TBI Rehabilitation in New Zealand

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A CONCUSSION,
BY ANY OTHER NAME IS STILL…
A BRAIN INJURY

(And..sometimes it is a Moderate one)

Concussion/Mild TBI

MTBI is an acute brain injury resulting from mechanical energy to the head from external physical forces.

- Glasgow Coma Scale (GCS) score: 13-15
- loss of consciousness less than 30 minutes following the injury
- Posttraumatic amnesia of less than 24 hours following the injury

The American Congress of Rehabilitation Medicine, Centre for Disease Control, and the World Health Organisation include the above criterion

Definition of Traumatic Brain Injury - a continuum of severity of injury

A TBI is an injury that disrupts the normal function of the brain. – CDC 2014

"A traumatically induced structural injury and/or physiological disruption of brain function as a result of an external force that is indicated by new onset or worsening of at least one of the following clinical signs, immediately following the event:"

- **Any** period of loss of or decreased level of consciousness
- **Any** loss of memory for events immediately before or after the injury
- **Any** alteration in mental state at the time of injury
- Neurologic deficits that may or may not be transient
- Intracranial lesion

The external forces may include the head being struck by an object, the head striking an object, the brain experiencing acceleration/deceleration movement without external trauma to the head, a foreign body penetrating the brain, or forces generated from events such as a blast or explosion – VA/DoD

Diagnostic Criteria for Concussion/Mild Traumatic Brain Injury - ONF

Concussion/mTBI is defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces. Several common features that incorporate clinical, pathologic and biomechanical injury constructs that may be utilised in defining the nature of a concussion/mTBI include:

1. Concussion/mTBI may be caused either by a direct blow to the head, face, neck **or elsewhere on the body with an ''impulsive' force transmitted to the head.**
2. Concussion/mTBI typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, symptoms and signs may evolve over a number of minutes to hours.
3. Concussion/mTBI may result in neuropathological changes, but the acute clinical symptoms largely reflect a **functional disturbance rather than a structural injury** and, as such, no abnormality is seen on standard structural neuroimaging studies.
4. Concussion/mTBI results in a graded set of clinical symptoms that may or may not involve loss of consciousness

Resolution of the clinical and cognitive symptoms typically follows a sequential course. However, it is important to note that in some cases symptoms may be prolonged.

- McCrory P, Meeuwisse WH, Aubry M, et al. Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012. British Journal of Sport Medicine. 2013;47(5):250-8.

Closed Head Injury in Adults - Initial Management – NSW –policy directives 2012

Patients with initial GCS 13 have a significantly higher rate of intracranial injury and should not be considered as having mild head injury

http://www0.health.nsw.gov.au/policies/pd/2012/pdf/PD2012_013.pdf Closed Head Injury in Adults - Initial Management
Document Number PD2012_013 Publication date 08-Feb-2012

NSW guidelines Mild and Moderate

- Mild head injury - A patient with an initial GCS score of 14-15 on arrival at hospital following acute blunt head trauma with or without a definite history of loss of consciousness or post traumatic amnesia.
- Moderate head injury - A patient with an initial GCS score of 9-13 on arrival at hospital following acute blunt head trauma.

Closed Head Injury in Adults - Initial Management - NSW

- Patients who present initially with moderate head injuries should all have an early CT scan and close clinical observation.
- They should be admitted to hospital for at least 24 hours observation unless they rapidly return to normal have a normal CT scan and absence of other clinical risk factors.
- **The majority of patients who suffer moderate head injuries will have some degree of cognitive behavioural social sequelae and should be considered for routine follow up with a brain injury rehabilitation service**

  or a neurologist.

