

Background:

- Traumatic brain injury (TBI) is a major public health concern and a leading cause of disability worldwide<sup>(1)</sup>.
  - In Canada, the incidence of people who acquire traumatic brain injury is estimated from 100/100,000 to 200/100,000, annually<sup>(2)</sup>.
  - Based on these statistics, it is estimated that there are 6000 new traumatic brain injury cases in British Columbia annually.
  - Twenty percent of these traumatic brain injury patients are predicted to die on the way to the hospital. Thus every year, there are 4800 survivors of traumatic brain injury in British Columbia (BC).
  - 3840 of these 4800 survivors are estimated to be mild traumatic brain injury (MTBI) cases.
- MTBI is sometimes referred to by a number of other names, such as concussion, minor brain injury, minor head injury and mild head injury<sup>(3)</sup>.
  - Concussion is a general term that is usually defined as a disturbance in neurological function caused by the mechanical forces associated with rapid acceleration/deceleration of the head/brain.
  - A mild concussion consists of 'seeing stars' or feeling 'dazed', and does not necessarily involve loss of consciousness. This is generally considered to be the lay definition of concussion
  - When loss of consciousness or neurological abnormalities occur within a short time after injury and any subsequent 'confusion' or disorientation resolves within hours, the condition is usually referred to as mild brain injury.
- Two common criteria used to define the severity of brain injury include length of loss of consciousness and length of post-traumatic amnesia<sup>(4)</sup>.
  - Glasgow Coma Scale (GCS) is the most common instrument employed to assess level of consciousness in the acute phase.
  - Post-traumatic amnesia (PTA); is defined as the length of interval after trauma during which the patient is unable to store current events at the time of injury until the return of continuous memory. Included in this time of PTA is the period of unconsciousness, confusion and disorientation.
- To date, there are no universally accepted criteria for the diagnosis of MTBI. However, despite variations in criteria between different organizations and experts, there are multiple points of agreement. Areas of agreement include a GCS score at admission of 13-15, brief loss of consciousness, brief PTA (< 24 hours), and negative neuroimaging scans (usually CT scan) at presentation<sup>(4)</sup>.

This exercise was conducted as a part of the Workers' Compensation Board of British Columbia's (WCB of BC) effort to further understand and improve on how workers with MTBI may best be assessed, diagnosed, treated, compensated and ultimately reintegrated into the work force and community.

Material and Methods:

- Data was extracted from the WCB of BC data warehouse in January 2003.
  - Crystal Report<sup>®</sup> ver 7.0 software was employed to extract data from various database formats into text files.
  - The extraction was based on criteria using:
    - ICD 9 code of 08500, 08501, 08502 and 08509
    - and/or (nature of injury 'concussion') and/or (body part 'brain').
  - Nature of injury and source of injury coding are based on coding schemes developed by the Canadian Work Injuries Standard (CWIS) and the Canadian Standard Association (CSA).
- For the purpose of this report, analysis was limited to data from the period 1987 - 2001 (15 years)
- Data was then translated and analyzed further by employing SPSS for Windows ver. 12.0
- Appropriate parametric and non-parametric statistical procedures were employed in the univariate analyses subsequently undertaken
- Multivariate analysis was conducted in order to explore the independent contribution of various factors, such as age, sex, claim year, in selected outcome criteria, including claim costs and workloss days
- Multiple linear regression was employed for these outcome analyses
- Dummy variables were created whenever appropriate

Results:

- In the period 1987 - 2001, 8260 claims were filed under MTBI.
  - Of 8260, 27 (0.3%) workers were classified as having sustained a brief loss of consciousness. The majority (98.6%) had 'concussion' coded (body part 'brain') as the nature of injury
  - Only 46 (0.6%) of claimants were registered as having multiple injuries.

