

NeuroMatters

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Getting a Handle on Pain

Neuropathic Pain and Spinal Cord Injury

We've all felt pain, and yet few of us understand why it happens. Chronic pain lasts a long time and occurs due to molecular and cellular changes. Pain is a common symptom for people with spinal cord injury (SCI) and yet it remains poorly managed and thus expensive for the healthcare system.

The Ontario Neurotrauma Foundation (ONF) recognizes that chronic pain can be a part of everyday life for many people living with SCI. Recently, ONF funded the research of Michael Salter, Program Head of Neuroscience and Mental Health at the Hospital for Sick Children in Toronto. Salter is trying to understand the biology of neuropathic pain with a view to developing



Michael Salter, Program Head of Neuroscience and Mental Health at the Hospital for Sick Children in Toronto

effective pain management strategies for people living with chronic pain.

There are two sorts of chronic pain:

- inflammatory pain and
- neuropathic pain

For inflammatory pain, the source is bones, muscles or joints. For neuropathic pain, the source is the nervous system.

Salter believes that in order to figure out how to manage pain, it's a good idea to find out what causes pain in the first place. He is working on looking at pain at the molecular level to better understand the mechanisms of neuropathic pain.

There are two problems concerning chronic neuropathic pain for people with SCI. The first problem is that neuropathic pain can be intense and debilitating. The second problem is that there is no good treatment yet. "We are trying to come up with creative new strategies to frame our understanding to develop new treatment approaches that might have to do with the molecules involved in neuropathic pain."

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Salter explains that pain has a very useful purpose, namely to alert us to danger or harm. "The fundamental mechanism for acute pain seems to be different from the mechanisms for chronic pain, but there are shared parts of the two systems," he says. "The trick is to alleviate the chronic pain without interfering with the acute pain mechanisms."

All organisms need to be able to respond when the body gets damaged. Humans have sensory neurons in the skin, joints and bones that signal when tissue damage has occurred. Nerves send messages via the spinal cord to the brain. The spinal cord is like a superhighway to the brain, or like a series of computers passing information from one to another along this highway. When these messages arrive at the brain, the pain motivates us to take action to limit the tissue damage.

In chronic neuropathic pain, the signal processing is different than it

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is for pain associated with an incident of tissue damage. There is amplification of the pain signals and the brain networks get activated even when there is very little or even no tissue damage. These amplified signals occur either in the tissues, the spinal cord or in the brain network itself.

Two principal strategies among researchers interested in determining the causes of neuropathic pain include examining (1) the peripheral nervous system, i.e. the nerve tissues at the location of the damage; and (2) the spinal cord. There are also some researchers who are examining the brain as the cause.

Salter is focussing his research on the possibility that the source of the problem lies in the spinal cord mechanisms and in the way the pain information is integrated and transformed in the injured spinal cord. Figuring out where the problem is could pave the road to

The stigma of complaining and the worry of being labelled a whiner can silence people with chronic pain

lasting relief for those people with SCI who experience neuropathic pain.

The stigma of complaining and the worry of being labelled a whiner can silence people with chronic pain. When there is no obvious visible cause of pain, it is difficult for people with chronic pain to understand what's going on in their bodies and difficult to convince others what is real and

what is imagined. To complicate matters, chronic pain might be a series of nervous system disorders, and not simply just one.

For peripheral inflammatory pain, there are some reasonably good treatments like non-steroidal opiates. But there is no specific treatment for neuropathic pain. Salter is trying to find new combinations of molecules that ultimately may give us some insight in how to treat neuropathic pain. "We have identified some molecules that we think are involved in neuropathic pain, but the whole process of getting from here to new therapies will take many years of research," he says.

In addition to research, there is strong advocacy by Canadians to develop comprehensive pain strategy to alleviate pain and suffering and lost productivity. This will ultimately decrease the burden of care on the province's healthcare system.

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Getting the Word Out about Concussion

It starts with recognition and awareness!

