HO 1.1

Aim and objectives

At the end of this session, participants should be able to:

- define the term 'traumatic brain injury'
- identify the epidemiology of this source of disability (eg. sex ratio, age distribution)
- describe the basic anatomy of the skull and brain
- recognise how trauma impacts upon the structures of the brain
- recognise the process of recovery
- define stages of rehabilitation
- give examples of four broad categories of long-term impairments often seen after a traumatic brain injury, recognising the links between site and type of injury with possible resulting impairments of brain function
- define common outcomes for the person with the injury as well as their family
- identify the types of services (nationally and locally) available to people with a TBI and their families.

HO 1.2

Living with a brain injury

Generally the public are ignorant of how life changes for someone with a new mind.
The waters are unchartered.
Rationality is hampered and delayed,
Impulsiveness is rampant and,
Thought doesn't have a barrage of filtration and tact to sift through...

Smell and taste are non-existent,
Hearing and balance are affected.

Suicide is hovering with open doors,
Depression is constant,
Life's beauty has faded.

One doesn't have the safe guiding of survival fear any more.
The ability to tell a white lie to resolve or comfort a situation has gone.
Truth is said without haste or filtration,
It's how it is.

Your family doesn't take your new mind with ease,
My family has gone.

Management of money is disastrous,
A day by day struggle.

Confidence is small – nearly non-existent.
How do I manage a job every day? I wonder and I can't...

Forgetfulness is daily,
Keys are gone, my teeth are greasy and furry,
Where's my toothbrush?

My tiredness is now a battle.
I used to have so much energy and spirit.

Who do I turn to?
I am craving for love.

('Bernard', 2000)

HO 1.3(a)

An introduction to Traumatic Brain Injury

Traumatic brain injury (TBI) is one form of Acquired Brain Injury (ABI).

The Australian National Policy on Services for People with Acquired Brain Injury defines ABI as:

> "an injury to the brain which results in deterioration in cognitive, physical, emotional or independent functioning...these impairments to cognitive abilities or physical functioning may be either temporary or permanent and cause partial or total disability or psychosocial maladjustment."
>
> (Department of Human Services and Health, 1994)

There are a number of common causes of ABI, listed below:

- **Traumatic brain injury**

  Traumatic brain injury occurs as the result of some external force being applied to the brain

- **Stroke**

  Stroke usually occurs as the result of a haemorrhage or blockage to the blood vessels that supply blood to the various regions of the brain

- **Hypoxia/anoxia**

  Hypoxia/anoxia refers to the reduced or complete stopping of the flow of oxygen to the brain leading to tissue damage, and can be caused by failed hangings, near drowning, or overdoses

- **Infection**

  Bacterial or viral infections can lead to an inflammation of the brain covering (meningitis) or the brain tissue itself (encephalitis)

- **Tumour**

  Tumours cause damage to the surrounding brain tissue and structures as they grow within the brain

- **Toxins**

  Alcohol acts as a toxin and the long term misuse of alcohol can cause damage to brain tissue.

- **Degenerative neurological diseases**

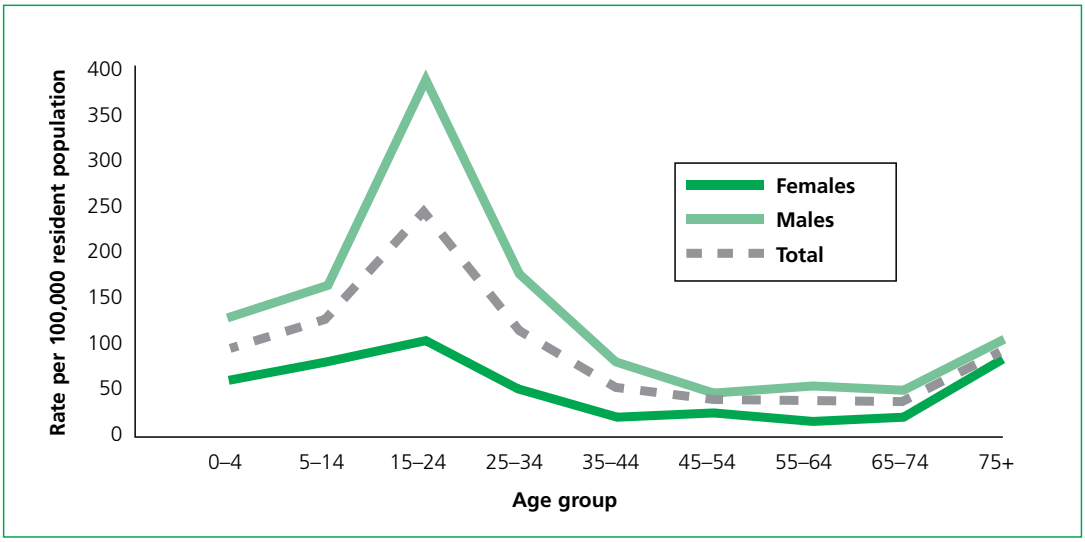
  Conditions including Huntingdon's disease, Parkinson's disease, and Alzheimer's disease are caused by abnormal changes to brain cells in particular regions of the brain

