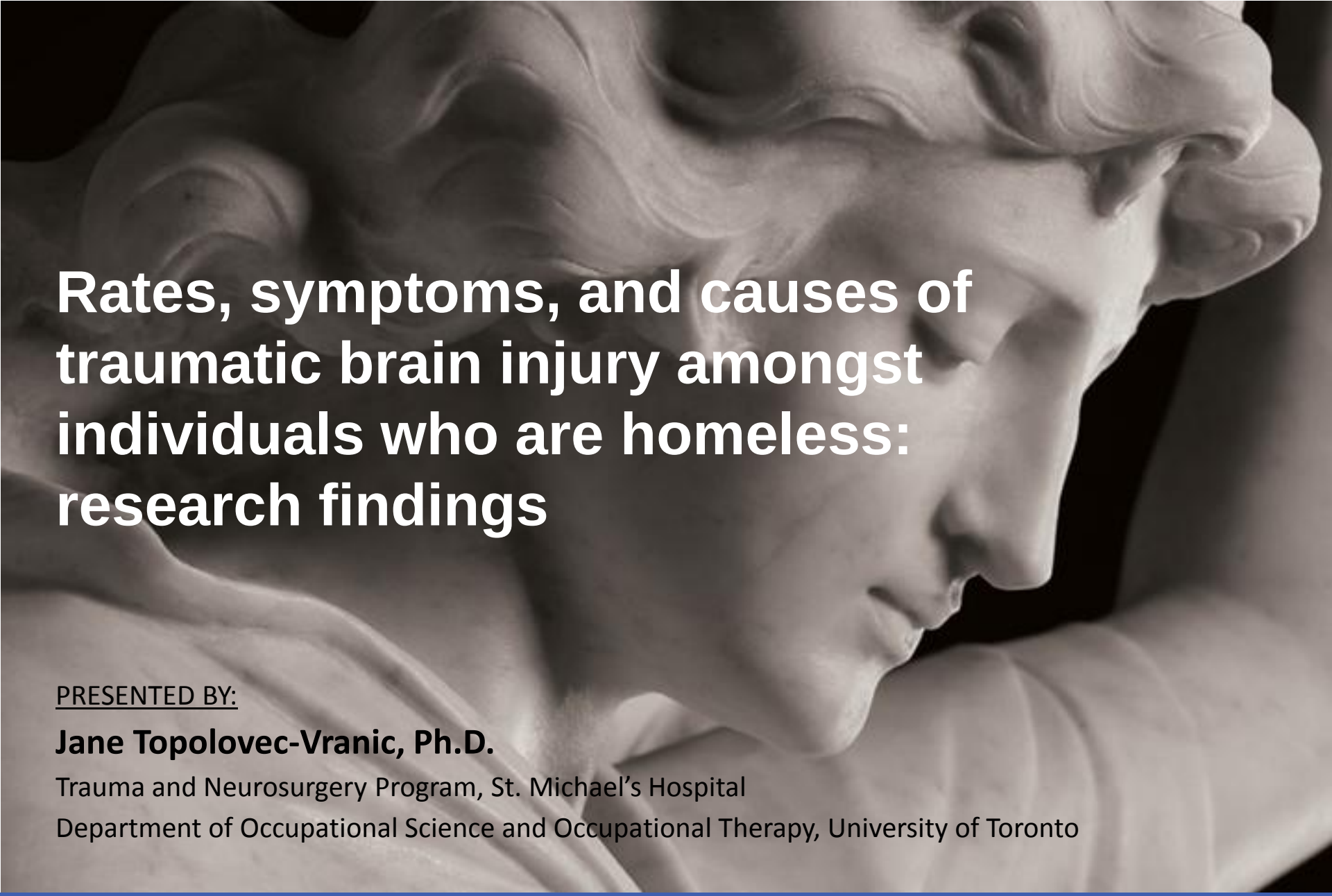


Rates, symptoms, and causes of traumatic brain injury amongst individuals who are homeless: research findings

PRESENTED BY:

Jane Topolovec-Vranic, Ph.D.

Trauma and Neurosurgery Program, St. Michael's Hospital

Department of Occupational Science and Occupational Therapy, University of Toronto

Objectives

1) Define traumatic brain injury

2) Review the literature related to traumatic brain injury and homelessness

3) Share results from a recent study

St. Michael's Hospital Head Injury Clinic

Who We Are:

- Manage and treat patients with TBI over the long term
- Largest clinic of it's kind in Ontario
- Services more than 1400 patients annually

The Multi-Disciplinary Team:

- Neurorehabilitation specialist
- Physiatrist
- Neuropsychologist
- Neuro-otolaryngologist
- Psychiatrist
- Clinical nurse specialist/case manager
- Research personnel

SMH Head Injury Clinic: Services Offered

- Early identification of TBI patients most in need of highly specialized follow-up services
- Access to medical/diagnostic tests & other SMH specialists/clinics
- Co-ordination of specialized rehabilitation services
- Patient and family education and support
- Advocating on behalf of the patients (referring hospitals, community partners, insurers and lawyers)
- Neuropsychological assessments
- Evaluation and treatment of psychiatric symptoms post-TBI
- Testing and treatment of vestibular issues

What is Traumatic Brain Injury?

TBI is "caused by a blow or jolt to the head or a penetrating head injury that disrupts the function of the brain"[1].

The severity of injury may range from:

"mild": a brief change in mental status or consciousness to

"severe": an extended period of unconsciousness or amnesia.

Not all blows or jolts to the head result in a TBI.

National Center for Injury Prevention and Control. Traumatic Brain Injury. *Centers for Disease Control and Prevention* [serial online] 2010

Some statistics related to TBI

- The leading cause of death and disability for Canadians under 45[1]
- Incidence of all closed head injuries admitted to hospitals in Canada[2]:
  - 70.9 per 100,000 (conservative estimation);
  - 66% of admissions are males.