# MILD TRAUMATIC BRAIN INJURY

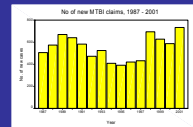
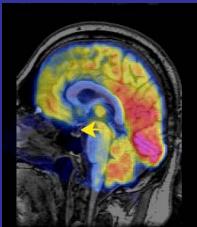
## AT THE WORKERS' COMPENSATION BOARD OF BRITISH COLUMBIA, CANADA, 1987 – 2001

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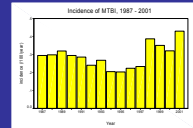
The Evidence Based Practice Group, Clinical Services, Program Design Division

The Workers' Compensation Board of British Columbia

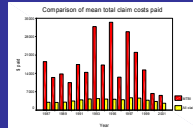
Richmond, British Columbia, CANADA



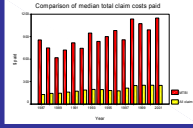
• During the 15 year period 1987 - 2001, on average, there were 551 new claims filed as MTBI (range 391 - 733).



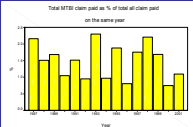
• The average incidence rate of MTBI annually was about 0.3% (range 0.20% - 0.43%)



• However, the average cost of claims for each MTBI claim was at least double the average cost of all other claims in the same year

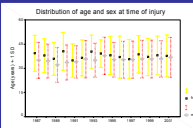
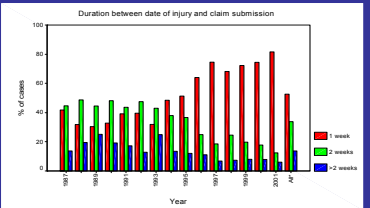


• The median cost was at least 3 times the median cost of overall claims during the same year



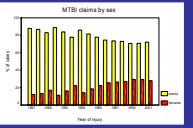
• Overall, MTBI claims represent approximately 1% - 2% of the overall claim costs during any given year

- In the 15 years period, the mean (± SD) duration between injury and claim submission was 9.85 ± 22.3 days. The median was calculated to be 7 days.
  - 52.6% of claimants submitted their claims by the first week post injury,
  - 33.7% by the second week and
  - by the third week post head injury, 95.5% of MTBI related claims had been submitted to the WCB of BC.
- There appears to be a significant trend across time that this duration of claim submission is narrowing such that claims are being submitted much sooner post injury than in past years



• The average age of claimants was relatively stable at 30 years (range from 34 - 37 years old)

• Almost half of the claimants were age 21 - 35 years old. Interestingly, there were a large number of claimants older than 50 years (data not shown).

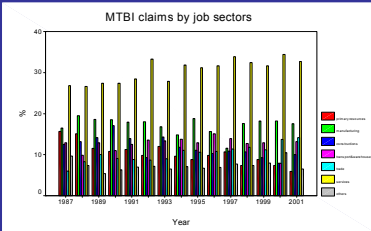


• In general, males were 3 - 4 times more likely to have an MTBI claim compared to females.

- There was a significant increase in the number of female MTBI claimants across time

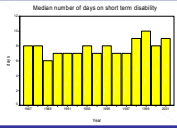
- Female MTBI claimants also tended to be older than their male counterparts (data not shown)

- In the period 1987 - 2001, the occupational categories of MTBI claimants included:
  - 10.2% in the primary resource sectors (agriculture, fishing, forestry, oil & gas)
  - 17.4% in the manufacturing sectors (food and beverage, metal and non-metallic mineral products, wood and paper products, petroleum, coal, rubber, plastic, chemicals and others)
  - 11.8% in construction (general, heavy or road constructions and maintenance)
  - 12.4% in the transportation and warehousing industry
  - 10.4% in the retail or wholesale trade business
  - 30.4% in service sectors (accommodation, food and beverage, health care and social assistance, education, business, utilities, professional, scientific and technology services)
  - 7.3% in other sectors (public administration, federal government, and others)
- The incidence of MTBI claims varied over time. However, service sector and the manufacturing industry consistently showed the highest incidence compared to other job sectors