This handout will focus on traumatic brain injury (TBI).

HO 1.3(b)

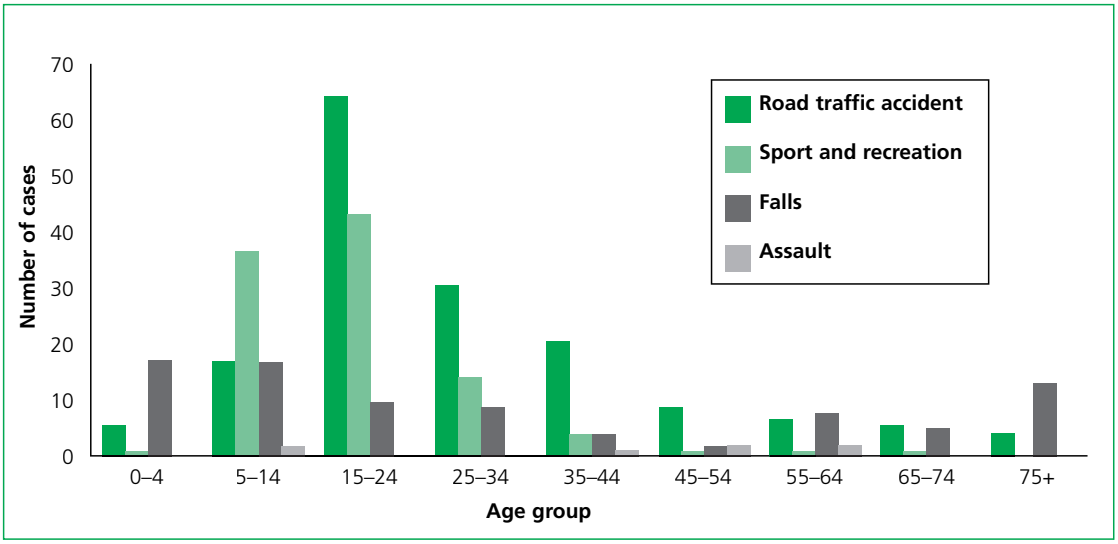
Epidemiology of TBI

The peak incidence of TBI is among young males. The male:female ratio for people with TBI is 3:1.The 15–25 years age group comprises 40% of survivors of TBI but only 15% of the Australian population. A second peak is observed after 75 years. But there are different causes for these two age groups. The main cause among young people is road crashes, whereas the main cause for the elderly is falls.



Common causes of brain injury

In relation to severe TBI, 64% are caused by road accidents (i.e. drivers, passengers, pedestrians, motor bikes, cyclists) and 36% relate to all other causes, including assaults, falls, sport/recreation, gunshot and other causes.

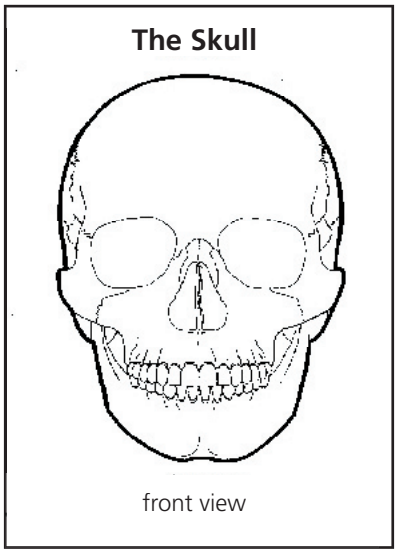


For further information about the incidence or prevalence of TBI, refer to the following articles in the references list (Fortune & Wen, 1999; Tate, McDonald, & Lulham, 1998).