- **400** will die;
  1,500 will sustain a severe brain injury;
  1,500 will sustain a moderate brain injury;
  15,000 will sustain a mild brain injury.[3]

- In Canada and USA, 2% of the population live with lifelong disabilities resulting from TBI[4]:
  - Approximately 1 in 4 adults with TBI are unable to return to work one year after injury because of physical and/or mental disabilities.

[1]National Center for Injury Prevention and Control. Traumatic Brain Injury. *Centers for Disease Control and Prevention* [serial online] 2010
[2] Canadian Institute of Health Information. Ontario Trauma Registry Regional Reports: Hospital Injury Admissions, 1999/2000. 3-31-2001
[3] www.obia.ca
[4]Thurman DJ, Alverson C, Dunn KA, Guerrero J, Sniezek JE. Traumatic Brain Injury in the United States: A Public Health Perspective. *JHTR* 1999;14:602-615

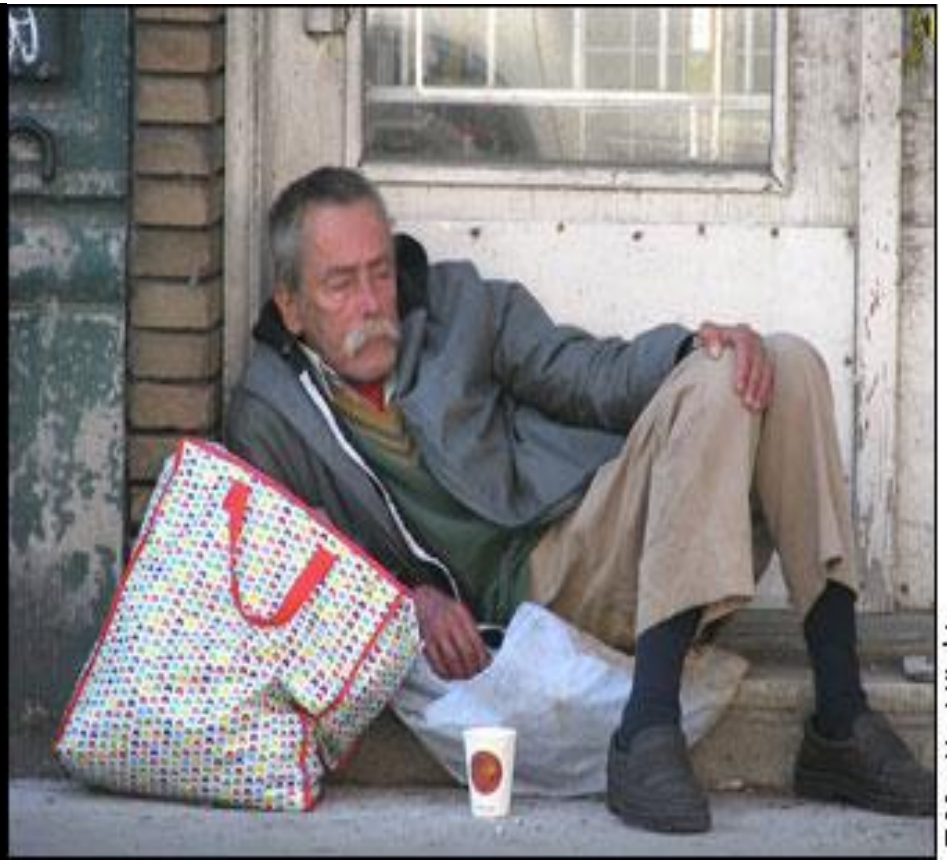
Substance use and TBI

- ⅓ - ½ of persons with TBI are intoxicated at the time of injury and/or show a pre-injury history of alcohol abuse[1]
- 20% of people who do not have a substance use problem before the injury become vulnerable to substance use after an injury
- Use seems to increase during the post-acute period of a brain injury

- Using substances greatly increases the chances of a second injury[2]
- Alcohol and other drugs have a more powerful effect following brain injury
- After a brain injury drinking alcohol or using other drugs can cause a seizure[3]

1.Corrigan, JD. (1994). Substance abuse as mediating factor in outcome for traumatic brain injury. *APMR*, 76(4), 302-309.
2. www.subi.ca
3. Ohio Valley Center, 1994

Homelessness and TBI



NEEDS ASSESSMENT SURVEY

Completion and Demographics

- 23 Responses
- Average age= 42.5 years
- 70% female
- Average years working with homeless = 10.7 (range 1-25)

Response	Chart	Percentage
Shift Supervisor (Homeless shelter)		13%
Counselor		30%
Nurse		17%
Community Support Worker		26%
Outreach Worker		9%
Education		4%
Crisis Support		9%
Addictions		35%
Other, please specify...		26%

What percentage of your clients do you think have experienced a traumatic brain injury in the past?

Response	Chart	Percentage	Count
0%-20%		43%	10
21%-40%		30%	7
41%-60%		17%	4
61%-80%		4%	1
81%-100%		4%	1
	Total Responses		23

A scoping review of the literature

PubMed Search on May 23, 2013:

Substance Abuse and Homeless:
2107 publications

Traumatic Brain Injury and Homeless:
17 publications

BMC Public Health

Traumatic brain injury among people who are homeless: a systematic review

Jane Topolovec-Vranic[1*], Naomi Ennis[2], Angela Colantonio[3], Michael D Cusimano[4], Stephen W Hwang[5], Pia Kontos[6], Donna Ouchterlony[7] and Vicky Stergiopoulos[8]

Topolovec-Vranic *et al. BMC Public Health* 2012, **12**:1059

Rates, symptoms, and causes of traumatic brain injury amongst individuals who are homeless: research findings