Canadian Head CT Rule

Inclusion Criteria

GCS 13-15

Age ≥ 16yr

No coagulopathy nor on anti-coagulation

No obvious open skull fracture

Head CT not required if NONE of the following are present

- **Age ≥ 65 years**
- **Vomiting > 2 time**
- **Suspected open or depressed Skull Fracture**
- **Signs suggesting basal skull fracture:**
- **Hemotympanum**
- **Racoon eyes**
- **CSF otorrhea or rhinorrhea**
- **Battle's sign (bruising around mastoid process)**
- **GCS < 15 at 2 hours post injury**
- **Retrograde Amnesia > 30min**
- **Dangerous mechanism**
- **Pedestrian struck by vehicle**
- **Ejection from motor vehicle**
- **Fall from elevation >3 feet or 5 stairs**

High risk mild head injury: **STRONG** indication for CT scan if... (NSW and ONF guidelines)

- **GCS <15 at 2 hours post injury**.
- Deterioration in GCS.
- Focal neurological deficit**.**
- Clinical suspicion of skull fracture
- Vomiting (especially if recurrent)
- Known coagulopathy or bleeding disorder
- **Age >65 years.**
- Seizure
- **Prolonged loss of consciousness (>5 mins).**
- **Persistent post traumatic amnesia (A-WPTAS <18/18 at 4hrs post injury)**
- Persistent abnormal alertness / behaviour / cognition
- Persistent severe headache.
- **Delayed presentation or representation.**

Relative indication for CT scan if...
NSW and ONF guidelines

- Large scalp haematoma or laceration
- Multi-system trauma.
- Dangerous mechanism.
- Known neurosurgery / neurological impairment.

Explanatory notes for risk factors Closed Head Injury in Adults -Initial Management (NSW and ONF)

- 1. Using GCS<15 at 2 hours post injury allows clinical judgement for patients who present soon after injury or who have drug or alcohol intoxication. Drug or alcohol intoxication has not been shown to be an independent risk factor for intracranial injury but persistent GCS<15 is a major risk factor and mandates CT.
- 2. Clinical suspicion of skull fracture includes history of focal blunt assault or injury; palpable skull fracture; large scalp haematoma or laceration; signs of base of skull fracture – haemotympanum / CSF leak / raccoon eyes / Battles sign.
- 3. Recurrent vomiting more concerning than isolated vomiting but both are indications.
- 4. Known coagulopathy is both a strong indication for early CT scan and to check the INR. Early reversal of anticoagulation if abnormal CT scan and consider reversal if initially normal CT scan with high INR (>4) depending on clinical situation.
- 5. Elderly patients have increasing risk of intracranial injury with increasing age; routine CT scanning indicated unless totally asymptomatic patient with no other risk factors.
- 6. Brief generalised seizures immediately following head injury are not significant risk factors. Prolonged, focal or delayed seizures are risk factors for intracranial injury.
- 7. Post traumatic amnesia may manifest as repetitive questioning or short term memory deficits and can be objectively tested using the A-WPTAS. PTA > 30 mins is a minor risk factor and **PTA > 4 hours a major risk factor for intracranial injury.**
- 8. ***Abnormal alertness/behaviour/cognition detects subtle brain injury better than GCS*** and should be part of the bedside assessment. Family may help establish what is normal.
- 9. **Multi-system trauma – beware patient with unstable vital signs or distracting injuries or who receive analgesia or anaesthesia, as significant head injury is easily missed.**
- 10. Clinical judgement required as to what is a large scalp haematoma or laceration.
- 11. Dangerous - MVA ejection/rollover; pedestrians/cyclists hit by vehicle; falls >own height or five stairs; falls from horses/cycles etc; focal blunt trauma, eg bat/ball /club.
- 12. Known neurosurgery/neurological impairment – conditions such as hydrocephalus with shunt or AVM or tumour or cognitive impairment such as dementia make clinical assessment less reliable and may increase risk of intracranial injury.
- 13. **Delayed presentation should be considered as failure to clinically improve during observation**. For representation consider both intracranial injury and post concussion symptoms and have a low threshold for CT scanning if not done initially.