HO 1.3(c)

Basic anatomy of the skull and brain

The skull



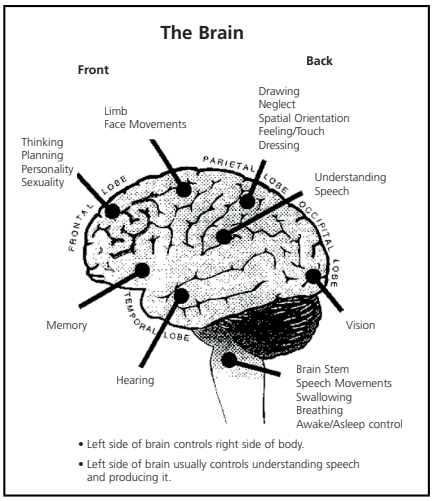
The skull is a hard, bony box protecting the brain. Cerebrospinal fluid circulates within the brain and between the brain and the skull, further protecting and providing stability to the brain.

The skull has bony ridges on its inner surface, which can cause damage to brain tissue in the event of a TBI. This damage can commonly include lacerations or contusions around the frontal/ temporal lobes and contra-coup damage in the region of the occipital lobe.

The brain

The brain comprises bundles of nerve cells and fibres that are the consistency of 'al dente' spaghetti. The left and right hemispheres of the brain typically control the opposite side of body. In addition, for people who are right handed, the left side of the brain usually controls understanding of speech and production of speech, and vice versa for left-handed people.

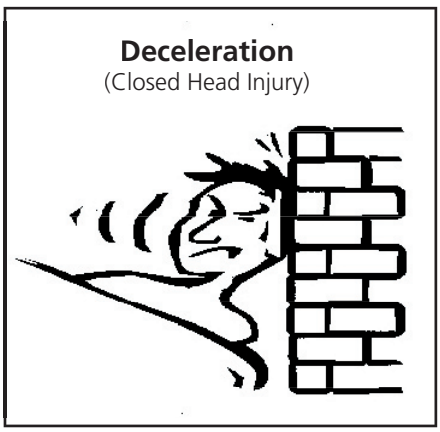
The brain is divided into areas that have special functions. Some of the most noticeable areas are the four lobes of the brain, namely the frontal, temporal, parietal, and occipital lobes. Many of the things we do depend on **several** of these areas **working together**. To do this, the brain depends on networks of nerves that control the functions and activities of the person and their body.



Mechanisms of injury (what happens to the skull and brain)

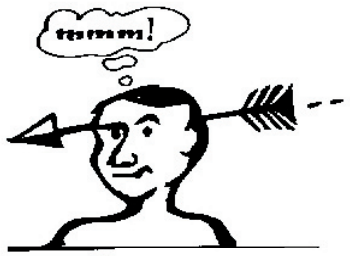
The most common mechanisms of TBI are (i) Acceleration/ Deceleration injuries and (ii) Penetrating injuries.

Acceleration/deceleration injuries refer to injuries in which the head is in motion and then abruptly comes to a halt. For example, if a car hits a tree, the car suddenly stops, and the driver's head hits the steering wheel. The brain within the skull still has forward momentum and can hit the inner surface of the skull (which has bony edges) with some force, thereby causing bruising, lacerations and bleeding. In addition, the twisting motions that typically accompany such accidents mean that the bundles of nerve fibres can be stretched or shear (this is called diffuse axonal injury). The term closed head injury is also used to describe this type of TBI, because the damage to the brain occurs as the result of these internal mechanisms, but with the skull remaining intact.