The Journal of Nervous and Mental Disease • Volume 192, Number 7, July 2004

Neuropsychological Functioning of Homeless Men

Cindy Solliday-McRoy, PhD, Todd C. Campbell, PhD,* Timothy P. Melchert, PhD,* Terence J. Young, PsyD,* and Ron A. Cisler, PhD†*

Brain Injury, January 2009; 23(1): 8–14

Screening for traumatic brain injury

KAREN HUX[1], TRISH SCHNEIDER[1], & KERI BENNETT[2]

[1]*Barkley Memorial Center for Special Education and Communication Disorders, University of Nebraska, Lincoln, NE, USA and* [2]*Department of Vocational Rehabilitation, Lincoln, NE, USA*

January/February 1997 - The Journal of Cognitive Rehabilitation

Cognitive Deficits and Their Remediation in the Homeless

Ann Cotman
Curt Sandman

The Journal of Nervous and Mental Disease
Issue: Volume 189(3), March 2001, pp 176-181

Neuropsychological Evaluation of Higher Functioning Homeless Persons: A Comparison of an Abbreviated Test Battery to the Mini-Mental State Exam

GONZALEZ, EFRAIN A. Psy.D.[1]; DIETER, JOHN N. I. Ph.D.[2]; NATALE, RUBY A. M.S.[1]; TANNER, SUZAN L. Ph.D.[1]

J Korean Neurosurg Soc 42 : 191-194, 2007

An Experience of Management of Homeless Neurosurgical Patients

Dae Ki Kim, M.D.
Cheol Su Jwa, M.D.
Gang Hyeon Kim, M.D.
Jae Kyu Kang, M.D.

British Journal of Psychiatry (1996), **169**, 434–439

Cognitive Function and Duration of Rooflessness in Entrants to a Hostel for Homeless Men

ALEXANDER J. BREMNER, PETER J. DUKE, HAZEL E. NELSON, CHRISTOS PANTELIS and THOMAS R. E. BARNES

Brain Injury, 2012, 1–7, Early Online

The prevalence of traumatic brain injury in the homeless community in a UK city

MICHAEL ODDY[1,2], JANE FRANCES MOIR[2], DEBORAH FORTESCUE[1], & SARAH CHADWICK[2]

[1]*The Disabilities Trust Foundation, and* [2]*Brain Injury Rehabilitation Trust (BIRT), West Sussex, UK*

Rates, symptoms, and causes of traumatic brain injury amongst individuals who are homeless: research findings

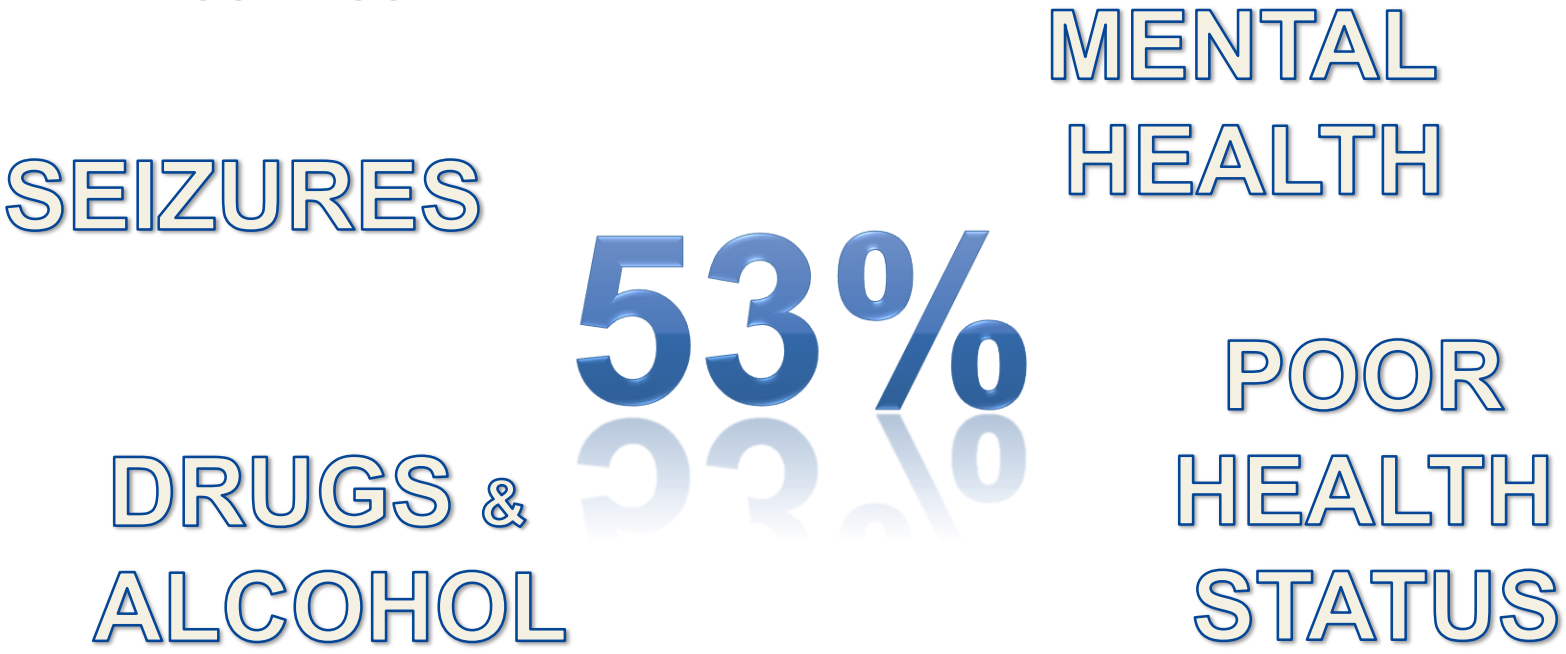
CMAJ RESEARCH

The effect of traumatic brain injury on the health of homeless people

Stephen W. Hwang MD MPH, Angela Colantonio PhD OT Reg, Shirley Chiu MA, George Tolomiczenko PhD MPH, Alex Kiss PhD, Laura Cowan BScN, Donald A. Redelmeier MD MSHSR, Wendy Levinson MD

