Ontario Neurotrauma Foundation
Fondation ontarienne de neurotraumatologie

Ontario Acquired Brain Injury (ABI) Dataset Project Phase III

Highlights: Numbers of Episodes of Care and Causes of Brain Injury

Acquired Brain Injury (ABI), which includes brain injury from traumatic (e.g., falls, motor vehicle collisions) and non-traumatic (e.g., anoxia, brain tumours) causes, is a leading cause of death and disability in Canada. ABI is more common than breast cancer, HIV/AIDS, spinal cord injury, and multiple sclerosis combined. Despite the large number of persons affected, ABI stakeholders have not previously benefited from a centralized data source to assist in planning and evaluation of services dedicated to ABI across the continuum.

The ABI Dataset Project, funded by the Ontario Neurotrauma Foundation, addressed this need by utilizing existing administrative data to answer important research questions about ABI in Ontario. Data were obtained from emergency departments (ED) from the National Ambulatory Care Reporting System (NACRS), acute hospital admission data from the Discharge Abstract Database (DAD), and inpatient rehabilitation admissions from the National Rehabilitation Reporting System (NRS). The data were obtained directly from the Ontario Ministry of Health Long-Term Care and housed at the Toronto Rehabilitation Institute. The project examined data from fiscal years 2003/04-2009/10.

The strengths of the project include:

- the ability to analyze **vast amounts of readily available data** from our publicly insured health-services in a cost-efficient manner
- identification of **acquired brain injury cases using ICD-10 diagnosis** for both traumatic (TBI) and non-traumatic brain injury (nTBI)
- the ability to **analyze and report data by geographical region over time and across the continuum of care**

The overall research questions addressed occurrence of ABI, causes of injury, outcomes, service provision, flow of service and geographical information. The **following report will discuss estimates of occurrence of ABI episodes of care by age and cause of ABI.**

The fact sheet provides highlights from our report available on the ABI Research Lab website (www.abiresearch.utoronto.ca), Ontario ABI Dataset.

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What was the Occurrence of ABI in ED/Acute Care?

The number of TBI episodes[1] increased from 2003/04 (17,019) to 2009/10 (25,760) and the number of nTBI episodes also increased from 2003/04 (24,353) to 2009/10 (27,525). During this period, there were more nTBI episodes than TBI episodes (see Figure 1).

The number of TBI patients[2] also increased from 2003/04 (16,230) to 2009/10 (23,862) and the number of nTBI patients increased from 2003/04 (20,166) to 2009/10 (21,307). For the years 2003/04 to 2006/07, there were more nTBI patients than TBI patients. Subsequently, from 2007/08 to 2009/10, there were more TBI patients (see Figure 1).

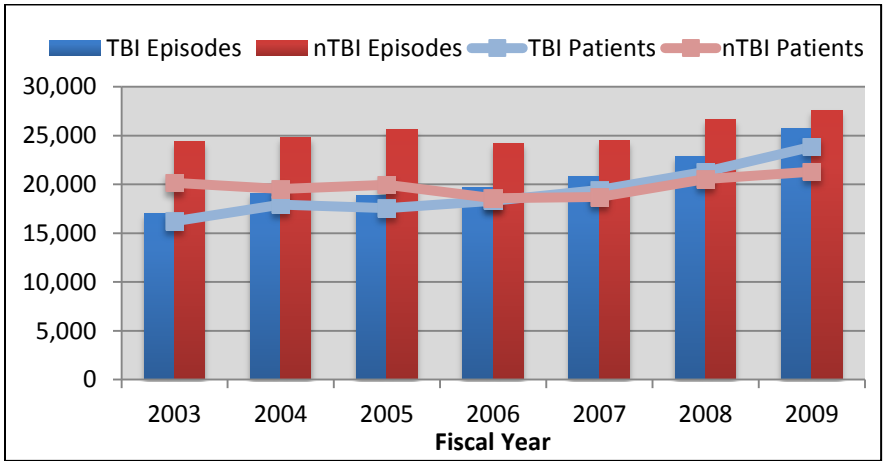

Figure 1. Number of ABI Episodes and Number of ABI Patients by Year, 2003/04 – 2009/10

[1] Episodes refer to records that were part of the same episode of care, within and between data sources within a defined time period. These were identified and counted only once.

[2] In order to estimate the number of new cases and as an attempt to approximate incidence, ABI episodes of care were examined longitudinally across the period of April 1, 2003 to March 31, 2010. All episodes with a similar condition in the one year prior were excluded. For example, if a patient had a TBI episode on March 1, 2005 and another one on July 1, 2005, the July 1, 2005 episode was excluded.

