

## S RTP - Project Description Form #217

### PART I:

**Name of Schulich faculty member who will supervise the project** Marat Slessarev

**Supervisor's Schulich, Western, Hospital or Lawson Email** Marat.Slessarev@lhsc.on.ca

**Schulich Department** Medicine

### PART II - Project Description

**Title of Project** Feasibility of using POCUS Transcranial Doppler to Optimize Cerebral Perfusion and Improve Cognitive Outcomes in Critically Ill Patients - the ULTRAMIND Study

#### Background

Up to 80% of critically ill patients experience acute and long-term cognitive impairment, adversely affecting patient outcomes and healthcare costs. Impaired brain oxygen delivery due to shock and endothelial dysfunction is a potential contributor to these cognitive deficits. Optimizing cerebral blood flow via bedside assessment methods like POCUS TCD could potentially improve cognitive outcomes, but its feasibility in non-brain injured, critically ill patients needs to be established. This work could disrupt conventional paradigms of shock management by optimizing hemodynamics based on individual patient physiologic and specific organ systems.

#### Hypothesis

We hypothesize that bedside POCUS TCD can be utilized effectively in ICUs to derive cerebral perfusion indices. Furthermore, we posit that these indices will have a significant association with neurocognitive outcomes in critically ill patients with shock, potentially guiding improved resuscitation strategies.

#### Proposed Methodology

A prospective observational cohort study will be conducted at two London ICUs to evaluate the feasibility of POCUS TCD in deriving brain perfusion indices and to explore their association with patient and health system outcomes. We will enrol non-brained injured patients with shock, and collect hemodynamic and physiologic data during their ICU stay. Trained personnel will perform POCUS TCD on days 1 and 3 of ICU admission. We will acquire and analyze cerebral perfusion data and correlate them with neurocognitive outcomes measured at ICU discharge and then again at 3-6 months after hospital discharge.

#### Expected Outcomes

We expect to establish the feasibility of POCUS TCD in a clinical setting and confirm the association between cerebral perfusion and neurocognitive outcomes. This will set the foundation for a future RCT aimed at improving cognitive outcomes in critically ill patients through personalized cerebral perfusion-guided resuscitation strategies.

#### Research Environment - Description of the number of research personnel, primary location of research, size of lab, etc

The research will be conducted in two tertiary-care academic ICUs with a skilled team led by Dr. Slessarev and Dr. Basmaji. The infrastructure includes POCUS machines and a dedicated research assistant for patient enrollment and data entry, supported by a statistician from the DOM POEM program. The prospective student will interact with Research Assistants, Research Coordinators, and clinical trainees (residents and fellows) on the point-of-care ultrasound team.

**Names and titles of other individuals who will be involved with the research project?**

Dr. John Basmaji  
Dr. Ross Prager  
Dr. Rob Arntfield  
Dr. Ian Ball  
Dr. Aleks Leligdowicz

**Can this project be done remotely?** No

**Duration of Project** Two Summers

**Expected Objectives/Accomplishments for Student for Year 1?**

- Learn research methodology pertaining to conducting high quality prospective observational studies
- Learn about shock physiology as it pertains to neurocognitive outcomes
- Gain familiarity with the TCD protocol and perform scans in patients enrolled in the study
- Begin a scoping review exploring the association of transcranial doppler measurements with outcomes in patients with shock

**Expected Objectives/Accomplishments for Student for Year 2?**

- Complete statistical analysis of data
- Manuscript preparation
- Present results at the results at the Canadian Critical Care Forums (CCCF) in November 2025 (national critical care conference)

**PART III - Certifications**

**If the project will require any certification - Human Ethics approvals from one or more of the following offices, please check the appropriate box below.**

**Human Ethics: If you have the protocol information, please enter it below (or enter the status of the approval).** Pending - REB will be submitted and approved before summer 2024

**Note: certification approval should be obtained prior to the start of the summer. Projects without this approval will not be a priority for funding.**