SRTP - Project Description Form #212

PART I:

Name of Schulich faculty member who will supervise the project	John Basmaji
Supervisor's Schulich, Western, Hospital or Lawson Email	john.basmaji@lhsc.on.ca
Schulich Department	Medicine

PART II - Project Description

Title of Project	Pilot Randomized Controlled Trial Comparing Venous Excess Ultrasound Guided Management, Versus Usual Care, in Patients with Septic Shock

Background

Sepsis, characterized by life-threatening organ dysfunction due to a dysregulated host response to infection, remains a leading cause of mortality in intensive care units (ICUs). A crucial aspect of sepsis management is fluid resuscitation, which aims to restore hemodynamic stability and organ perfusion by augmenting cardiac output. However, inappropriate fluid management can lead to fluid overload, contributing to adverse outcomes like acute kidney injury (AKI) and increased mortality. Unfortunately, up to 70% of patients with septic shock will develop fluid overload. Currently, clinicians have no effective tools to prevent fluid-overload associated organ injury.

The Venous Excess Ultrasound (VEXUS) protocol, a point-of-care ultrasound (POCUS)-based tool, offers a non-invasive method to assess systemic venous congestion. Venous congestion, is an early marker of fluid overload, and can be identified by VEXUS before organ injury becomes irreversible. VEXUS evaluates venous flow patterns in the hepatic, portal, and renal veins, providing insights into the patient's fluid status and guiding tailored fluid management.

Recent studies have demonstrated the potential of VEXUS in identifying systemic venous congestion and its association with AKI and other complications in critical care settings. However, there is a lack of robust evidence, particularly from randomized controlled trials (RCTs), to determine whether VEXUS-guided fluid management can improve clinical outcomes in septic shock compared to usual care.

Hypothesis

The primary hypothesis of this pilot RCT is that it is feasible to conduct a definitive RCT comparing VEXUS-guided fluid management in patients, versus usual care, in patients with septic shock. Our overarching hypothesis is that VEXUS-guided fluid management will lead to a more precise assessment of the patient's fluid status, allowing for tailored fluid administration and avoidance of fluid overload. We believe this personalized approach will reduce the incidence of fluid-related complications such as AKI, decrease ICU length of stay, and potentially lower mortality rates.

The underlying assumption is that VEXUS, by providing real-time, non-invasive assessment of systemic venous congestion, enables a more nuanced understanding of the patient's hemodynamic state. This detailed insight could facilitate more informed decisions regarding fluid administration, diuretic therapy, and other supportive measures, thus optimizing patient outcomes in the challenging context of septic shock.

Proposed Methodology

In this pilot RCT, we will compare VEXUS guided management to usual care in septic shock patients, focusing on feasibility outcomes: recruitment rate, consent rate, and protocol adherence rate.

Enrollment and Randomization:
We will identify eligible patients with septic shock in the ICU for potential enrollment at University and Victoria Hospitals. After obtaining informed consent from eligible patients or their substitute decision makers, we will randomize them them to either the VEXUS-guided management group or the usual care group. We will track the recruitment rate to assess the effectiveness of our enrollment strategies.

Intervention:
We will conduct VEXUS assessments once a day for 5 days in the intervention group. These assessments will guide individualized fluid management plans aimed at optimizing hemodynamic status. The control group will receive standard septic shock management as per current Surviving Sepsis guidelines.

Data Collection and Feasibility Metrics:
Our primary focus will be on measuring feasibility outcomes. We will calculate the recruitment rate as the proportion of eligible patients enrolled and the consent rate as the proportion of approached patients who agree to participate. We will determine the protocol adherence rate by evaluating how faithfully we implement VEXUS in the intervention group and adhere to standard care protocols in the control group.

Expected Outcomes
Feasibility Outcomes:
- Recruitment Rate
- Consent Rate
- Protocol Adherence Rate

Secondary Outcomes:
We will also explore secondary outcomes such as 28-day mortality, ICU stay length days alive and free of organ sustaining therapy, adverse event rates, and whether there was a separation in fluid balance between the two arms. These outcomes will offer preliminary insights into the potential benefits of VEXUS-guided fluid management and guide decision for the primary outcome in the definitive RCT.

Research Environment – Description of the number of research personnel, primary location of research, size of lab, etc
The summer student will be integrated into a dynamic and multidisciplinary research team at Victoria Hospital, with potential arrangements at University Hospital. The team comprises 4-5 critical care physicians who bring a wealth of expertise in point-of-care ultrasound, physiology, and research methodology. This rich learning environment will offer the student a unique opportunity to engage with experts in critical care medicine and to contribute meaningfully to a cutting-edge research project.

The student will have access to a dedicated workspace equipped with the necessary resources to facilitate effective research activities. They will be actively involved in various stages of the research process, including patient enrollment, data collection, and preliminary data analysis. Additionally, the student will have the opportunity to participate in team meetings and discussions, providing a platform for intellectual exchange and professional development.

Supporting the student in their research endeavors will be experienced Research Coordinators and Research Assistants. These team members will provide guidance on the operational aspects of the study, including regulatory compliance, data management, and coordination of patient assessments. The student will also receive mentorship and supervision.

Names and titles of other individuals who will be involved with the research project?
Ross Prager - MD, Clinical Scholar, and POCUS fellow. Role: VEXUS/POCUS expert
Marat Slessarev - MD, Assistant Professor, Clinician Scientist. Role: Physiology expert
Rob Arntfield - MD, Professor. Role: POCUS expert

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 RCTs
- Learn about septic shock physiology as it pertains to fluid administration.
- Gain familiarity with the VEXUS protocol and perform scans in patients randomized to the intervention arm

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 approvals from one or more of the following offices, please check the appropriate box below.	- Human Ethics - Animal Use Subcommittee
Human Ethics: If you have the protocol information, please enter it below (or enter the status of the approval).	pending

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