CMAJ 2008;179(8):779-84

HOMELESSNESS AND TBI



- Little/no information is available regarding TBI in homeless **women** and **youth**, and what the **presenting characteristics** of TBI are in the homeless

[1]Hwang SW, Colantonio A, Chiu S et al. The effect of traumatic brain injury on the health of homeless people. *CMAJ* 2008;179:779-784
[2] Bremner AJ, *et al*. Cognitive function and duration of rooflessness in entrants to a hostel for homeless men. *Br J Psychiatry* 1996;169:434-439
[3]Solliday-McRoy C, *et al*. Neuropsychological functioning of homeless men. *J Nerv Ment Dis* 2004;192:471-478

Rates, symptoms, and causes of traumatic brain injury amongst individuals who are homeless: research findings

Citation	Retrieved from?	Source Type	Summary of Information provided
HCH Clinicians' Network, 2003	National HCH Council website	Article in *Healing Hands*	-Describes the cognitive disabilities faced by the homeless population -Includes a discussion of the prevalence of TBI and acquired brain injury among the homeless -Outlines practical strategies for case management.
HCH Clinicians' Network, 2008	National HCH Council website	Article in *Healing Hands*	-Describes assessment tools that may be useful among the homeless -Provides strategies for caring for homeless affected by TBI
Highley, 2008	National HCH Council website	Monograph in *Healing Hands*	-discuses: links between adverse childhood experiences, homelessness and TBI; failures to detect TBI among the homeless; prevalence of cognitive impairment among the homeless; implications for practice, administration and policy recommendations.
Carlson et al., 2008	National HCH Council website	Case study	-portrays case of a homeless patient suffering from the outcomes of a TBI -argue for an interdisciplinary approach to care -recommendations for clinicians working with homeless individuals
National HCH Council, 2011	National HCH Council website	Webinar	-review of the literature -diagnosis and treatment of TBI -general information on TBI
Tatlock & Lepore, 2012	National HCH Council website	Information on upcoming workshop session	-information on an educational workshop to teach participants basic information about TBI among the homeless
Luchetti, 2007; 2008	National HCH Council website	Power-points (webinar) presented at previous conferences	-summaries of the literature on TBI, cognitive impairment and developmental disability among the homeless

Rates, symptoms, and causes of traumatic brain injury amongst individuals who are homeless: research findings

Recent research has uncovered high rates of traumatic brain injury and cognitive dysfunction in the homeless. Might these problems contribute to their plight? Norra MacReady investigates.

Neurological deficits in the homeless: a downward spiral

Recent research has uncovered high rates of traumatic brain injury and cognitive dysfunction in the homeless. Might these problems contribute to their plight? Norra MacReady investigates.

Homeless people have a high rate of traumatic brain injury (TBI), according to a study published in October, 2008. Stephen Hwang and colleagues at the University of Toronto surveyed 904 men and women at local shelters and meal programmes and found that 53% were likely to have a TBI over their lifetime, with 12% of cases having moderate or severe TBI. These findings were not surprising to Hwang, associate professor of medicine at the university, because "we had made the clinical observation that TBI was common among the homeless". However, what did surprise him was that, in 70% of cases, the first TBI occurred before the patient became homeless, a finding that "raises the hypothesis that the TBI might be a factor in the causal pathway to homelessness". In some cases, the injury occurred years in the past.

This study adds to a small but growing amount of published work documenting what those who work with the homeless already know: that cognitive and neurological impairments are common in this population. In fact, as Hwang suggests, the social and emotional problems, learning disabilities, memory lapses, and poor executive function that result from neurological injuries might be what push people into homelessness, or at least make learning the skills needed to re-enter society all the harder. In a study of 90 men living in a homeless shelter in Milwaukee, WI, USA, 80% of the participants showed evidence of impaired cognitive function. The overall rate of TBI in the study sample was 48%. In other studies, the occurrence of cognitive impairment has ranged from 28% to 78%.

> "...the social and emotional problems, learning disabilities, memory lapses, and poor executive function that result from neurological injuries might be what push people into homelessness..."

Little is known about neurological impairment among the homeless, largely because many of the studies on the subject are small and many date back as far as the 1970s. In a survey of 100 homeless men, researchers at the Mount Sinai School of Medicine in New York, USA, found that 82% had a history of TBI due to a substantial blow to the head, often as the result of child abuse. Clinicians and caseworkers who work with the homeless can confirm the high rate of undiagnosed TBI.

Hwang decided to do the Toronto study because he could find no good published data to support his clinical impression that this population had high rates of TBI. "If we consider self report and experience in the field, there is at least a subjective sense that the incidence of TBI among the chronically homeless is much higher than it is among the non-homeless population", says Virginia Luchetti, senior psychologist and supervisor of the Mental Health Services Delivery System of the California Department of Corrections and Rehabilitation, Vacaville, CA, USA. Sometimes the injuries occur in unexpected ways. Luchetti recalls that, during her 5 years as director of the Homeless Encampment Outreach Project in California, many of the homeless people she and her colleagues saw used bicycles for transportation, often rode at night without helmets, and often had head injuries in accidents. Assaults were another common source of injury. "When I interviewed homeless clients and asked about head injury, the majority reported having received at least one serious TBI—being hit on the head with baseball bats and other objects, as well as automobile accidents."

