Traumatic Brain Injury – A Hidden Disability

Dr Carol Hawley

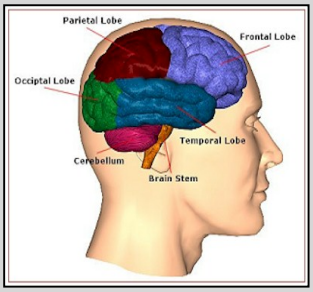
c.a.hawley@warwick.ac.uk

Collaborators: Professor Stephen Joseph; Dr Anthony Ward; Dr Andrew Magnay; Mrs Julie Long; Dr Bas Mychalkiw; Ms Lynda Lavery; Professor Anthony Maden; Professor Jane Hutton; Dr Kevin Morris; Dr Rob Forsyth, Dr Robert Tasker; Dr Roger Parslow; Professor Neil Brooks; Mr John Stilwell; Mrs Carol Davies; Mrs Pippa Stilwell; Dr David Owen.

What is Traumatic Brain Injury?

Traumatic brain injury (TBI), also called acquired brain injury or head injury, occurs when a sudden trauma causes damage to the brain. TBI can result when the head suddenly and violently hits an object, or when an object pierces the skull and enters brain tissue. Symptoms of a TBI can be mild, moderate, or severe, depending on the extent of the damage to the brain.

Severity of injury is usually measured by Glasgow Coma Scale (GCS) scores, where 15 is fully conscious and 3 is minimally conscious.
Mild = GCS: 14-15
Moderate = GCS 9-13
Severe = GCS 3-8



The Brain

The Frontal Lobe:
- How we interact with our surroundings.
- How we react to our environment.
- Our judgments on daily routines.
- Our emotional responses.
- Our expressive language.
- Assigns meaning to words we choose.
- Involves word association.
- Memory for habits and motor activities.

The Temporal Lobe:
- Hearing
- Memory
- Visual perceptions.
- Categorizing of objects.

The Brain Stem:
- Breathing
- Heart Rate
- Swallowing
- Reflexes to seeing and hearing.
- Controls sweating, blood pressure, digestion, temperature (autonomic nervous system).
- Affects level of alertness.
- Ability to sleep.
- Sense of balance.

The Cerebellum:
- Coordination and voluntary movement.
- Balance and equilibrium. Some memory for reflex motor acts.

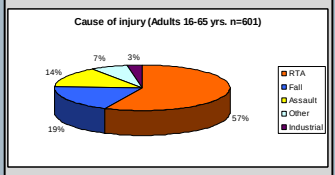
Occipital Lobe:
- Vision

Parietal Lobe:
- Location for visual attention.
- Location for touch perception.
- Goal directed voluntary movements.
- Manipulation of objects.
- Integration of different senses that allows for understanding a single concept.

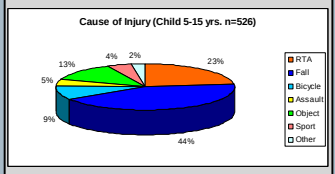
Major Causes of TBI

Falls

Road traffic accidents (RTA)



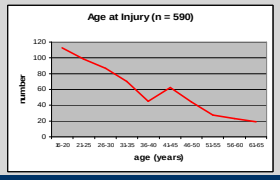
National traumatic brain injury study.[1]



Outcomes after HI – A population study.[2,3]

Who is at risk of TBI?

Over one million people worldwide survive TBI with some residual disability. Males outnumber females by 3:1. At greatest risk are young males aged 16 to 25, and there is another peak among the elderly. Our adult TBI research studied 16-65 yr olds:



Warwick Research on TBI

Recent studies include:

Return to driving after head injury. Collaborator: Transport Research Laboratory. Funder: Department for Transport (DfT).

Positive Growth After Head Injury. Collaborator: Prof. S. Joseph. Funder: DfT.

Risk of further seizures after an initial seizure. Collaborator: Prof. J. Hutton, Statistics. Funder: DfT.

Epidemiology of head injury – a study of UK paediatric intensive care units. Collaborators: Dr. K. Morris et al. Funders: Birmingham Children's Hospital and Warwick University.

Long term follow-up of Ex-Military Personnel. Collaborator: Dr. C. Evans. Funder: Duchy Healthcare.

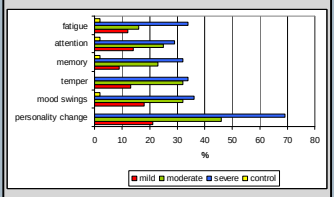
Outcomes after adolescent head injury. Funder: Warwick Primary Care Research Network.

Outcomes after head injury among children in the West Midlands. Collaborators: North Staffordshire NHS Trust. Funder: NHS West Midlands.

National traumatic brain injury study. Collaborators: J. Stilwell, C. Davies, P. Stilwell. Funder: Department of Health.