Traumatic Brain Injury:Diagnosis, Acute Management, and Rehabilitation 2006

When assessing a person with a suspected TBI who is apparently intoxicated, it should not be assumed that the signs and symptoms of the person's injury are due to the intoxication from alcohol or drugs. There should be particular caution with people who are vomiting or who may be intoxicated, due to the risk of aspiration and consequent hypoxia.

traumatic brain injury rehabilitation guidelines NZ

People admitted to hospital or accident and emergency clinics:

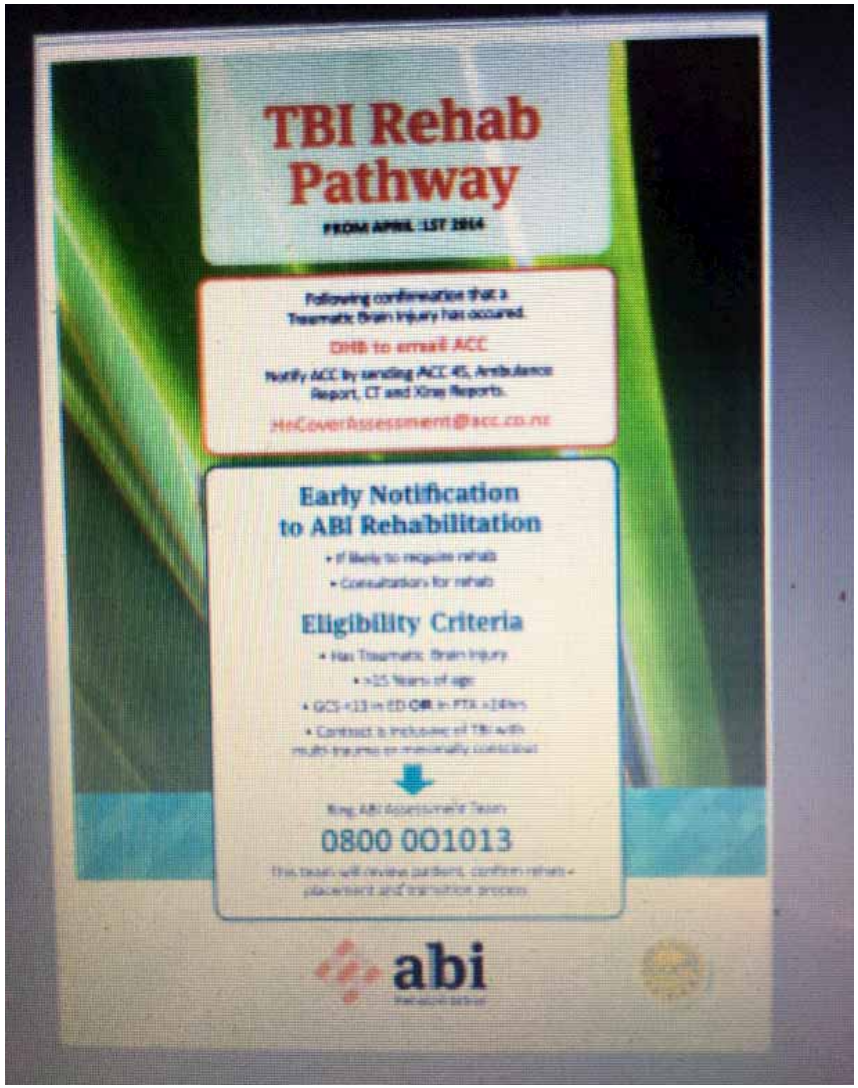
- • in alcohol-induced coma
- • with drug overdose
- • with spinal injury or multi trauma
- • with confusion or disorientation
- • with reported or suspected loss of consciousness
- • with whiplash

Need to be adequately assessed for brain injury

Moderate to Severe TBI Rehab Pathway

TBIRR Eligibility Criteria

- Sustained mod or severe TBI
- **Accepted ACC claim for mod to severe TBI (positive scan)**
- >15 years or over
- Medically stable
- Require a period of intensive rehabilitation in order to enable a transition to a home of their choice and / or a life of greater independence in the community



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Concussion signs and symptoms

- Kraus et al found that 30% of their patients (GCS 13-15) had a multiple symptoms on the Rivermead symptom questionnaire.
- 20% of control group of patients attending ED for other problems reported multiple symptoms.
- They found that **headaches, dizziness, forgetfulness and frustration** were the Rivermead symptoms that best identified mild head injury patients from the controls.
- PTSD and Whiplash Disorder have a significant overlap with concussion symptoms, but also with concussion.