HO 1.3(d)

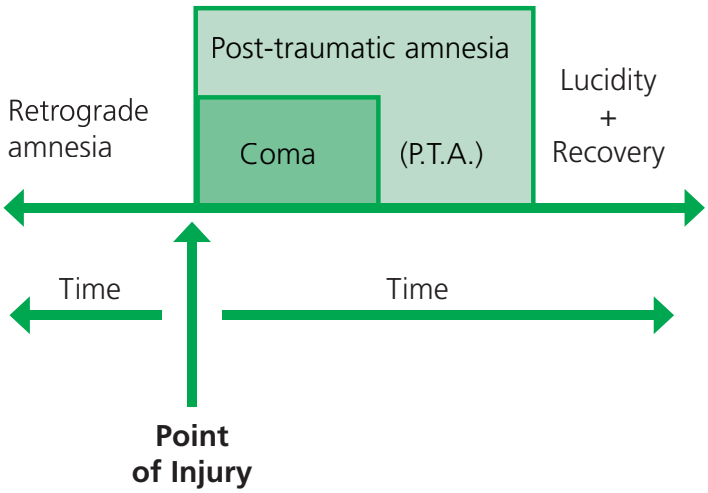
Penetrating Head Injury



Penetrating injuries describe cases where some external object pierces the skull and comes in direct contact with the brain, thereby causing a TBI.

Recovery and rehabilitation

The process of recovery from a TBI comprises a number of different components, illustrated in the diagram below. Typically, at the point of injury, one of the immediate effects is that a person exhibits a depressed or altered state of consciousness. This may include a period of coma (a loss of consciousness). The length of unconsciousness can be measured on the Glasgow Coma Scale. As people emerge from a coma, they go through a period of post-traumatic amnesia (PTA), during which the person is not orientated to time, place, person, and is unable to learn, and may display disinhibition, irritable or agitated behaviour. This is in contrast to the many misleading media portraits, in which a person emerges from a comatose state, as if waking from sleep, fully lucid and oriented.



However, not everyone experiences a loss of consciousness (LOC) as the result of a TBI. Some people who are injured will be confused (i.e. in PTA) but without ever loosing consciousness. One example of this is a football player, who is concussed as the result of a heavy tackle. The person may not loose consciousness, but may be confused and disoriented for a few minutes, not knowing that they are on a football field (this would be classified as a mild TBI).

The period of coma and/or PTA, can range from a matter of minutes, through to days, weeks or even months. Duration of PTA is measured until continuous memory is restored. Duration of PTA, as a measure of initial injury severity, is the best predictor of long term outcome after a TBI.

HO 1.3(e)

People who sustain a TBI will also characteristically lose some memories of the events preceding the point of injury. Once again, this memory loss may only last a few minutes, but in more severe cases, people may lose their memories for events that happened for hours, days, weeks or even months before the injury. The loss of memory for events occurring prior to the injury is called retrograde amnesia.

As people emerge from coma and PTA and become more lucid, they also make rapid recovery of functioning more generally, including physical recovery, language, and functional abilities. The most rapid recovery is in the first 6–9 months post-injury, but after two years most of the natural recovery has plateaued. After this time, the person can still make improvement, but this will be through a process of adjustment, making optimum use of intact abilities or developing strategies to compensate for remaining disabilities.

Stages of rehabilitation

Note that rehabilitation does not cause recovery, but helps the person make the most of recovery that occurs spontaneously. Most rehabilitation is an active learning process.

Stage 1: Acute rehabilitation

This acute stage involves initial management to ensure the person is medically stable in the Intensive Care Unit and high dependency wards. Acute rehabilitation normally occurs within hospital with a strong focus on physical recovery and regaining independent living skills.

Stage 2: Post-acute rehabilitation/community re-settlement

This stage involves managing the transition from hospital back home, and the ongoing process of rehabilitation that occurs after discharge. The focus of rehabilitation at this stage may include return to work or study, finding alternatives where this is not possible and relearning skills for community living.

Stage 3: Social rehabilitation

This is the long-term rehabilitation aimed at maintaining and enhancing the level of participation in community life that people with TBI can achieve over their lifespan (community integration).

HO 1.3(f)

Common impairments after TBI

People after TBI may experience impairments in one or more of the following four areas, namely (i) motor-sensory, (ii) communication, (iii) cognitive, and (iv) behavioural/psychosocial domains.