What was the Occurrence of ABI in ED and Acute Care?

Between 2003/04 and 2009/10, there were 126,614 TBI and 85,527 nTBI cases in ED, 38,161 TBI and 120,177 nTBI cases in acute care, and 13,546 brain dysfunction cases in inpatient rehabilitation.

From 2007/08 to 2009/10, there were more TBI episodes than nTBI episodes in ED. During the same period, there were substantially more nTBI than TBI episodes in acute care (see Figure 2).

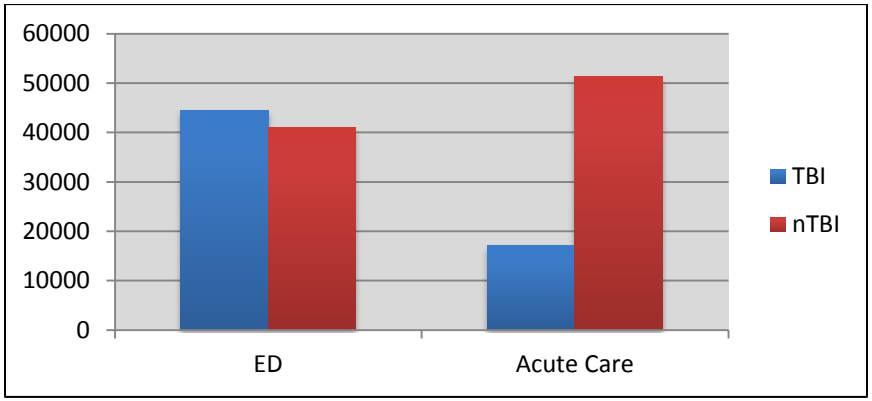

Figure 2. Number of ABI Episodes in the ED and Acute Care, 2007/08 – 2009/10

The highest percentage of TBI ED visits occurred in the <18 years age group (36%) while the highest percentage of nTBI ED visits occurred in the 35 – 54 years age group (28%) (Figure 3).

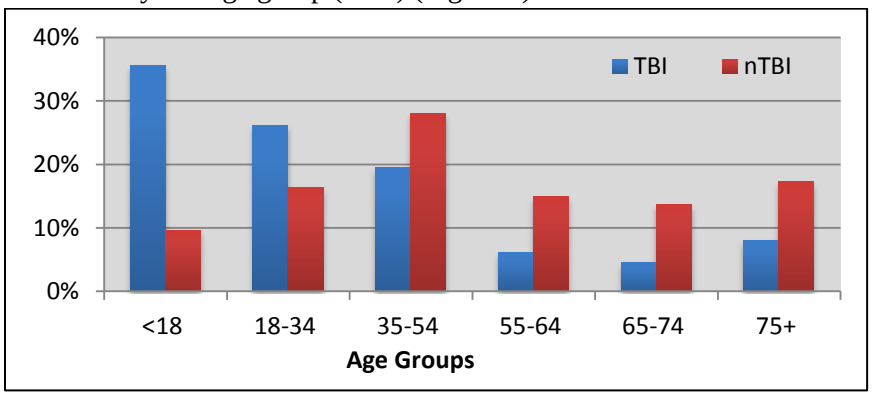

Figure 3. Distribution of ABI ED Visits by Age Groups in Percentage, 2003/04 – 2009/10

The highest percentage of TBI acute care admissions occurred in the 75+ years age group (26%) while the highest percentage among nTBI patients occurred in the 35 – 54 years and 75+ years age group (23%) (see Figure 4).

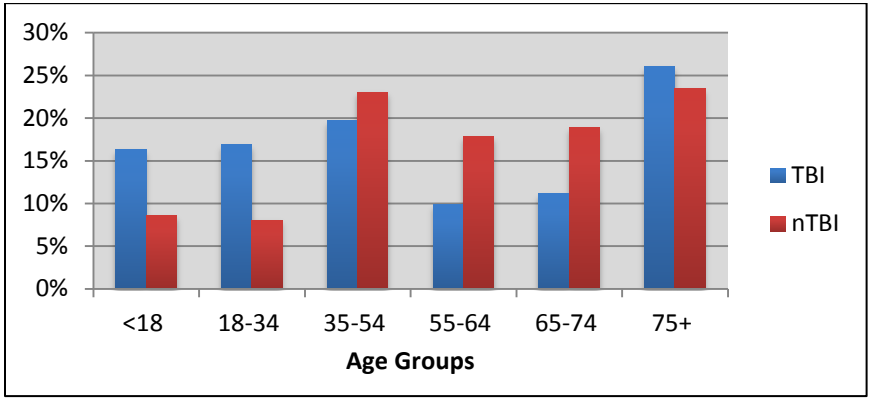

Figure 4. Distribution of ABI Acute Care Admissions by Age Groups in Percentage, 2003/04 – 2009/10

The highest percentage of brain dysfunction[3] in inpatient rehabilitation occurred in 40 – 64 years age group (41%) (see Figure 5). It should be noted that pediatric cases are not included in this figure because the data are not in NRS.