- Lannsjo et al in a population based study of patients with initial GCS 15 found that about 34% of patients reported multiple (3 or more on the Rivermead Questionnaire) significant ongoing post concussion symptoms at three months.

Concussion Symptoms

Thinking/ Remembering	Physical	Emotional/ Mood	Sleep
Difficulty thinking clearly	Headache Fuzzy or blurry vision	Irritability	Sleeping more than usual
Feeling slowed down	Nausea or vomiting (early on) Dizziness	Sadness	Sleep less than usual
Difficulty concentrating	Sensitivity to noise or light Balance problems	More emotional	Trouble falling asleep
Difficulty remembering new information	Feeling tired, having no energy	Nervousness or anxiety	

Risk factors for a poor or protracted recovery: The importance of taking a TBI Hx:

Adults with a prior history of at least one TBI that resulted in loss of consciousness when compared to adults without head injuries were:

- 1.5 times more likely to be misusing alcohol
- almost 2 times more likely to be in fair or poor health
- greater than 2 times more likely to have a work related limitation
- greater than 2 times more likely to have any limitation due to physical, mental or emotional problems;
- 2.5 times more likely to be dissatisfied with their life
- almost 3 times more likely to have problems with learning or memory
- Greater than 3 times more likely to have a disability

Other Risk Factors for a Protracted Recovery.

Hx Taking:

- **Headache History**: Pt and family Hx. History of headaches or family history of headaches (esp. migraines) is a risk for protracted recovery with headaches.
- **History of motion sickness**: may have increased risk for dizziness with decreased ability of the brain to process vestibular information.
- **Visual history**: Amblyopia, impaired stereopsis; uncorrected myopia, hyperopia or presbyopia before the injury. After an injury, the brain compensation for the visual problem may not work as well, and the ability to focus on still objects or following moving objects may be cause symptoms of dizziness, head pressure, head fog and concentration problems.
- **Developmental Hx**: ADHD, learning disability, and other developmental disorders. Research indicates a longer time to recovery.
- **Mood/affective disorder and sleep history**: Concussion increases the risk of depression, anxiety and SWD. Previous history increases the risk of depression, anxiety or sleep disorder. DTI studies of persons with new post concussion depression show that the regions injured were very similar to those of people with non-traumatic major depression disorder. This suggests there may be similar mechanisms to non-trauma and trauma-dependent depression that may help guide treatment. Post concussion anxiety patients had diminished FA in the vermis (helps modulate fear-related behaviors). The vermis has not been associated with dysfunction in non-traumatic anxiety disorders, this may indicate that different treatment targets are required for patients with anxiety after trauma.
- **History of pain or fatigue disorder**: May have prolonged post concussion fatigue, or poor resolution of headaches.