Eighty to ninety percent of traumatic brain injury is classified as mild. The incidence of concussion/mild traumatic brain injury (mTBI) is estimated at 600 per 100,000 people according to the literature. But the reality of missed diagnoses has many experts suspecting the real numbers in the province may be twice as high. Although generally, recovery occurs from a week to three months, up to 20% of concussion patients continue to experience significant symptoms well beyond this period. These symptoms can include headache, sleep disturbances, dizziness and troubles with balance, cognitive impairments, fatigue and mood disorders.

The Ontario Neurotrauma Foundation (ONF) has convened the Concussion/mild Traumatic Brain Injury (mTBI) Strategy for the past two years to improve recognition, diagnosis and management, and most importantly outcomes of concussion/mTBI. ONF has gathered experts from across many sectors, involving medical and non-medical professionals and association representatives to work together to address this complicated issue.

The Concussion/mTBI Strategy seeks to achieve the following goals:

- improve understanding and management of mTBI across the province through increased education and awareness for individuals and sectors
- use the latest research in order to suggest changes in policy at the provincial, sectoral and organizational levels
- standardize approaches for diagnosis and management of mTBI
- improve outcomes for those with persistent symptoms of mTBI
- reduce the impact of mTBI on various sectors by

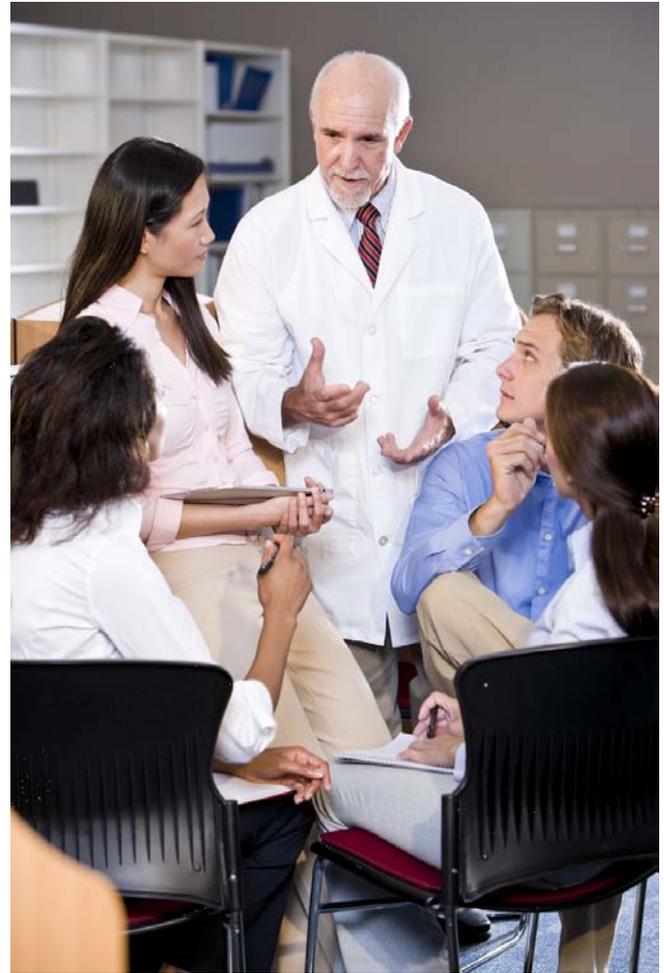
increasing the healthcare system's ability to treat and manage mTBI

To accomplish this, the Strategy has formed five working groups in priority areas. They are:

- Recognition and Awareness
- Diagnosis and Early Education for Patients and Families
- Management of Persistent Symptoms
- Psychosocial and Reintegration
- Evaluation of Access

The Concussion/mTBI Strategy wants the information about how to recognize, treat and manage concussion over time to get into the hands of those who need it most. While the Strategy is pursuing many avenues toward this goal, it recognizes education of medical and non-medical professionals as a priority.

One of the most active groups in the Strategy is the Recognition and Awareness working group; co-chaired by Dr. Charles Tator, Neurosurgeon and Founder of ThinkFirst Canada, and Patrick Brown, a Partner at the firm



McLeish Orlando LLP, who replaces Malcolm Moffat, President and CEO of St. John's Rehab Hospital.