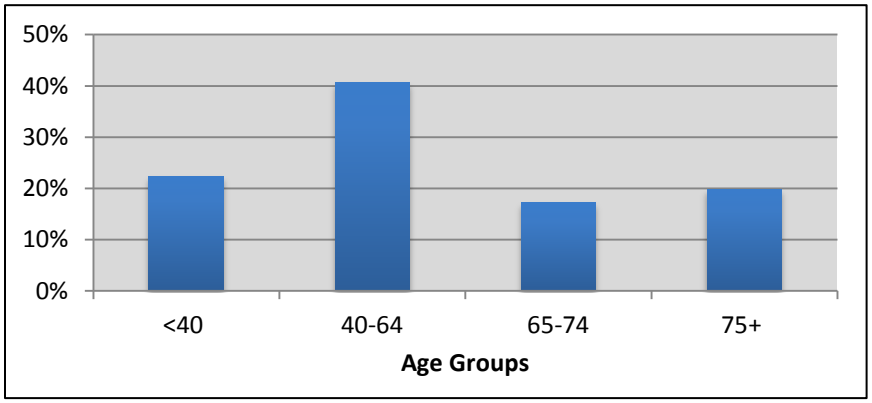

Figure 5. Distribution of Brain Dysfunction in Inpatient Rehabilitation by Age Groups in Percentage, 2003/04 – 2009/10

[3] RCG 2, brain dysfunction, includes both TBI and nTBI.

Pediatric Cases

Pediatric patients were defined as 18 years and under. Data showed a higher percentage of pediatric patients in ED among TBI (36%) and nTBI patients (10%) (see Figure 6).

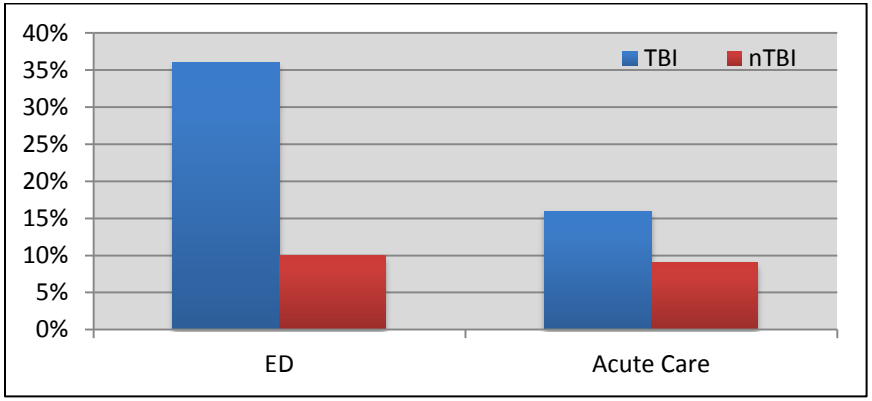

Figure 6. Percentage of Pediatric Patients in ED and Acute Care, 2003/04 – 2009/10

Mechanism of Injury among TBI Patients

The most prevalent mechanism of injury in ED was falls (43%), followed by struck by/against (26%). In acute care, the majority of injuries were due to falls (57%), followed by motor vehicle collisions (15%) (see Figure 7).

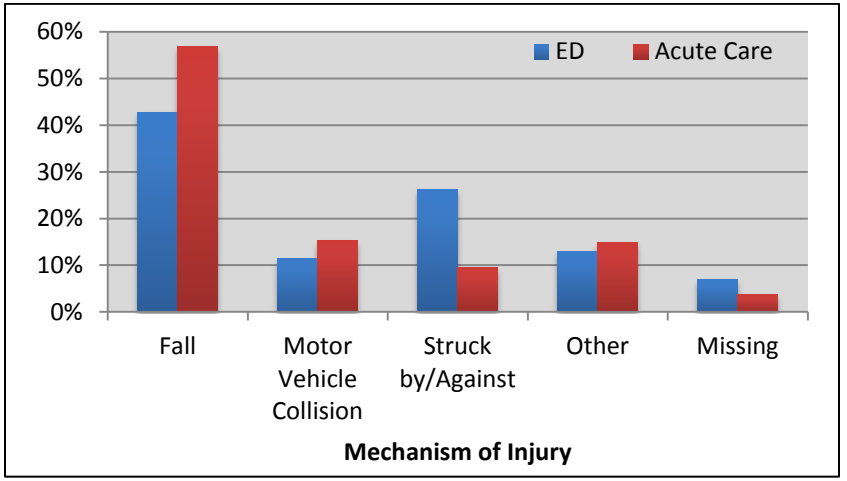

Figure 7. Distribution of the Mechanism of Injury Among TBI Patients 19+ Years in ED and Acute Care, 2007/08 – 2009/10

