

RESEARCH SCHOLAR PROGRAM 2017  
SUPERVISOR/PROJECT INFORMATION FORM



Due on or before **October 21 2016**. Forms received after this date will not be posted on the website.

**SUPERVISOR INFORMATION**

Supervisor Name: **Andrea Kassner**

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Email Address: andrea.kassner@utoronto.ca

Degree (MD, PhD, MD/PhD): PhD

Academic Rank: Associate Professor

Field of Research: MRI, Stroke

Graduate School Appointment (IMS, IHPME etc.): IMS

*Please note that you must be appointed to the SGS in order to be a supervisor in the Scholar Program*

Research Institute Affiliation (if applicable): SickKids Research Institute

Allocation of student contact time (# of hours per week you are available to the student for any concerns or to review progress): 5-8 hours

Do you have a student that you have already agreed to work with? No

*Please note, you may go ahead with a self-initiated project with a student of your choosing. If you choose this option, your project will not be posted online, meaning it will not be open to student applicants.*

## PROJECT INFORMATION

Project Title: Assessing ischaemic brain injury in children with sickle cell disease using novel MRI techniques

Project Description (max 500 words):

Sickle cell disease (SCD) is a genetically inherited disorder that causes the deformation of oxygen-carrying red blood cells into a sickled shape. As a result, children with SCD suffer from chronic anaemia and are at increased risk of ischaemic damage in the brain. Using advanced MRI acquisition and analysis techniques, our lab is investigating the physiological mechanisms associated with ischaemic damage in the brain such as poor hemodynamic regulation, impaired cortical development, and abnormal cerebral oxygen metabolism. We have collected MRI data from a large cohort of pediatric patients with SCD and age-matched healthy controls, and we would like to perform texture analysis on our data to predict ischemic injury and also investigate the progression of SCD disease over time using our pool of longitudinal data.

Texture analysis is based on statistical computation of features to quantify subtle characteristics in an image that cannot be detected by the human eye. The process needs to be very consistent in order to remove any user bias. We believe that the application of texture analysis on standard structural MR images of the brain can reveal abnormalities in regions that correspond to microvascular damage. It may serve as an early warning system or identify patients who are in need of additional medical care, and can be implemented simply by analyzing existing clinical data. All of the data has been collected and is available for analysis.

Physiological changes over time will be investigated by comparing baseline and 1-year follow-up SCD data. The goal is to stratify patients based on changes in cerebral physiology, and correlate these changes to either treatment or co-morbidities. This may provide valuable insight into the progression of the disease, as well as the optimal disease management strategies for children with SCD. We have already collected sufficient longitudinal data for an interim analysis and data collection will continue using our current CIHR funding.

If human subjects are involved, has Ethics been obtained?

☒ YES                      ☐ NO                      ☐ Application Submitted                      ☐ N/A

Do you expect this work will be published within 20 months?

☒ YES                      ☐ NO                      ☐ Uncertain

Student's Roles / Responsibilities (Please be as specific as possible) Please indicate who will serve as the student's direct report. (PI, PDF, PhD student, technician etc...):

The CREMS student will report directly to the myself (PI), and work in close collaboration with my research team. Through literature review and guidance from me and my team, the student will learn the basics of MRI as well as the physiological interpretation of brain MRI data. For texture analysis, the student will be responsible for consolidating large sets of image data to satisfy the analysis requirements. Additional testing and optimization will be necessary in order to select the most appropriate brain regions to compare between patients and controls. Analysis of the longitudinal data will involve an extensive review of patient records in order to correlate changes in MRI measurements with clinical reports

over 6-12 months. To accomplish this, the student will be required to understand the cerebrovascular and metabolic effects of SCD and their relation to the measurements that were acquired. A literature review will also be necessary. Both aspects of the project are expected to lead to abstracts and publications. The student will be encouraged to submit their findings to suitable meetings and publish in collaboration with my team.

**Desirable skills**

- Fast and independent learner
- Strong background in statistics and computation
- Experience with image analysis tools
- Familiar with data processing pipelines
- Knowledge in neuroimaging using MRI is an asset but not required
- Self-direction and an ambition to attain high levels of productivity
- Good communication including scientific writing skills