"The idea of the Concussion/mTBI Strategy and of the Recognition and Awareness Committee is to open the dialogue about concussion beyond the healthcare community. We need to identify all the people who should be able to recognize concussion. It turns out that that's virtually everyone, including the general public," says Tator.

This inclusive approach engaging many sectors of the medical and non-medical communities distinguishes the Concussion/mTBI Strategy. "I don't think we're unique in taking this comprehensive approach,

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but certainly we're at the forefront of this movement of concern about concussion," Tator says.

ONF and its partners have hosted two Summits for the Strategy in the past two years, where the stakeholders involved discuss progress and plan how to implement the Strategy. Supported by ONF, the Awareness and Recognition working group had conducted some studies that contribute to understanding some of the knowledge gaps. At the most recent Summit in October 2011, Tator presented on this work. "We have identified a few areas where we felt education needs to be advanced," he said. The working group surveyed Ontario medical schools and nursing programs about their concussion education and found that no clear standards exist. Variations exist in terms of the stage of the program in which concussion was offered, the amount of time dedicated to it and the content included.

The working group also reviewed other research that surveyed medical students and doctors in training and found that healthcare students had many misperceptions about concussion diagnosis and management. Even first aid courses were found to provide insufficient information about concussion.

"What we'd like for starters is a one-hour lecture about concussion in every medical school in the country." The one-hour lecture on concussion was piloted at the University of Toronto last year and was a success. The Recognition and Awareness Working Group recently approved the distribution of a new PowerPoint presentation on concussion which was conceived by Tator. That presentation will be sent to all 17 medical schools across the country, on behalf of the Concussion/mTBI Strategy.

In the past, people were led to believe that a blow to the head

was not so serious but recent research indicates that concussion needs to be taken seriously, not least because of the number of people affected. The ONF-led Concussion/mTBI Strategy recognizes the importance of accurate concussion recognition in the workplace, schools, the sports arena and the community, and by medical and non-medical professionals.

One of the most important areas needing attention is concussion in the schools. People working in the school system need to be educated because a brain injury can occur at recess, during a gym class, or in after-school leagues. Equally important, a concussion may occur completely outside of the school system, but when the child then returns to school he/she may have trouble adapting. Since

"We're at the forefront of this movement of concern about concussion"

most affected. On March 6, 2012, the Government of Ontario introduced Bill 39, Education Amendment Act (Concussions) covering concussion education in elementary and high schools. If passed, the bill would help protect students engaging in



teachers have to deal with the kids returning to the classroom after a concussion, teachers need to be as aware of 'return to learn' as 'return to play'.

Fortunately many are seeing the importance of improving knowledge of those who are on the front lines and those who are

school sports and health and physical education classes from the potentially serious and long-term effects of concussions. It would also ensure that students who sustain concussions do not 'return to play or learn' too soon,

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thereby risking further complications. Additionally, the bill aims to provide resources to parents, teachers and school staff about the seriousness of concussions.

The Recognition and Awareness Working Group of the Strategy does not intend to accomplish the job of raising awareness about concussion by itself; rather, it

intends to make awareness strategies known to the people who could do the job.

"The beauty of the Concussion/MTBI Strategy", says Corinne Kagan of ONF, "is that we are all working together in a way that has not been previously done. We are looking at the need to improve recognition, diagnosis and management in a systemic

way that looks at the gaps, and then carefully works to address them using research and education. Through the collaboration of the outstanding stakeholders involved in the working groups, we can look at establishing more standard approaches that can be used across the province."

Actionable Nuggets™

Translating Spinal Cord Injury Care in Family Practice

Many primary care doctors feel ill-equipped to deal with individuals with spinal cord injuries (SCI) in routine practice. Typically, a family practice may have only one or two patients with SCI, so while they do keep abreast of more common ailments affecting many of their patients, it is difficult for them to keep updated about those conditions that only a small handful of their patients may have. They do not have the time to conduct the new research or read about the best available research evidence to take care of their patients with SCI and related conditions, and yet they feel they need more information to better serve them.



In 2009, the Ontario Neurotrauma Foundation (ONF) funded a project to design and implement an innovative knowledge translation product called Actionable Nuggets™ in a bid to get the latest research on SCI into the hands of the province's family physicians. The project was completed late last year by Alice

Aiken and Mary Ann McColl, Professors at Queen's University in the School of Rehabilitative Therapy.

