



RESEARCH SCHOLAR PROGRAM – 2018 SUPERVISOR & PROJECT INFORMATION FORM

Please complete and return, via email only (crems.programs@utoronto.ca) by **November 3rd 2017** (forms received after this date will not be posted).

Supervisor Information

Name: **Michael G. Fehlings**

Email: **michael.fehlings@uhn.ca**

Degree: **MD, PhD, FRCSC, FACS**

SGS Appointment (IMS, IHPME, LMP etc.): **IMS**

Academic Rank: **Professo**

Field of Research: Translational clinical research in traumatic and non traumatic forms of spinal cord injury

Research Institution Affiliation (if applicable): **Krembil Research Institute, Toronto Western Hospital, University Health Network**

Allocation of student contact time (number of hours per week YOU are available to the student for any concerns or to review progress): **>10**

Project Information

Title:

Clinical research in traumatic and non-traumatic spinal cord injury

Description (max 500 words):

BACKGROUND

Spinal cord injury (SCI) is a devastating disorder, with far-reaching physical, emotional, and economic ramifications for patients, families, and society at large. Broadly, SCI occurs in two forms: 1) acute traumatic SCI as a result of sudden traumatic injury; or 2) chronic, non-traumatic SCI, known as degenerative cervical myelopathy (DCM), as a result of spinal cord compression from osteoarthritis within the spinal column. As growing sources of disability, the study and optimization of outcomes of acute traumatic SCI and DCM have become forefront priorities of public health systems globally.

OBJECTIVES

This project involves the epidemiological, clinical, and radiological study of both acute traumatic SCI and DCM to: 1) delineate natural history and treatment outcomes; 2) characterize degree and pattern of impairment in quality of life; 3) evaluate clinical predictors of outcomes; 4) use advanced quantitative MRI techniques to identify novel markers

that may quantify injury and predict outcomes; 5) investigate the safety and efficacy of neuroprotective drugs and strategies; 6) study the cost-effectiveness of surgical and non-surgical therapeutics; 7) establish age- and sex-stratified population incidences; and 8) study healthcare resource utilization at the provincial and national levels.

HYPOTHESES

We hypothesize the population burden of disease of traumatic SCI and DCM are growing. Further, we hypothesize that both traumatic SCI and DCM represent heterogeneous populations and that it is possible to identify clinical and radiological variables that predict neurological, functional, and quality of life outcomes. We also hypothesize both surgical (e.g., early decompression) and pharmacological (e.g., methylprednisolone, riluzole, VX-210, G-CSF) neuroprotective strategies may be identified that are safe, efficacious, and cost-effective in patients.

METHODS

High quality data for the present investigation will be derived from multiple sources, including prospective, multi-center datasets, systematic reviews of the literature, and prospective enrollment of patients undergoing quantitative high-resolution MRI. Available datasets include:

- *Provincial and national administrative healthcare datasets:* the Ontario Institute for Clinical Evaluative Sciences (ICES) Data Repository, the United States National Inpatient Sample (NIS), the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) and Trauma Quality Improvement Program (TQIP), and the National Trauma Data Bank (NTDB)
- *Prospective, multi-center datasets:* the AOSpine Cervical Spondylotic Myelopathy North America (CSM-NA) and International (CSM-I) studies, the North American Clinical Trials Network (NACTN) SCI Registry, the Rick Hansen SCI Registry (RHSCIR)

An array of study designs and statistical techniques will be employed to fulfill the above objectives and test the above hypotheses, including propensity score matching, advanced regression techniques, machine learning algorithms, and meta-analysis. MRI techniques to elucidate elements of spinal cord microstructure and function will include diffusion tensor imaging (DTI), magnetization transfer (MT), myelin water fraction (MWF), MR spectroscopy (MRS), and functional MRI (fMRI).

POTENTIAL FOR IMPACT

The sheer statistical power and robust contemporary prospective data derived from the above sources places the present investigation in an unprecedented position to address many important and relevant knowledge gaps in SCI and DCM research. Completion of this multifaceted study will redefine the landscape surrounding our understanding of spinal cord injury.

If human subjects are involved, have Ethics been obtained?

YES NO Application Submitted N/A

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

YES NO Uncertain

Student's roles and responsibilities (please be specific)

Please indicate who will serve as the student's direct report (PI, PhD student, technician etc...)

The student will be involved in virtually all aspects of this investigation, from design stages to data acquisition to statistical analysis to manuscript drafting and critical revision, depending on his or her level of motivation and expertise. The student's direct report will be Dr. Michael Fehlings, who is Professor in the Division of Neurosurgery and Vice Chair of Research of the Department of Surgery. The student will work side-by-side with Dr. Fehlings' outstanding multidisciplinary research group, including graduate students, post-doctoral researchers, epidemiologists, statisticians, scientists, and clinician investigators, all of whom are invaluable resources. In particular, the student will work closely with Dr. Jetan Badhiwala and Dr. Ali Akbar, PGY4 Residents in Neurosurgery at the University of Toronto who are now pursuing PhDs in clinical research under Dr. Michael Fehlings' supervision through the Surgeon Scientist Training Program (SSTP). This project provides a bright and motivated student with a

rich opportunity to develop and hone skills in basic and advanced health research methodologies and statistical techniques essential for a future career in academic medicine. Support and resources available to the student are abundant, and he or she will be poised for success.