Neuropsychiatrist Gregory O'Shanick, national medical director of the Brain Injury Association of America, says that TBI is seldom studied in the homeless because "it's not 'sexy'—there's no easy fix". The problem encompasses biological, psychological, and social factors, making it complicated to study. "People tend to shy away from it because it's messy", O'Shanick explains. Furthermore, assessment of the full effect of a brain injury can take years, so follow-up research is difficult, and funding is hard to obtain. The result, he says, is a paucity of information on the long-term outcomes of TBI, particularly among homeless people.

This is changing, however, as the fact that TBI is surprisingly widespread in the general population is becoming clear. According to the US Centers for Disease Control and Prevention, 1·4 million Americans have a TBI each year, and at

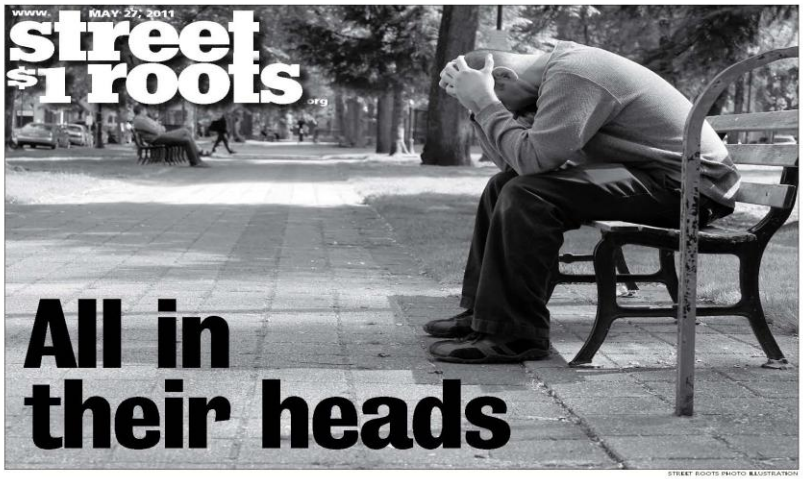
For the Milwaukee study see J Nervous Ment Dis 2004; 192: 671–79

For more on the rates of TBI in homeless people see CMAJ 2008; 179: 779–84

www.thelancet.com/neurology Vol 8 March 2009

The printed journal includes an image merely for illustration

Rates, symptoms, and causes of traumatic brain injury amongst individuals who are homeless: research findings



STREET ROOTS PHOTO ILLUSTRATION

Traumatic brain injuries often go undiagnosed, especially on the streets

BY KATE COX
CONTRIBUTING WRITER

You might say Nick Patton was born to fish. Literally born on a boat, Nick spent his earliest years living in orphanages along the Alaskan coastline. He ran away at the age of eight and quickly learned how to take care of himself and to rely on others – traveling in groups around the Pacific Northwest, picking apples and doing day labor.

He was only 11 years old when he started working the boats and canneries of the Alaskan fishing industry. With a community of other fisherman, Nick followed the seasonal work, living on boats and in tents, even during the cold Anchorage winters.

It all ended with the smack of a crowbar.

Nick was 32 and alone on the night he was attacked, and there were no witnesses. With no memory of the assault, he has few clues to the story except for the scar on his forehead where the crowbar cracked his skull.

"First it hurt the front of my brain, because that's where they hit me. Then, the force caused my brain to hit the back of my skull, back here. Then, there was also some swelling, so that caused more damage – way down here in my brain stem."

Nick woke up in an Anchorage hospital, but nothing was ever the same. His gregarious nature was now drowned out by voices and hallucinations, and reality was lost in the din.

"I couldn't deal with society anymore. I didn't know what was real or who to trust. I ended up cutting all ties to the world."

Alcohol and drugs became his only way of coping. "If I stayed high I could deal with it." For the first time in his life, Nick found himself unable to work and spent the next several years selling heroin, panhandling, and living on the streets.

Unfortunately, Nick's story isn't unique.

News about traumatic brain injury, or TBI, has increasingly come to light in recent months, from a spate of sports-related injuries particularly among football players, to the blast injuries of veterans returning from Afghanistan and Iraq. Although, homelessness can be the ultimate tragic consequence of a brain injury, the medical world is only beginning to connect the dots between TBI and homelessness.

According to the National Healthcare for the Homeless Council, at least half of all homeless individuals have experienced at least one head injury in their lifetime.

"Brain injury in the homeless community is a very common thing that we're just starting to learn about," says Dr. Barb Wismer, a practicing physician who serves on the board of the Council. Few formal studies have been done, but those few are sobering.

In one recent study of 904 homeless men and women in Toronto, Ontario, 53 percent reported some type of traumatic brain injury. Studies in Milwaukie, Wisconsin and Boston, Massachusetts offer similar statistics of 48 and 67 percent.

The Toronto study found that for those who had experienced a head injury, 70 percent had suffered the injury prior to becoming homeless. And although there is no clear cause and effect, the results suggest that TBI could be at least one contributor to some individuals' homelessness.

That shouldn't be so surprising, as the long-term effects of a brain injury can be debilitating. Symptoms vary widely. Some are as dramatic as Nick's hallucinations. Others are much more subtle. Sometimes described as an "invisible disability," brain injury often causes problems with memory, concentration and thinking, as well as the ability to regulate emotion and behavior.

As a result, brain injury survivors often have a hard time doing the work they did before their injuries. Family and social relationships suffer, straining the most immediate safety net before homelessness.

"Brain injury in the homeless community is a very common thing that we're just starting to learn about."

— DR. BARB WISMER
NATIONAL HEALTHCARE FOR THE HOMELESS COUNCIL

The same symptoms can also create barriers for those individuals once they are on the streets. Navigating shelter systems, attending to basic health and hygiene, and accessing services can be overwhelming and difficult. Controlling anger can be a daily struggle.