The Actionable Nuggets™ provide evidence-based information in small, bite-sized excerpts. This information is provided to physicians in both an electronic format and on a handy

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card. A set of twenty prototype SCI Nuggets were developed and distributed to three groups of family physicians in Ontario, Newfoundland and Australia. The topics covered included:

- epidemiology
- physician office accessibility
- bowel and bladder management
- skin care
- pain
- cardiovascular disease
- physical activity
- sexuality
- depression
- autonomic dysreflexia

"We got the most positive feedback on the nuggets on the bladder and bowel management," Aiken reports.

To assemble the information for the nuggets, the team looked at SCI literature from 2000 to the present. From the more than 5000 articles, they narrowed the search

The information on the card is just the nugget of information about the topic. It's what doctors would need to know now to change their practices tomorrow.

with the help of an expert panel of:

- physicians
- physiatrists
- physiotherapists
- occupational therapists
- and input from the community

Then they put the information on cards, based on the criteria of the expert panel. On the website, they offered a fuller explanation of each topic as well as a summary of the data used for the nuggets.

"The information on the card is just the nugget of information about the topic. It's what doctors would need to know now to change their practices tomorrow," Aiken says. Approximately 40-60 references were consulted for the information on each card.

Each card was sent to the doctors at the rate of one per week, rather than as a set. The idea, Aiken explains, was that the doctors would be more likely to read each card if they received one at a time, than if they received them as a set.

The program development is on-going. The team is also working on actionable nuggets designed for use by people with spinal cord injury. "The nuggets are a living-knowledge product. As new evidence becomes available, the nuggets need to be constantly updated. We have already done one update in the context of this project," Aiken explains. To keep the cards current, the team is hoping to assemble a permanent nugget team, which would keep abreast of the information on the nuggets, and update them as necessary.

The spinal cord injury nuggets are one in a series. "We developed the program for several different conditions. We are in development for post-breast

We were really pleased with how appreciative the doctors were with the method of translating the information

cancer treatment, and for veteran health," Aiken says. The team chose those areas of medicine in which there are likely to be relatively few patients in a family practice. Since family practice doctors cannot be expected to keep current on all conditions, the nuggets can help them keep up to date.

"We were really pleased with how appreciative the family doctors were with the method of translating the information," Aiken says. The findings have been presented at a variety of conferences including the Family Medicine Forum in Montreal, the 2nd Annual Military and Veteran's Health Research Forum in Kingston, and the Primary Healthcare Partnership Forum in St. John's.

The team is hoping to test the concept with a broader audience, both in Canada and in Australia. ONF is always looking for new avenues and venues to share information to improve primary care for people with SCI.

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Getting Older, Getting Better (continued)

It has become clear from this study that traumatic brain injury and non-traumatic brain injury in the older population are quite distinct. This information is important with respect to planning healthcare and community services for older people and determining their needs to maximize their improvement after ABI. Once seniors are discharged from hospital and return home, most of the building of care in the home goes to case management, homemaking, personal support and nursing. Very small amounts of funds actually go to home rehabilitation, and this too has a

direct effect on the outcomes of individuals.

The statistics of this study are consistent with data from other studies on TBI, Colantonio noted. But she thinks the study's findings with respect to n-TBI are ground-breaking. "As far as we know, these analyses have never been conducted on n-TBI. I don't know of any other project focussed on n-TBI in older adults. It's not like there's a template out there; this is pioneering work."

"ABI is more common than HIV-AIDS, multiple sclerosis, breast cancer, and spinal cord injury put together. It's a huge issue. We

need to raise awareness. The numbers and the impact on people is staggering," Colantonio said.

This research has been presented at the International Brain Injury Association Meeting in March 2012 in Edinburgh.

This research as well as other findings was used by ONF to hold an expert panel meeting last fall. Recently ONF received Letters of Intent to further examine some key areas of prognosis and rehabilitation needs of older adults. Some of these are currently being developed into full proposals to advance these issues.