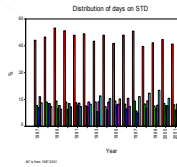


- With regard to different job categories:
  - The highest incidence was observed among claimants aged 26 - 35 years old
  - Majority of males were engaged in primary resource businesses, construction and transportation sectors.
  - Majority of females were engaged in the trades, services and others sectors

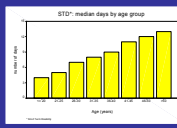
- Claim outcome is defined by the WCB of BC as to whether the claimant was awarded health care only (HCO), short term disability (STD), long term disability (LTD) or if it was a fatal claim, survivor benefits.
  - In the period 1987 - 2001, 0.5% of MTBI claims were for health care only benefits, 96.2% were for STD, 3.1% were for LTD and 0.1% were fatal
  - Majority of fatal claims occurred in the primary resources sectors.
  - Majority of the STD was awarded to claimants in the service sectors.
  - The majority of LTD was awarded to claimants in the construction, primary resources and service sectors
  - There was no relationship of duration between injury and claim submission with the outcome of the claim.



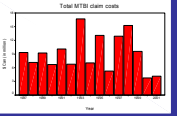
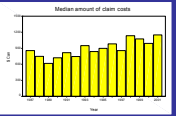
• The overall median days of MTBI claimants on STD in the period 1987 - 2001 was 8 days with a mean (± SD) of 63.7 ± 204.9 days). This has not varied much in the last 15 years.



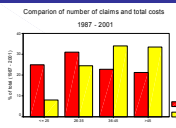
• About half of the MTBI claims were on STD for ≤ 1 week, 12.8% for 2 weeks, 10.2% between 3-4 weeks, 12.8% between 5-10 weeks and 14.7% for > 10 weeks



• There was somewhat a 'dose-response relationship' between age at injury and median days on STD



- Even though there is a trend that the median claim costs for each MTBI claim is rising over time, the opposite tendency is observed for the annual total MTBI claim costs.
  - Median claim costs for females are about 1/4 - 1/2 of their male counterparts
  - The median cost of MTBI claim is highest among those older than 45 years



• Even though there were only 44.1% of MTBI claimants older than 35 years in 1987 - 2001, the total claim costs in this age group -

-represent 67.4% of the overall MTBI claim costs in the same period

• Median claim costs were highest among claimants in primary sector industries (\$1,950 Can) and lowest among those in the trade sectors (\$475 Can).

- Multivariate analysis:
  - Only sex, duration of workloss days and days between injury and claim submission were significant independent predictors the total claim costs
  - Workloss days was the most important predictor of the total claim costs
  - Models on predicting days of workloss were not presented here due to model's poor fit as measured by its R<sup>2</sup>.

Independent variables	B	SE* B	p-value
Constant (a)	- 899.9	1510.4	0.55
Females vs. males	- 8324.0	2861.1	0.004
Number of workloss days	344.0	5.1	0.000
Days between injury and claim submissions	- 135.2	47.3	0.004
Model R <sup>2</sup> = 0.46			

Summary:

- On average, the WCB of BC receives about 551 new MTBI related claims annually. Even though MTBI claims comprise about 0.3% of the total annual claims, the claim costs associated with MTBI is about 1% - 2% of the total claim costs in that year.
- Half of the MTBI claimants submitted their claims within a week post injury. The median duration between injury and claim submission was 7 days.
- Almost half of the MTBI claims were aged 21 - 35 years. Males were 3-4 times more likely to file MTBI claims compared to females.
- Half of all MTBI claimants were on STD for 7 days. Only about 15% were on STD for > 10 weeks.
- Females spent less days on STD as compared to males. Older claimants(> 45 years) recorded longer median STD times.
- The median claim cost for MTBI has been rising across time, however, the annual total cost of MTBI has been declining. Costs of MTBI claims among females was less than males. The highest median cost of claims was observed among those aged 45 years or older.
- About 0.1% of MTBI claims were fatal; more than 95% were for STD only. 3.1% of MTBI claims are on LTD.
- Independent predictors for total claim costs included: sex, duration of workloss days and days between injury and claim submission

References available upon request.