Guidelines for Concussion/mTBI & Persistent Symptoms: Second Edition

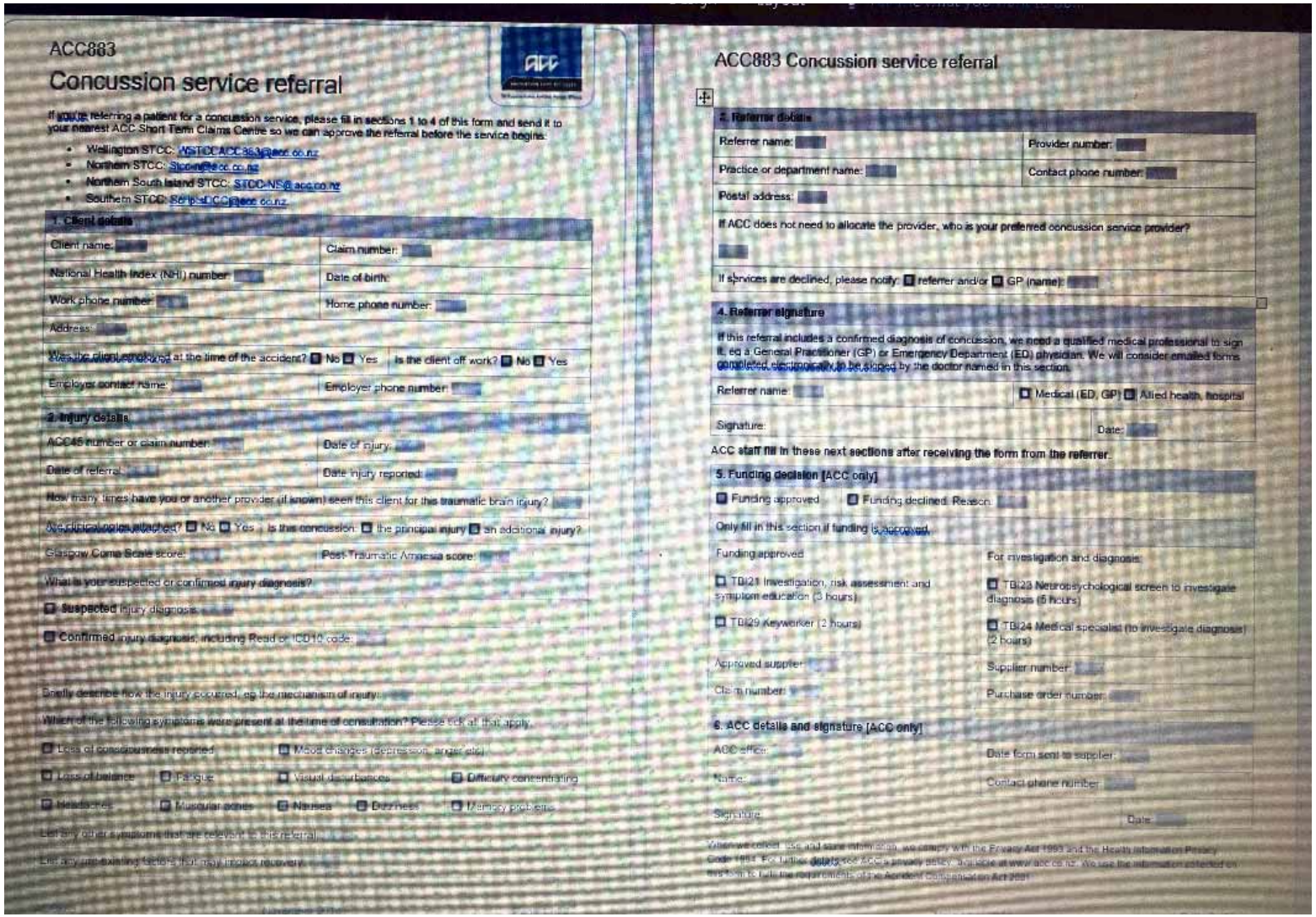
http://onf.org/documents/guidelines-for-concussion-mtbi-persistent-symptoms-second-edition

"A glaring omission from most mild TBI discharge instructions is the lack of any mention of the possibility of the patient developing post-concussive symptoms."

– Dr Andy Jagoda, for the American College of Emergency Physicians.

Closed Head Injury in Adults - Initial Management - NSW

- "all patients with mild head injury should be given both verbal and written discharge advice covering symptoms and signs of acute deterioration, when to seek urgent medical attention, lifestyle advice to assist recovery, information about typical post concussion symptoms and reasons for seeking further medical follow up".
- "As with all discharge advice this should be time specific and action specific".
- Anyone with a concussion diagnosis may be referred to a Concussion Service at any time (1 year).
- BUT THEY NEED THE DIAGNOSIS!!!



ACC883
Concussion service referral

If you're referring a patient for a concussion service, please fill in sections 1 to 4 of this form and send it to your nearest ACC Short Term Claims Centre so we can approve the referral before the service begins.

