads to haemolysis and the release of cell-free haemoglobin. Haemoglobin in turn has been shown to cause kidney injury, leading to the patients suffering from prolonged intensive care time.
We are keen to understand better how haemoglobin causes injury in kidney cells, and want to ultimately develop strategies to reduce the risk for kidney injury in these patients. We have recently started a project to address these questions using a range of kidney cell lines.
Techniques: Culture of kidney cell lines, assessments of their response to haemoglobin, using cell viability assays and activation of specific signalling pathways, including NFkB.
Further techniques that may be used: bright field and fluorescence microscopy, flow cytometry, qPCR, ELISA of supernatant,.

Project Title	Managing Single Ventricle Babies in the Community: Little Hearts at Home Digital Platform
Project ID	104
Supervisor	Dan Hawcutt
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's Hospital

Project Description:

Alder Hey Innovation, in collaboration with Alder Hey Heart Centre, have developed a clinically validated paediatric remote patient monitoring platform called Little Hearts At Home®™ (LHAH). The LHAH platform hosts the information of babies born with severe heart defects, such as single ventricle anatomy, providing remote patient monitoring, connecting patients, parents, community care providers, and hospital staff. Real-time data provided by the platform is audited and counter-checked with hospital visit records of these children over a 12 month period.
The LHAH platform now requires an assessment of the impact it has had on this cohort of children. This will include looking at the data that is continuously generated through the platform as well as a qualitative assessment of the impact to families and clinicians.

Project Title	Research Ambassador Programme
Project ID	6
Supervisor	Dan Hawcutt
Pathway	Women and Children's Health
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

There is a network of schools with which we work to get research data on young people and medicines/drugs/ This project is to lead this programme for a year, deliver a new project, and work closely with children and young people regionally and nationally. This will be the fourth year this programme has run, all the previous years have delivered successful MRes projects. The nature of the questionnaire for the schools is not yet finalised - but previous ones have included Adverse Drug Reactions, Transition to medication independence, and Vaping.
Happy to chat about this - please email dhawcutt@liverpool.ac.uk

Project Title	E-scooter injuries in children - What is the incidence of e-scooter injuries in children across Liverpool and the North West?
Project ID	37
Supervisor	Dr Charlotte Durand
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's Hospital

Project Description:

This project would be building on local data already obtained on e-scooter injuries in children and gain further understanding of the scale of these injuries in children and young people. There is no national data published on injuries in children in the UK, this is despite 47 deaths across the UK since 2019, 8 of these were children (<16 years). E-scooters are illegal for children <16years and despite this we are seeing increasing numbers of children injured using these micromobility vehicles. A national report in Dec 2023 found that 9-26% of e-scooter injuries are reported to the police - therefore the injuries reported nationally are an under-representation of the scale of the problem.

This project would be to:

- Review and analysis of retrospective data on e-scooter injuries from Merseyside/North West and also national audit data collected (over last 5 years)
- Literature review of e-scooter injuries in children
- PPI work with CYP and parents on their understanding of e-scooters and children
- This work would be collated as part of a funding application for a prospective observational study planned for 2026

Project Title	Outcomes and follow-up of acute kidney injury in children
Project ID	47
Supervisor	Steve McWilliam
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

There is data demonstrating that children who experience acute kidney injury (AKI) have significantly increased morbidity and mortality. In the short term, this is reflected in increased length of hospitalisation and in-hospital mortality. In the long term, this is reflected in an increased incidence of chronic kidney disease. The outcomes may vary depending on the initial cause and severity of the AKI.

This project will include:

1.Systematic review of literature on short- and long-term outcomes of AKI in children

2.Analysis of Alder Hey electronic medical record data to describe short-term outcomes of AKI

3.Review of data from patients in the Alder Hey AKI follow-up clinic to assess longer-term outcomes

We anticipate this work will lead to presentations at national conferences and submission for publication. This work will contribute to an ongoing quality improvement project which will reduce this preventable cause of morbidity and mortality for children at Alder Hey and beyond.

Project Title	Improving recognition and reporting of drug-induced kidney injury in children
Project ID	49
Supervisor	Steve McWilliam
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

Drug-induced kidney injury is a common cause of acute kidney injury (AKI) in children. However, over a 10-year period between 2015 and 2024 only 162 cases have been reported to the MHRA through the yellow card scheme, compared to 4,676 in adults. This means that we have much less paediatric-specific data on renal risks of medications.
This project will include:
1. Analysis of data from MHRA yellow card scheme to describe the pattern of reports of drug-induced kidney injury in children and compare to adults.
2. Prospective audit at Alder Hey to review medication exposures in patients who develop AKI.
3. Design of a quality improvement study or research project (such as RCPCH BPSU) to improve reporting.
We anticipate this work will lead to presentations at national conferences and submission for publication. The student will also have the opportunity to contribute to delivery of other clinical research projects at Alder Hey.

Project Title	Parental monitoring of hydration status in children at risk of dehydration
Project ID	50
Supervisor	Steve McWilliam
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

Many parents bring their children to the Emergency Department at Alder Hey every year with concerns about dehydration. Clinicians in the department will review the child, often provide a trial of oral fluids, and in the vast majority of cases they will then be discharged home with advice to return if they get worse. Unfortunately, occasionally children are brought back with such severe dehydration that they require significant medical intervention and in some cases can develop severe acute kidney injury. We would like to address this by working with the innovation team at Alder Hey to develop a tool to support parents to monitor their child's hydration status at home that would then flag up children who need to be seen again. This tool could take a number of different forms, but one option we have discussed is an app where parents can enter fluid intake, urine output and weights, that then flags any concerns to community nurses.