Children and TBI

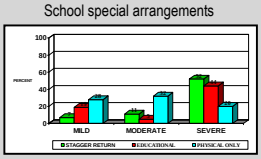
Traumatic brain injury is a major public health problem and a leading cause of mortality or permanent disability in children and adolescents.[4] In the United Kingdom it has been estimated that each year, approximately 3000 children acquire significant new neurological or cognitive disability as a result of TBI.[5]
We studied a population of children admitted to one Hospital Trust with TBI to compare outcomes following mild, moderate and severe TBI.
Methods: Questionnaires were mailed to parents of all 974 surviving children on a register of paediatric TBI admissions, 526 completed questionnaires were returned (56.2%). Most children (419) had suffered mild TBI, 57 moderate, and 49 severe.
Main outcomes and results: Thirty percent of parents received no information on post-injury symptoms, and clinical follow-up was limited. Statistically significant differences were observed between mild and moderate/severe groups for cognitive, social, emotional, and mobility problems. Nevertheless, approximately 20% of the mild group suffered from poor concentration, personality change, and educational problems post-injury. Few schools (20%) made special provision for children returning after injury.
Conclusions: children can have long lasting and wide ranging sequelae following TBI. Information should be routinely given to parents and schools after brain injury.[6,7]
We measured parental stress among parents of children with TBI and parents of children in the control group. Parents of children with TBI of any severity demonstrated severe stress, in the severe group 60% had clinically significant stress, and over a third of parents in the mild and moderate groups also had clinically significant stress. Parents in the control group showed normal levels parental stress.[8]
Problems frequently reported among children post TBI were:



Return to School after TBI

On return to school, one third of teachers were unaware of the TBI. Special arrangements were made for only 27% of children. Special educational needs were identified for 24%, but only 9% received specialist help. Two-thirds of children with TBI had difficulties with school-work, half had attention/concentration problems. Half the TBI group had a reading age ≥1 year below their chronological age, one third were reading ≥2 years below chronological age.[9-12]

School special arrangements



Future Research

- ❖Use of functional MRI to predict outcomes.
- ❖Use of new and emerging technologies to facilitate rehabilitation and new learning after brain injury.
- ❖Examination of the effect of blast injuries among military personnel.
- ❖Further investigation of outcomes after mild TBI.
- ❖Accident and Emergency Care for patients with minor head injury.
- ❖Prevalence of TBI among black and minority ethnic groups.

Adults and TBI

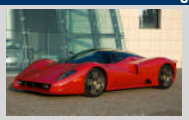
The overall annual incidence of traumatic brain injury (TBI) in the United Kingdom is approximately 300 per 100,000, and around 500,000 people in the UK are currently living with the consequences of their TBI. TBI is a 'hidden disability' since a person may appear physically normal, yet have considerable cognitive, psychological, social, emotional and behavioural problems.

Head injury and offending
Half the patients in UK medium-secure forensic mental health units have a history of HI. Patients with HI are more difficult to discharge from mental health units.[13]

Yet, there is capacity for recovery & post-traumatic growth:

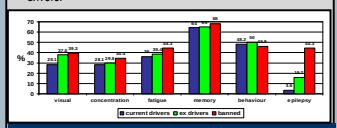
Positive psychological growth after brain injury
We investigated long-term positive psychological growth in individuals with TBI and compared growth to injury characteristics and early outcomes.
Methods: 165 TBI survivors were assessed on the Glasgow Outcome Scale (G OSE) and the a Positive Changes in Outlook Questionnaire (CiOP). 103 (62%) participants had suffered severe TBI, 24(15%) moderate and 38 (23%) mild. Mean length of follow-up was 11.5 years post-injury (range 9-25 years). On the GOSE at follow-up, 43 (26%) had severe disability; 72(44%) moderate disability; and 50 (30%) good recovery. Scores on the CiOP indicated positive psychological growth in over half of the sample, as evidenced by agreement with items such as "I don't take life for granted anymore" and "I value my relationships much more now". CiOP total scores did not correlate with any injury or early outcome variables. However, at long-term follow-up there was a negative correlation between positive growth and anxiety and depression.[14]

Return to Driving after TBI



Although people with brain injury have not been identified as at particularly high risk of road accidents, poor judgement and impulsivity are major sources of risk, with physical problems playing only a minor role. Stopping driving is associated with lost social activities and depression, and many people see the ability to drive again as a crucial index of recovery. We studied 381 people who were drivers before TBI (70% severe, 20% moderate, 10% mild). At approximately 6 months post injury:
139 (37%) returned to driving "current drivers"
242 (63%) not driving "ex-drivers"
61 (16%) formally advised not to return to driving after TBI "banned drivers".
All three groups had problems which could affect driving.
Few given advice on return to driving
Few were assessed for their ability to drive.[15,16]

Problems reported: Comparison of current, ex- and banned drivers:



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