

Abstract: Every day Canadian youth put themselves at risk of traumatic brain injury through sporting and recreational activities. Each year more than 300,000 North Americans suffer a sport-related concussion. There is emerging evidence that recurrent injury could have long term consequences, creating an urgent need to advance knowledge in the assessment, diagnosis, prognosis and management of children and adolescents who sustain this injury. Our understanding of the risk factors and the ability of the developing brain to recover from concussion is quite limited, largely because research regarding the neural mechanisms behind mild traumatic brain injuries is in its infancy. Standard clinical neurologic tools (i.e. the physical exam and neuroimaging) are limited in their ability to assess post-concussion changes. Our present understanding of sport related concussion comes largely from adult studies and anecdotal evidence. In children, we have far less evidence and we are limited in our ability to predict outcomes including possible long-term effects. Traditionally, the assumption has been that concussion is a “functional” injury without neuropathological changes, but recent data in adults indicates this may not be the case. We need better information about the natural history of this condition in the developing brains of children as well as better diagnostic and prognostic tools in order to inform our clinical decision-making. Currently, one of the best approaches for addressing concussion in youth appears to be prevention, as evidence has shown that history of concussion is a risk factor for subsequent concussion. Prevention needs to occur across the continuum of care: 1. Primary prevention is aimed at stopping the occurrence of injury; 2. Secondary prevention requires early diagnosis, and effective early management, and; 3. Tertiary prevention ensures full recovery and prevention of re-injury.

Aim: The aim of this 5 year interdisciplinary research program is to develop best practice guidelines for child and youth concussion by addressing all aspects of prevention with innovative new technologies targeted at improved diagnosis.

Methods: High participation and concussion rates in youth ice hockey make this an ideal population to study. Ongoing engagement of the youth ice hockey community since 2003 uniquely position this research team to carry out this research program. Through “Safe to Play” we will establish the first longitudinal community cohort of youth ice hockey players in which we will comprehensively examine predictors and long-term sequelae of concussion over 5 years of sport participation to address the following objectives: Objective 1: Develop baseline normative values (and annual developmental changes) for the Sport Concussion Assessment Tool (SCAT2), ImPACT and KINARM robotic assessment in a cohort of 11-12 year old hockey players.

Objective 2: Monitor change in baseline measures following concussion.

Objective 3: Determine the proportion of concussed players (at each specific age over the 5 year cohort) who demonstrate abnormalities in neuroendocrine function.

Objective 4: Determine which markers predict length of recovery and re-injury risk.

Summary: A better understanding of childhood sport concussion is imperative to make clinical decisions and establish best practice in the prevention, diagnosis, prognosis and management of concussion in this population. This requires a better understanding of “normal” neurologic development using various diagnostic tools such that we can identify impairments associated with concussion. To understand prognosis, there is a need of long-term data on children with concussion. This 5-year longitudinal study will both inform best practice and impact thousands of children participating in sport in Canada each year.