Spinal Cord Injury Knowledge Mobilization Network

A best practice implementation project supported by the Rick Hansen Institute and Alberta Paraplegic Foundation and led by the Ontario Neurotrauma Foundation

A best practice is a method or technique that has consistently shown results superior to those achieved with other means and that is used as a benchmark. In addition, a "best" practice can evolve to become better as improvements are discovered and techniques refined.

The Spinal Cord Injury (SCI) Best Practice Implementation (BPI) Project is funded by the Rick Hansen Institute and the Alberta Paraplegic Foundation and co-ordinated by ONF. The SCI BPI Project began in January 2011 and the funding is scheduled to run until 2013 with the expectation that the developed capacity will

sustain the program beyond then.

The goal is to build implementation capacity within and across sites to support sustainable adoption of any evidence-based practice. Participating are six implementation teams representing spinal cord injury rehabilitation hospitals in Quebec City, Montreal, Toronto, London, Calgary, and Edmonton.

The Ontario Neurotrauma Foundation (ONF) is acting as the change agent to promote Best Practice Implementation across this Knowledge Mobilization Network (KMN). ONF engages communities of practice through knowledge mobilization, consensus

activities, and expert committees in partnership with the National Implementation Research Network (NIRN) which provides global expertise in the field of best practice implementation.

Currently, the BPI Project focuses on pressure ulcer prevention and management. The KMN has selected Risk Assessment and Education as the two best practices to implement within all sites. Also selected were three optional best practices for future consideration by individual sites. The longer term goal is to cover the additional domains of pain and management of bladder function as determined by the Network.

Getting Older, Getting Better

Acquired brain injury and seniors in Ontario

Like Canada, Ontario is growing older. The proportion of the Ontario population aged 65 and older is expected to continue to rise significantly over the next few decades.



The aging brain is vulnerable in that it atrophies with time, is more predisposed to bleeding, and has less cognitive reserve than a younger brain. As individuals age they become more generally fragile, more prone to falls and disease, and have more co-existing health conditions. In comparison with younger adults, older adults who sustain a brain injury have higher rates of mortality, different patterns of recovery, and differing discharge destinations and follow-up care.

Rates of acquired brain injury (ABI) have been shown to be among the highest in older adults. A better understanding of this population can assist in planning, and evaluation of ABI services for seniors including approaches to prevent injury.

In 2011, the Ontario Neurotrauma Foundation (ONF) funded a sub-study from the ABI Dataset Project to profile older adults with ABI in the province. The dataset includes information on traumatic brain injuries (TBI) such as falls, as well as non-traumatic brain injuries (n-TBI) resulting from tumours and infections and other

medical events. Information collected by the province's health-care program was analysed with a number of objectives in mind:

- the number of episodes of ABI in older adults and the number of older patients with ABI
- better understanding of the characteristics of patients and their movement through the continuum of care
- the cost of providing care for these patients

"Unless we do something now, we are going to see a lot more brain injuries," says Angela Colantonio, Senior Research Scientist at Toronto Rehab, Professor at University of Toronto and Principal Investigator of the ABI Dataset Project. "The older people get, the more susceptible to falls they become. At the same time, a brain tumour is no longer a death sentence; people are surviving non-traumatic brain injuries and consequently, they need rehabilitation therapy. We need to be set up for that," she added.

The study compared younger seniors with older seniors to get an idea of where the need was

greatest and what sorts of brain injuries are particular to the different age groups. The three age groups were: 65-74 (younger seniors), 75-84 and 85+ (oldest seniors). Among the findings were that the older seniors experience traumatic brain injury at a rate nearly three times that of the younger senior group. Falls are the greatest cause of traumatic brain injury in older people. With respect to non-traumatic brain injury, older seniors experience just over one and a half times the number of n-TBIs as their younger counterparts.

Older seniors tended to do worse in terms of recovering from brain injuries and tended to have their outcomes adversely affected by their co-existing health conditions or co-morbidities. For patients with ABI, the co-morbidity groupings were:

- diseases of the circulatory system
- endocrine, nutritional, and metabolic diseases
- poisoning and external causes (TBI) grouping
- neoplasms (mass of tissue) (n-TBI)

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