And once on the streets, the risk of brain injury continues. Steve Hill suffered head injuries throughout his adolescence and adulthood, from sports injuries to snow boarding to fight clubs. He describes each one as taking him down another notch. Even small injuries caused intense reactions including vomiting and confusion. "You're

See HEADS page 10

Inside

Witness for the revolution
Ken Hawkins on the life as a conflict zone journalist
Page 8

Loretta Smith
A conversation with the county commissioner on the heals of her African-American forum
Page 3

Vendor profile
Jason Bo is the new face in The Pearl
Page 6

For those who cannot afford free speech

street roots

A nonprofit, grassroots newspaper that assists people experiencing homelessness and poverty by creating flexible income opportunities. Through education, advocacy and personal expression, we are a catalyst for individual and social change.

St. Michael's
Inspired Care. Inspiring Science.

Clarifying the link between TBI and homelessness: A planning workshop

Funded by: Canadian Institutes for Health Research, Planning Grant

April 23, 2012 Li Ka Shing Knowledge Institute, St. Michael's Hospital

Aim: "To discuss and identify research gaps and priorities in order to develop a research agenda".

ORGANIZATIONS REPRESENTED

CAMH, SUBI Project
CAST Canada
CHIRS
Covenant House
Housing Services Division, City of Hamilton
Lawson Health Research Institute
Ontario Neurotrauma Foundation
Portland State University
Seaton House
St. Michael's Hospital
Street Health
Toronto ABI Network
Toronto Rehabilitation Institute
University of Colorado
University of Toronto
Women's Residence, SSHA

Recommended Research Questions (Selected)

- What are the characteristics of TBI in the homeless population and how detrimental are TBIs to the functioning of individuals who are homeless?
- How do gender, age, and culture intersect with regards to TBI among people who are homeless?
- What are the different needs, protective factors and risk factors for TBI in the various subpopulations of people who are homeless?
- What current knowledge do various stakeholders such as individuals who are homeless, health care professionals and policy makers have regarding TBI and homelessness, and what knowledge can we disseminate to these stakeholders?
- When and how can interventions be implemented and how can the symptoms of TBI be managed within the homeless population?
- How can homeless shelter workers be trained to help clients with a TBI navigate through the system and how can specialists aid these workers in supporting their clients?

Homelessness and TBI: Pilot Study Rationale

A better understanding of TBI,
its **presentation and characteristics**
in the homeless is vital to enable
appropriate **interventions, treatments,**
and **case management**
to **improve** outcomes.

Study Objectives

1. To obtain preliminary descriptive data regarding the incidence of TBI in a homeless population.

2. Evaluate the feasibility of implementing a research protocol in the homeless shelter setting.

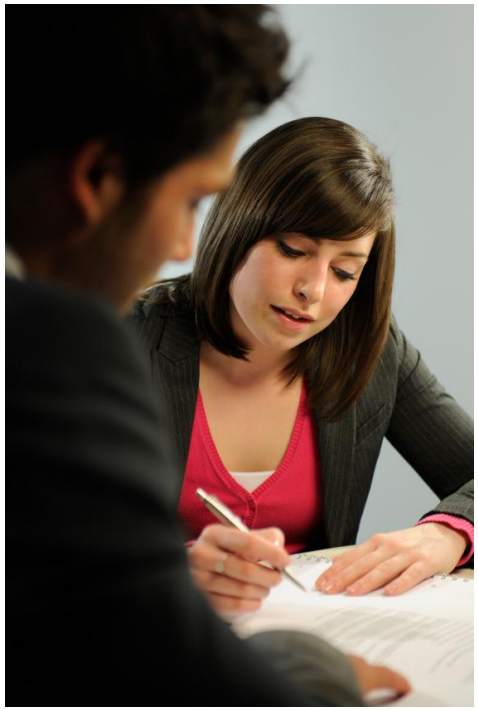
METHODS

- Participants recruited from an urban adult men's shelter in Toronto, Canada

- Exclusion criteria:
    - Non-communicative;
    - Poor English language skills;
    - Mental illness;
    - Incapable of providing consent