Type of nTBI

The most common type of nTBI in ED was brain tumours (31%), followed by toxic effects (28%). In acute care, the most common type was also brain tumours (46%), followed by anoxia (15%) (see Figure 8).

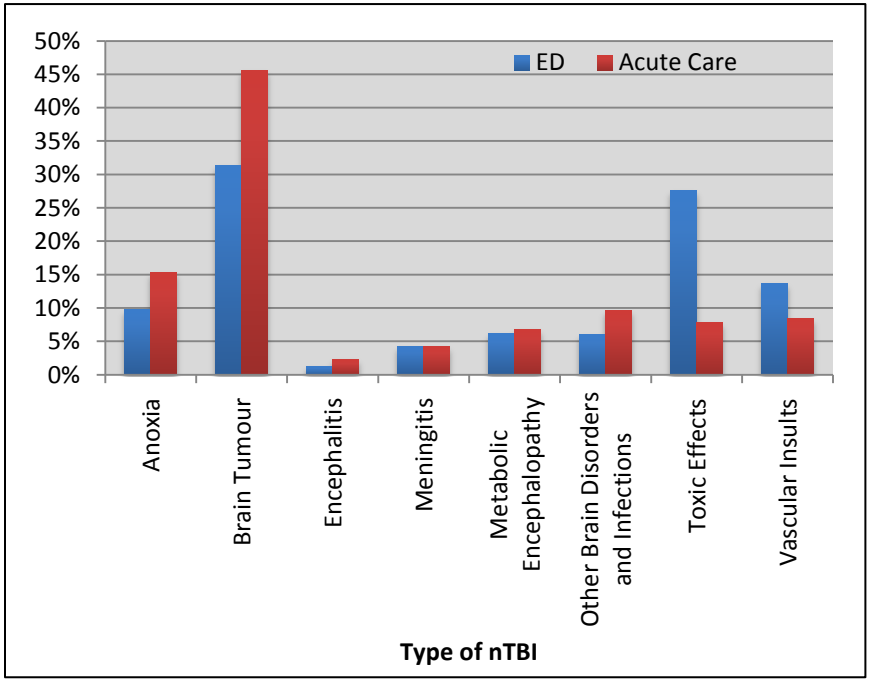

Figure 8. Type of nTBI Among Patients 19+ Years in ED and Acute Care, 2003/04 – 2009/10

Table 1. ICD-10 Definition of TBI in ED and Acute Care

Diagnosis	ICD-10 Code and Description
1. Fracture and crushing of the skull and facial bones	✓ S02.0 Fracture of vault of skull ✓ S02.1 Fracture of base of skull ✓ S02.3 Fracture of the orbital floor ✓ S02.7 Multiple fractures involving skull and facial bones ✓ S02.8 Fractures of other skull and facial bones ✓ S02.9 Fractures of skull and facial bones, part unspecified ✓ S07.1 Crushing injury of skull
2. Intracranial injury, excluding those with skull fracture	✓ S06.0 Concussion ✓ S06.1 Traumatic cerebral oedema ✓ S06.2 Diffuse brain injury ✓ S06.3 Focal brain injury ✓ S06.4 Epideural hemorrhage ✓ S06.5 Traumatic subdural hemorrhage ✓ S06.6 Trauatmic subarachnoid hemorrhage ✓ S06.7 Intracranial injury with prolonged coma ✓ S06.8 Other intracranial injuries ✓ S06.9 Intracranial injury, unspecified
3. Late effects of injuries **The "sequelae" include conditions specified as such or as late effects, or those present one year or more after onset of the causal condition.**	✓ F07.2 Post concussion syndrome ✓ T90.2 Sequelae of fracture of skull and facial bones ✓ T90.5 Sequelae of intracranial injury