Motor-sensory impairments

Most people make a good physical recovery after TBI with only 25% experiencing permanent long term physical impairments (Tate, Broe et al., 1989). Paralysis or restricted range of movement may be more prominent on a particular side of the body (left- or right-sided weakness). Incoordination may be the result of damage to the cerebellar region of the brain.

Visual impairments are one of the most common motor-sensory impairment after TBI. A total of 42% of 103 patients with TBI followed up in Melbourne still reported visual difficulties at five years post-injury (Olver et al. 1996). In addition to visual impairments, changes in smell and taste are often reported. If there is a loss of sensation to touch, it may be dangerous, eg. water too hot in shower and get burnt.

However, only 3% of a series of 175 people with TBI needed to use a wheelchair for mobility at two years post-TBI (Ponsford et al. 1995)

Communication

A range of communication impairments have been reported after TBI.

Aphasia refers to the disruption in one or more of the communication skills including understanding speech, speaking, remembering names, reading, writing, and so on. Rates of aphasia ranging between 2–30% have been reported after TBI. (McDonald et al.,1999)

Dysarthria refers to communication problems following damage to the brain stem, which can result in physical problems in the production of speech, swallowing difficulties and drool control. Some degree of dysarthria could be found in up to 34% of people with severe TBI at five years post-injury (Olver et al., 1996)

People with TBI can also experience impairments in social or pragmatic communication. This can result in poor ability to take turns, maintain eye contact, difficulty coming up with topics of conversation, overly familiar, disinhibited remarks, standing too close etc.

Cognition

A range of cognitive impairments have been reported after TBI.

- **Attention**

Attention problems range from shorter span of attention to difficulties concentrating over time or poor attention to detail and being distractible. Therefore, it may be difficult for someone to sit and watch a movie, or to attend to a conversation in a crowded, busy environment. Up to 34.1% of people may have reduced or a slowing of information processing (Tate et al., 1991).

- **Memory**

Memory problems can include difficulties in learning new information, forgetting information quickly. Forgetting appointments or future plans. Memory problems are the most commonly reported cognitive impairment after TBI. Between 56.5% and 74% of people with TBI may report changes or difficulties with memory (Ponsford et al., 1995; Tate et al. 1991)

HO 1.3(g)

• **Thinking**
People may have difficulty with complex ideas, or be very rigid or perseverative in their approach (this is like having a piece of chewing gum on your finger and not being able to get rid of it). Up to 40% of people may have difficulty in thinking flexibly after a TBI (Tate et al., 1991).

• **Planning and organising**
People may have a number of difficulties in this area. For example, cooking a meal becomes a disaster because the steps were not done in the correct order. A lack of self-monitoring means that it can be hard for people to learn from their mistakes. Up to 48% of people with TBI reported some planning problems (Ponsford et al., 1995).

• **Reasoning**
People's thinking may be very concrete, and they may have difficulty with abstract concepts.

Personality/behavioural changes

A range of personality/behavioural changes have been reported after TBI.

Some 60–80% of relatives will report changes of these types over periods up to 15 years post-injury (Thomsen, 1984)

• **Drive**
People appear as lethargic or inert. Every thing seems to take enormous effort. Families often mistake this for laziness.

• **Control**
People may be disinhibited or impulsive. Also, they may have problems with temper control.

• **Emotion**
People may be unrealistically happy, or have flattened affect (e.g. not respond emotionally to either good or bad news), or maybe be labile, laughing or crying for no reason.

• **Insight**
People may be unaware of their limitations or have unrealistic goals or expectations.

• **Self-centredness**
People may become very self-centred and demanding, and have difficulty empathising with other people's needs and points of view. Families often describe this as "childlike" behaviour.

HO 1.3(h)

Psychosocial outcomes (life changes associated with TBI)

Activities of daily living

Most people with TBI have the ability to carry out activities of daily living. A study of 103 people with TBI in Melbourne found that at five years post-injury:

81% were independent in light domestic chores (e.g. meal preparation), 72% in heavy domestic chores (e.g. gardening) and 70% in shopping and banking (Olver et al., 1996).