- Provided with $20 for their participation in the study

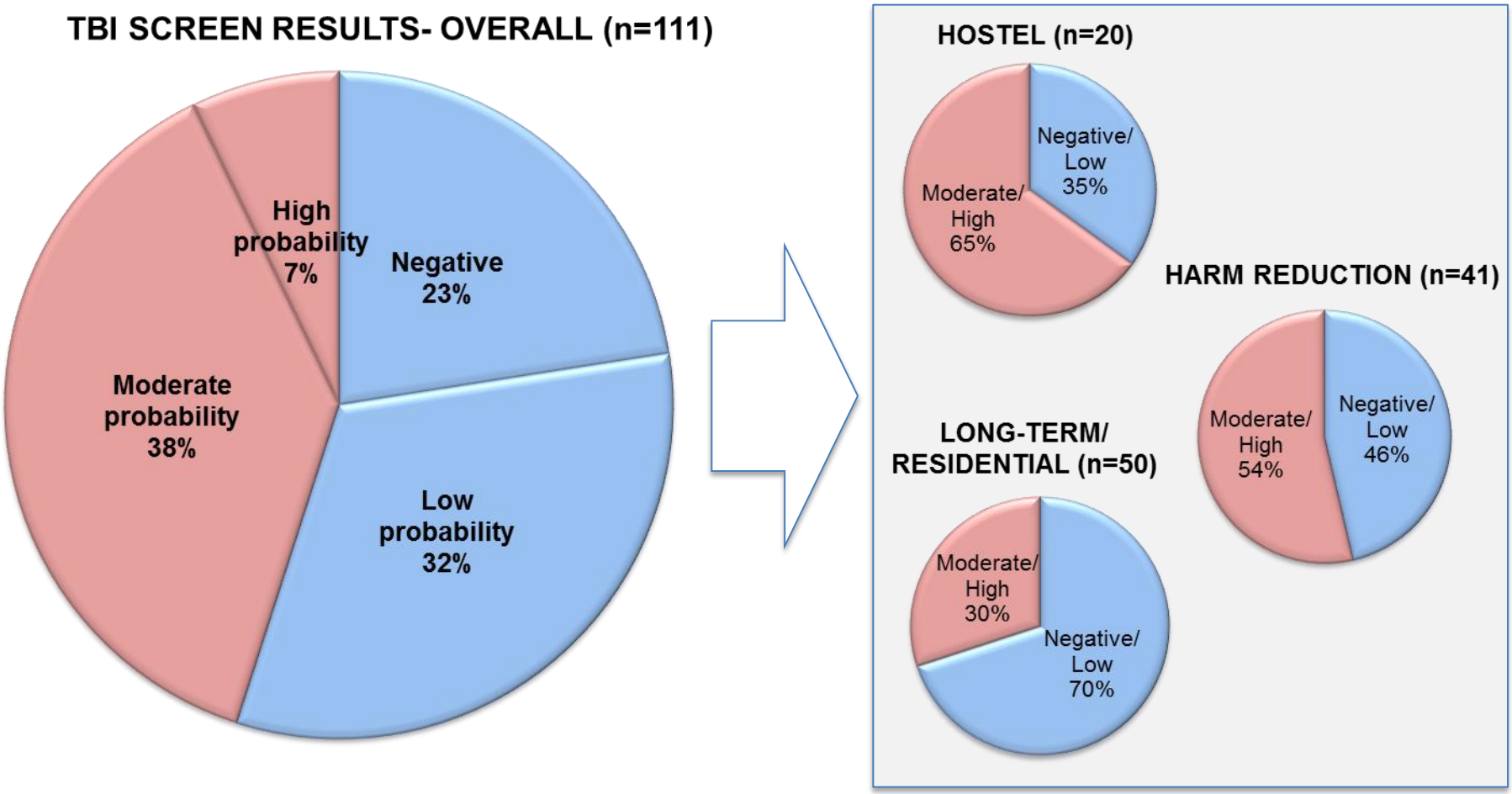
- Study tools:
    - Self-report head injury questionnaire
    - Qualitative history and demographic survey



PRELIMINARY RESULTS - FEASIBILITY

- One month in 2011 – 48 shelter clients in a harm-risk reduction program were approached to participate in the study
- 45 recruited and consented to participate: 1 declined, 2 excluded due to mental health reasons
- 44 (97.8%) individuals completed the entire protocol
- 38 (84.4%) completed 3-month follow-up

Characteristic	Mean (SD)	Range
Length of Interview	54 (19) minutes	22-98 minutes
Number of clients who took a break	20	N/A
Number of breaks	1	0-2 breaks
Length of time for breaks	5.5 (7) minutes	0-20 minutes
Number of assessments per day	4.5	3-8 assessments



For **80%** of those with a positive screen for TBI, injury occurred **before the onset** of homelessness.

Of those who may have experienced a traumatic brain injury, what percentage would you say did so within the following time frames?

	%	Range (%)
Within the past 3 months	11.8	0-50
3-12 months ago	20.4	0-65
Greater than 12 months ago	54.8	0-100

Of those who may have experienced a traumatic brain injury, what percentage would you describe as having the following severities of injury?

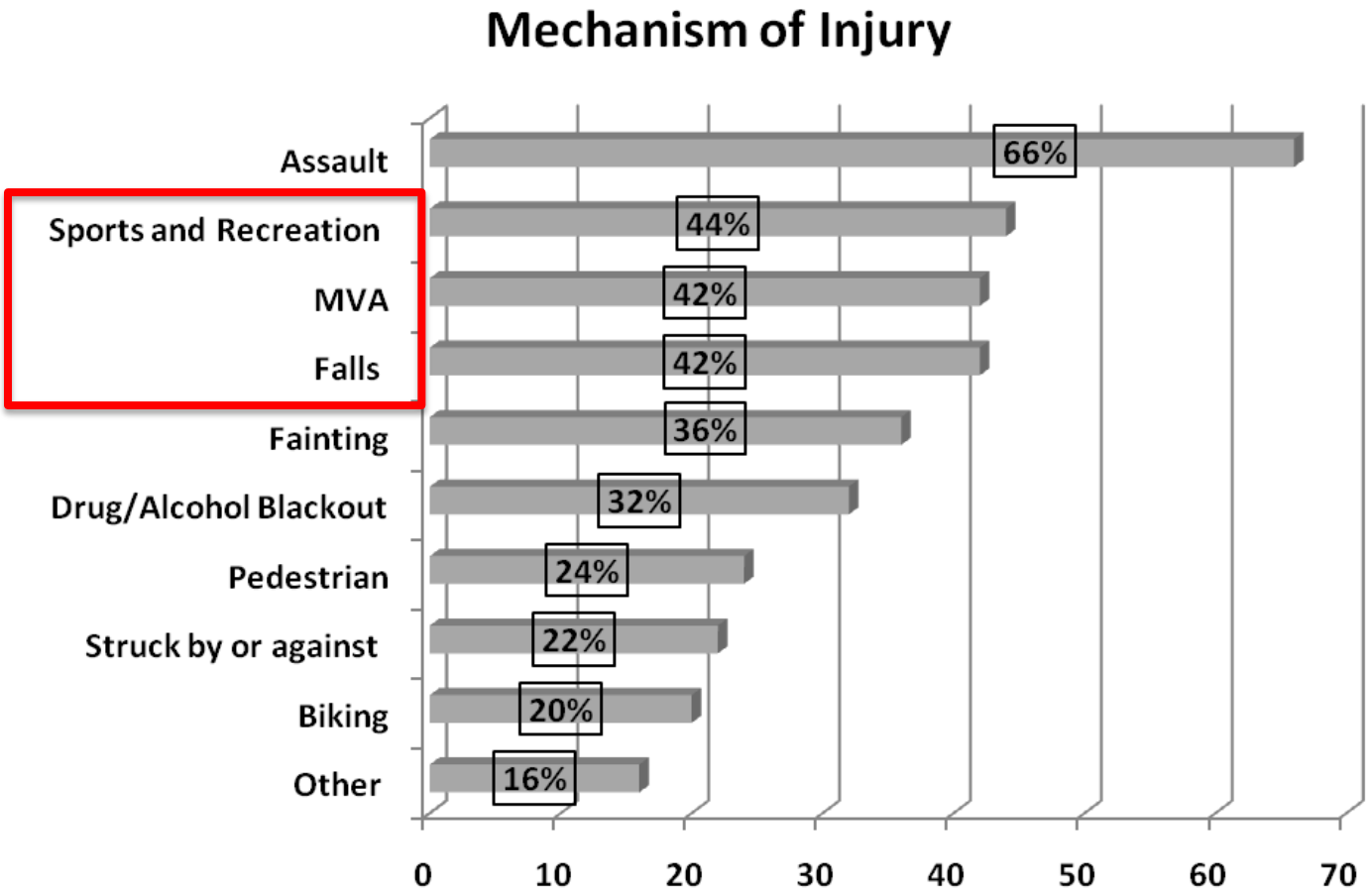
	%	Range (%)
Mild	36.1	3-100
Moderate	45.4	3-80
Severe	17.8	0-50