Table 2. ICD-10 Definition of nTBI in ED and Acute Care

Diagnosis	ICD-10 Code and Description
1. Toxic effect of substances, chiefly non-medical as to source	✓ T40.5 Poisoning: cocaine ✓ T42.6 Poisoning by other antiepileptic and sedative-hypnotic drugs, Methaqualone, Valproic acid ✓ T51 Toxic effect of alcohol ✓ T56 Toxic effect of metals ✓ T57.0 Toxic effect of arsenic and its compounds ✓ T57.2 Toxic effect of manganese and its compounds ✓ T57.3 Toxic effect of hydrogen cyanide ✓ T58 Toxic effect of carbon monoxide ✓ T64 Toxic effect of aflatoxin and other mycotoxin food contaminants ✓ T65.0 Toxic effect of cyanides
2. Anoxia	✓ G93.1 Anoxic brain damage (includes all causes of anoxia except those occurring following abortions, ectopic pregnancy, labour and delivery and newborn) ✓ T71 Asphyxiation, suffocation (by strangulation) ✓ T75.1 Drowning and nonfatal submersion ✓ R09.0 Asphyxia
3. Vascular insults (not captured in stroke analyses)	✓ I62.0 subdural hemorrhage ✓ I62.9 Unspecified intracranial hemorrhage
4. Brain tumours	✓ C70 Malignant neoplasm of brain ✓ C71 Malignant neoplasm of brain ✓ C79.3 Secondary malignant neoplasm of brain and cerebral meninges ✓ C79.4 Secondary malignant neoplasm of other and unspecified part of nervous system ✓ D32.0 Benign neoplasm of cerebral meninges ✓ D33.0 Benign neoplasm of brain, supratentorial ✓ D33.1 Benign neoplasm of brain, infratentorial ✓ D33.2 Benign neoplasm of brain, unspecified ✓ D33.3 Benign neoplasm of cranial nerves ✓ D42.0 Neoplasm of uncertain or unknown behavior of cerebral meninges ✓ D43 Neoplasm of uncertain or unknown behaviour of brain and central nervous system ✓ D43.2 Neoplasm of brain, unspecified ✓ G06.0 Intracranial abscess and granuloma ✓ G06.1 Intraspinal abscess and granuloma ✓ G06.2 Extradural and subdural abscess, unspecified ✓ G07 Intracranial and intraspinal abscess and granuloma in disease classified elsewhere ✓ G93.0 Cerebral cysts

Diagnosis	ICD-10 Code and Description
5. Encephalitis	✓ A81.1 Subacute, sclerosing encephalitis ✓ A83.0 Japanese encephalitis ✓ A83.2 Eastern equine encephalitis ✓ A86.0 Unspecified viral encephalitis ✓ B00.4 Herpes viral meningoencephalitis ✓ B01.1 Varicella encephalitis ✓ B02.0 Zoster encephalitis ✓ B05.0 Postmeasles encephalitis ✓ B94.1 Sequelae of viral encephalitis ✓ G04.0 Acute disseminated encephalitis ✓ G04.2 Bacterial meningoencephalitis and meningomyelitis, not elsewhere classified ✓ G04.8 Other encephalitis, myelitis and encephalomyelitis ✓ G04.9 Encephalitis, myelitis, and encephalomyelitis, unspecified ✓ G05 Encephalitis, myelitis, and encephalomyelitis in diseases classified elsewhere ✓ G09 Sequelae of inflammatory diseases of central nervous system
6. Metabolic encephalopathies	✓ E10.0 (Type I) ✓ E11.0 (Type II) ✓ E13.0 Other specified diabetes mellitus with coma ✓ E14.0 Unspecified diabetes mellitus with coma ✓ E15 Nondiabetic hypoglycaemic coma ✓ G92 Toxic encephalopathy ✓ G93.4 Encephalopathy, unspecified
7. Meningitis	✓ A87 Viral meningitis ✓ B01.0 Varicella meningitis ✓ B37.5 Candidal meningitis ✓ G00 Bacterial meningitis, not elsewhere classified ✓ G01 Meningitis in bacterial diseases classified elsewhere ✓ G02 Meningitis in other infectious and parasitic diseases classified elsewhere ✓ G03 Meningitis due to other and unspecified causes
8. Other brain disorders and infections	✓ G91.0 Communicating hydrocephalus ✓ G91.1 Obstructive hydrocephalus ✓ G91.2 Normal-pressure hydrocephalus ✓ G93.2 Benign intracranial hypertension ✓ G93.5 Compression of brain ✓ G93.6 Cerebral oedema ✓ G93.8 Other specified disorders of the brain (including post-radiation encephalopathy) ✓ G93.9 Disorder of the brain, unspecified ✓ G99.8 Other specified disorders of nervous system in diseases classified elsewhere ✓ R29.1 Meningismus