Work

Rates of successful return to work vary considerably. For people with TBI with severe injuries, the Melbourne study found that only 40% of people were employed at five years post-injury (Olver et al.,1996).

Leisure pursuits

Many people either lose all their leisure activities or have to change activities. The Melbourne study found that at five years post-injury, 63% of people with TBI had had to make changes to the sort of leisure activities that they had enjoyed prior to their injuries (Olver et al., 1996).

Marriage or relationship

A Sydney study found that at six years post-injury, 55% of marriages had broken down (Tate, Lulham, et al.,1989). For marriages that do stay together, there can still be a number of changes, for example, the loss of the sexual component of the relationship.

Friendships

The Melbourne study found that at five years post-injury, 50% of people with TBI reported that they had lost friends and become more socially isolated since the injury (Olver et al.,1996).

Psychological reactions

People with TBI can experience a range of differing psychological reactions. This can include depression, anxiety, low self-esteem and thinking about suicide. Between 30–40% of people can experience periods of depression. Almost 1 in 5 people will attempt suicide after a TBI (Simpson & Tate, 2002).

HO 1.3(i)

Impact on family

The majority of people with a brain injury are discharged from an acute rehabilitation unit to return to their parents or partners. This often produces enormous changes and stress for the family unit as well as for individual family members. In the Sydney study, more than 90% of people returned home to their family (Tate et al.,1989).

Many families find it a rewarding experience to provide support for a family member with TBI. However, it other cases, it can be extremely stressful.

Sources of stress can relate to:

- Family members having to give up work, and being financially worse off
- Increased level of conflict due to temper control problems
- Family members (especially partners) having to take on new roles if partner with TBI no longer able to play these roles (e.g. financial manager, home maintenance, disciplinarian with children, etc.)
- Family members who play a caring or support role losing touch with their own social networks, becoming more socially isolated
- Family members experiencing grief or depression mourning for the person "they knew before" the TBI
- Family members experiencing post traumatic stress if they witnessed or were involved in the accident that caused the injury.

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October 2004

HO 1.3(j)

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HO 1.3(k)

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The Liverpool, Sydney Brain Injury Rehabilitaton Unit Website has research, articles and conference presentations by category, eg. outcomes, case management. http:/www.swsahs.nsw.gov.au/biru/

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 HO 1.3(l)

Contacts

Brain Injury Association of NSW

Advocacy and information about groups and services for people with ABI.

Address 17 Macquarie Rd Auburn 2144
Phone 02 9749 5366 (Sydney)
or 1800 802 840 (outside Sydney)
Fax 9749 5608
Email mail@biansw.org.au
Internet www.biansw.org.au

Brain Injury Australia (BIA)

The Australian peak organisation working for people living with ABI. Their website provides links to state BI networks.

Address 86 Herbert Street, Northcote, VIC 3070
Phone 03 9497 8074
Fax 03 9486 7941
Email admin@bia.net.au
Website www.bia.net.au

Greater Metropolitan Clinical Taskforce Brain Injury Directorate

Information about the Department of Health Brain Injury Rehabilitation Program in NSW.

Address Locked Bag 7103
Liverpool BC NSW 1871
Phone 9828 6133
Fax 9828 6132
Website http://internal.health.nsw.gov.au/birp/

 HO 1.3(m)

Contacts (continued)

The National Alliance of Young People in Nursing Homes (YPINH) is a nationwide association of young people living in aged care facilities, their family members, friends, and other concerned individuals and organisations who work together to make life in the community a reality for young people living in residential aged care.

Contacts: Bronwyn Morkham and Trudy Brunton
Address: 86 Herbert Street
Northcote Victoria 3070
Phone 03 9482 5655
Fax 03 9482 5855
Website http://www.ypinh.org.au
Email ypinh@headwayvictoria.org.au

The MotorAccident Authority of NSW

The Motor Accident Authority (MAA) of NSW is a statutory corporation that regulates the compulsory third party (CTP) personal injury insurance scheme for motor vehicles registered in NSW.

CTP motor vehicle insurance is compulsory in all Australian States and Territories and is designed to ensure that compensation is available to those who are injured in motor vehicle accidents.

Phone **1300 137 131**
Website www.maa.nsw.gov.au