Injury Severity	**N = 49***
Mild	3 (6.1%)
Moderate	31 (63.3%)
Severe	15 (30.6%)

*Injury severity could not be determined for one participant as he could not remember how long he had lost consciousness for.

RESULTS- TBI

	Negative Screen for TBI (n = 61)	Positive Screen for TBI (n = 50)	p-value
History of arrests	63.5%	82.5%	0.023*
History of substance abuse	60.0%	68.0%	0.39
History of mental illness	40.4%	60.9%	0.038*
History of seizures	31.1%	46.3%	0.15
Parental history of substance abuse	34.5%	55.0%	0.047*



Mechanisms of all reported TBI's by study participants. Percentage indicates the proportion of patients (n=50) who had sustained injury by the mechanism indicated. Note that some patients had reported sustaining injuries by more than one mechanism.

SUMMARY OF THE PILOT STUDY

- ✓ Feasible
- ✓ TBI rate = **45%** but varied by program in the shelter
- ✓ Most often **moderate** TBI; **30%** had experienced severe TBI
- ✓ TBI → history of arrests, mental illness, parental substance abuse
- ✓ **Assaults** were the most common mechanism, but sports and rec, MVC, and falls were second most common
- ✓ TBI preceded homelessness in **80%** of cases

NEEDS ASSESSMENT SURVEY RESULTS

In each of the following categories, please rate the top **three** issues for those clients who may have experienced a traumatic brain injury in the past:

Physical

Pain[2]
Balance Impairment
Fatigue and **Headache**[1]
Sleep Disturbance[3]
Motor Weakness
Seizures
Vision Disturbance
Dizziness
Hearing
Bowel/Bladder Concerns

Cognitive

Memory[3]
Impulsivity[1]
Concentration and **Attention**[2]
Multi-tasking
Verbal fluency

Emotional/Behavioural

Substance Abuse[1*]
Depression[2]
Anger
Lack of Insight
Anxiety
Aggression[3]
Irritability

SURVEY RESULTS: ADDITIONAL ISSUES

- Lack of timely case management and appropriate housing options.
- Resources , programs and tools for homeless clients with TBI.
- More practical diagnosis and treatment strategies; less research data.
- How to differentiate between symptoms of mental health, brain injury and behavioral issues?
- Interactions with the Justice system, including incarceration.
- Need to enable Service Providers to provide flexible and integrated models of care and supports.
- Substance use linking to homelessness.
- Understanding the underlying issues involving homelessness and other chronic diseases including mental health and addictions.

Conclusions

- Rates of TBI are high amongst homeless populations.
- TBI in this population has been linked to seizures, arrests, substance use, poorer mental and physical health.
- There are numerous factors which need to be addressed in working with complex clients including lack of resources, substance use, mental illness, experience with the justice system, and physical health issues.
- There is a need for practical ways to diagnose and manage TBI and its associated symptoms.

STUDY TEAM

Lead Investigator:

Jane Topolovec-Vranic, BSc PhD
topolovec-vranicj@smh.ca

Co-Investigators and Collaborators:

St. Michael's Hospital
Andrew J. Baker, MD Chief, Critical Care
Michael D. Cusimano, MD Neurosurgeon
Stephen Hwang, MD Physician, Center for Research on Inner City Health
Cheryl Masanic, MD Physiatrist, Head Injury Clinic
Alicja Michalak, RN MScN, Case Manager, Nurse
Patricia Johnson, PhD, Researcher
Donna Ouchterlony, MD Director, Head Injury Clinic
Vicky Stergiopoulis, MD Chief, Dept. Psychiatry

Toronto Rehab
Angela Colantonio, PhD, OT Reg. Ont., Senior Scientist
Pia Kontos, PhD Scientist

Support Staff:
Naomi Ennis
Amy Wong

Students:
Jackie Andersen
Connor Cooper
Brianna Epringham
Mackenzie Howatt
Nadine Kot
Justin Shamis
Michael Taylor
Farhaad Virjee

Funding Sources:
St. Michael's Hospital Head Injury Clinic
Canadian Institutes of Health Research

Thank you to the wonderful staff and clients at Seaton House Men's Shelter, Toronto!

Jane Topolovec-Vranic

Topolovec-VranicJ@smh.ca

(416) 864-6060 ext. 3421

Twitter: @JaneTopolovecVr

Rates, symptoms, and causes of traumatic brain injury amongst individuals who are homeless: research findings