This project will include:

1. Working with ED staff, innovation team and parents to develop a prototype tool for parental monitoring of hydration status.
2. Conducting a small pilot of the tool with families attending the ED
3. Refining the tool based on feedback from the pilot and designing an implementation project/applying for funding

We anticipate this work will lead to presentations at national conferences and submission for publication, as well as experience working in medical innovation. The student will also have the opportunity to contribute to delivery of other clinical research projects at Alder Hey.

Project Title	Outcomes for children following renal replacement therapy in PICU
Project ID	51
Supervisor	Steve McWilliam
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

Renal replacement therapy is frequently used during the management of extremely unwell children in a PICU setting. This typically takes the form of Continuous Veno-venous haemofiltration (CVVH) or peritoneal dialysis (PD). This project will look at what is known about the short- and long-term outcomes for children who require these treatments, and will collect and analyse data from Alder Hey to seek to add to this data.
This project will include:
1. Systematic review of the literature to describe the existing evidence base around outcomes of children following RRT in PICU.
2. Data collection for an established prospective audit of RRT in PICU at Alder Hey and collection of data around patient outcomes at 6 months post-RRT.
3. Statistical analysis of audit data
We anticipate this work will lead to presentations at national conferences and submission for publication. The student will also have the opportunity to contribute to delivery of other clinical research projects at Alder Hey.

Project Title	Health economics of AKI in children
Project ID	52
Supervisor	Steve McWilliam
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

Prevention of Acute Kidney Injury is important because these patients experience increased short-term morbidity and mortality, longer hospitalisation and long-term increased risk of chronic kidney disease. This is true for children as well as adults. However, whilst the costs of AKI to healthcare systems have been well documented for adults, there is little paediatric-specific data available. This project will look at what is known about the economic costs of AKI in children, and will collect and analyse data from Alder Hey to seek to add to this data. This project will include:

1. Systematic review of the literature to describe the existing evidence base around the health economics of AKI in children.
2. Health economic data collection at Alder Hey with input from health economist.
3. Health economic analysis of data

We anticipate this work will lead to presentations at national conferences and submission for publication. The student will also have the opportunity to contribute to delivery of other clinical research projects at Alder Hey.

Project Title	Exploring the link between complex social backgrounds and pregnancy outcomes
Project ID	55
Supervisor	Abi Merriel
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LWH

Project Description:

This project will be to develop a way of systematically identifying pregnant women from complex social backgrounds in order to be able to understand their pregnancy outcomes. We will use consensus methodology to develop this definition with key stakeholders and explore its utility within a locally available dataset.

Project Title	Adverse Drug Reactions in Children - improving the reports from Children and Young People
Project ID	15
Supervisor	Dan Hawcutt
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey

Project Description:

As part of an ongoing project to get young people to report their suspected adverse drug reactions to the MHRA using the Yellow Card scheme, we will test the roll out of information to all young people in the hospital and get the information back from the MHRA team to see what was reported - this will be a study looking at what reports are gathered from other places and what from our hospital, seeing patients and interpreting clinical information.

Project Title	Is it time for a randomised trial on planned caesarean vs planned vaginal birth?
Project ID	80
Supervisor	Abi Merriel and Carol Kingdon
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LWH

Project Description:

1) Analysis of existing qualitative interviews on whether women/staff believe a trial is needed and whether they would participate
2) national survey of women and staff views of a trial on planned caesarean vs planned vaginal birth
3) comparison of this 2025/6 data to 2005 data

Project Title	Personalising care for women during pregnancy and birth
Project ID	7
Supervisor	Abi Merriel
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	LWH

Project Description:

You will work alongside the Options study team on the cohort study and feasibility trial to predict emergency caesarean and provide choices to women in their first pregnancy. The exact project will depend on your personal interests but could include interviewing women or staff to understand their views on the study and recruitment to it, or working as part of the team to develop the information women in our engagement groups have requested, or analysing the feedback from staff on the training to deliver the intervention.

Project Title	The Effect of Pulsed Dye Laser on Intraocular Following Treatment of Capillary Malformations of the Head and Neck in the Paediatric Population
Project ID	105
Supervisor	Sian Falder
Pathway	Women and Children's Health; Clinical Sciences (General)
Type of Project	Desk based (require bench fee of £1,000)
Project Location	Alder Hey Children's Hospital

Project Description:

Capillary malformations (CM), or port-wine stains, commonly affect the head and neck region in children. Pulsed Dye Laser (PDL) therapy remains the standard treatment due to its selective vascular targeting. However, when treating lesions near the orbit, concerns arise regarding intraocular pressure (IOP) changes in children, whose ocular regulation systems are immature. This study aims to assess the impact of PDL on IOP to guide safer treatment protocols.

Primary Aim: To evaluate the effect of pulsed dye laser treatment on intraocular pressure in paediatric patients with capillary malformations of the head and neck.

Secondary Objectives:

- - Correlate treatment site with IOP change
  - Evaluate timing and duration of IOP changes
  - Explore influence of laser parameters and patient age
  - Recommend monitoring protocol for high-risk areas

This will be a prospective observational cohort study at Alder Hey, involving children aged 0–16 receiving PDL treatment. Pre- and post-treatment IOP will be measured using handheld tonometry. Variables like lesion site, age, laser settings, and treatment history will be recorded. Statistical methods include paired t-tests and regression analysis to assess IOP changes.

Ethical approval will be sought from NHS REC and University Ethics Board.