- Wellington STCC: WSTCC.ACC383@acc.co.nz
- Northern STCC: Stccn@acc.co.nz
- Northern South Island STCC: STCC-NS@acc.co.nz
- Southern STCC: Southern.STCC@acc.co.nz

1. Client details

Client name:
Claim number:
National Health Index (NHI) number:
Date of birth:
Work phone number:
Home phone number:
Address:
Were you employed at the time of the accident? No Yes
Is the client off work? No Yes
Employer contact name:
Employer phone number:

2. Injury details

ACC45 number or claim number:
Date of injury:
Date of referral:
Date injury reported:
How many times have you or another provider (if known) seen this client for this traumatic brain injury?
Are clinical notes attached? No Yes
Is this concussion: the principal injury an additional injury?
Glasgow Coma Scale score:
Post-Traumatic Amnesia score:
What is your suspected or confirmed injury diagnosis?
Suspected injury diagnosis:
Confirmed injury diagnosis, including Read or ICD10 code:
Briefly describe how the injury occurred, eg the mechanism of injury:
Which of the following symptoms were present at the time of consultation? Please tick all that apply.
Loss of consciousness reported
Mood changes (depression, anger etc)
Loss of balance
Fatigue
Visual disturbances
Difficulty concentrating
Headaches
Muscular aches
Nausea
Dizziness
Memory problems
List any other symptoms that are relevant to this referral:
List any pre-existing factors that may impact recovery:

ACC883 Concussion service referral

3. Referrer details

Referrer name:
Provider number:
Practice or department name:
Contact phone number:
Postal address:
If ACC does not need to allocate the provider, who is your preferred concussion service provider?
If services are declined, please notify: referrer and/or GP (name):

4. Referrer signature

If this referral includes a confirmed diagnosis of concussion, we need a qualified medical professional to sign it, eg a General Practitioner (GP) or Emergency Department (ED) physician. We will consider emailed forms completed electronically to be signed by the doctor named in this section.

Referrer name:
Medical (ED, GP) Allied health, hospital
Signature:
Date:

ACC staff fill in these next sections after receiving the form from the referrer.

5. Funding decision [ACC only]

Funding approved Funding declined. Reason:
Only fill in this section if funding is approved.
Funding approved:
For investigation and diagnosis:
TBI21 Investigation, risk assessment and symptom education (3 hours)
TBI23 Neuropsychological screen to investigate diagnosis (5 hours)
TBI29 Keyworker (2 hours)
TBI24 Medical specialist (to investigate diagnosis) (2 hours)
Approved supplier:
Supplier number:
Claim number:
Purchase order number:

6. ACC details and signature [ACC only]

ACC office:
Date form sent to supplier:
Name:
Contact phone number:
Signature:
Date:

When we collect, use and store information, we comply with the Privacy Act 1993 and the Health Information Privacy Code 1994. For further details see ACC's privacy policy, available at www.acc.co.nz. We use the information collected on this form to fulfil the requirements of the Accident Compensation Act 2001.

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ACC883
CONCUSSION
SERVICE
REFERRAL

“We see what we are looking for, we look for what we know, and what we don’t know we never see.”

- Goethe

"You ain't gonna learn what you don't want to know"

- Jerry Garcia, The Grateful Dead

”There are things we know that we know. There are known unknowns. That is to say there are things that we now know we don't know. But there are also unknown unknowns. There are things we do not know we don't know”.

Donald Rumsfeld

How important is the Brain? VERY

- THERE'S EVEN A SONG ABOUT IT!

I could while away the hours, conferrin' with the flowers
Consultin' with the rain.
And my head I'd be scratchin' while
my thoughts were busy hatchin'
If I only had a brain.
I'd unravel every riddle for any individ'le,
In trouble or in pain.
With the thoughts I'd be thinkin'
I could be another Lincoln
If I only had a brain.
Oh, I could tell you why The ocean's near the shore.
I could think of things I never thunk before.
And then I'd sit, and think some more.
I would not be just a nuffin' my head all full of stuffin'
My heart all full of pain.
I would dance and be merry, life would be a ding-a-derry,
If I only had a brain.

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Thank you!


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