Brain Injury and the Shared Mission of Disease Management
Centre for Neuro Skills
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TBI Incidence by Time

TBI as a Cause of Disability

TBI in the United States

Traumatic Brain Injury
Mechanisms of Injury

- Blow to the head
- Violent shaking of the head/torso
- Lack of blood flow to the head
- Electrical injury
- Missile wound to the head
- Falls

On an annual basis in the United States:

- 1.5 million people will sustain a TBI annually
- 50,000 people will die annually as a result of TBI
- 80,000 people annually experience the onset of long-term disabilities following TBI
- There are currently 5.3 million Americans living with a disability as a result of a TBI

Comparison of Annual Incidence

Traumatic Brain Injuries: 1,500,000

• Cerebral Concussion: 176,300
• Brain Contusion: 43,661
• Intracranial Bleed: 10,400
• Multiple Injuries: 11,000

Traumatic Brain Injury: 15,000

Mechanisms of Injury:

• Blow to the head
• Violent shaking of the head/torso
• Lack of blood flow to the head
• Electrical injury
• Missile wound to the head
• Falls

Estimated American adults with disabilities from traumatic brain injuries:

5,300,000
Traumatic Brain Injury
Mechanisms of Injury

- Penetrating injury to the head
- Myocardial infarct
- Anesthetic incident
- Drug overdose
- Toxic exposure

Traumatic Brain Injury
Primary Impact Damage

- Skull fracture
- Contusions of gray matter
- Contusions of white matter
- Shearing
  - Axonal
  - Glial
  - Vascular
- Anoxia

Traumatic Brain Injury
Secondary Damage

- Raised intracranial pressure
- Intracranial hematoma
  - Epidural
  - Subdural
  - Arachnoid
- Ischemic brain damage

Disease Management After Neurotrauma
Medical Consequences of Brain Injury

Brain Injury as a Disease, Disease Causative, or Disease Accelerative

- Neurological Disorders
  - Anosmia
  - Ageusia
  - Central auditory processing disorders
  - Cerebral salt wasting
  - Hydrocephalus
  - Encephalomalacia
  - Dysphagia
  - Motor speech disorders
  - Dyslexia
  - Bladder dysfunction
  - Movement disorders
- Migraine
- Chronic daily headache
- Hippocampal atrophy
- Neurodegenerative disease acceleration
- Oculomotor disorders
- Vestibular disorders
- Attentional disorders
- Epilepsy
- Spasticity
- Pain

Oculomotor/Perception
Brain Injury as a Disease, Disease Causative, or Disease Accelerative

- Neuroendocrine disorders
  - Panhypopituitarism
  - Hypoadrenalism
  - Hypothyroidism
  - Hypogonadism
  - Diabetes insipidus
  - Infertility
  - Impotence
  - Decreased libido
  - Obesity
- Kidney stones
- Osteoporosis
- SIADH
- Hyperlipidemia
- Hypertension
- Delayed gastric emptying
- GERD
- Constipation
- Cognitive dysfunction
- Immunological suppression

Brain Injury as a Disease, Disease Causative, or Disease Accelerative

- Infectious Disease
  - Candidiasis
  - Pneumonia
  - Urinary tract infection
  - Opportunistic infection
- Gastric ileus
- Orthopedic
  - Heterotopic ossification
  - Contractures
- Cupulolithiasis
- Posttraumatic Meniere’s
- Hearing loss
- Deafness
- Blindness
  - Psychiatric disorders
    - Suicide
    - Suicidal ideation
    - Mania
    - Hallucinations
    - Agoraphobia
    - Delirium
    - Personality change
  - Psychosis
  - Depression
  - Anxiety
  - Substance abuse
  - Abulia

“Results show that, although physical impairment, dysarthria, and defects of memory remained severe in many subjects, the psychosocial sequelae presented the most serious problems. Permanent changes in personality and emotion were reported in two-thirds of the subjects and were especially frequent among the youngest subjects.”

Behavior

- Amygdala:
  - Anxiety, fear, rage

Why Behavior Treatment?

- Preliminary human data also suggest that certain pharmacologic interventions may hinder the quality of neurologic recovery.
  - "a trend suggested that those on narcotics, neuroleptics and benzodiazepines had a longer length of PTA (post traumatic amnesia) when compared to those who did not receive neuroleptics."
  - "attempts to control agitation should not be done at the expense of cognitive function…"

Why Behavior Treatment?

- Rehabilitation and Integrated Applied Behavior Analysis Model (effective treatment for TBI/behavior)
  - Remediate (provides foundation for future learning)
  - vs. Compensate
  - Skill Development (focus on demonstrating ability to perform tasks/activities)
    - Promote optimal function and community reintegration
  - Generalization and maintenance (long term performance and placement options improve)
    - Across settings, situations and people

Why Behavior Treatment?

- Five (5) Essential Components of Behavior Treatment in Neurorehabilitation
  - Philosophical Base:
    - Early intervention
    - Structure
    - Consistency
    - Bias for action. Proactive vs. reactive.
  - Administrative Support
  - Assessment
  - Experience
  - Programming

Investment Worth Making

Brain Injury as a Disease, Disease Causative, or Disease Accelerative

- Sexual dysfunction
  - Erectile dysfunction
  - Hypersexuality
  - Hyposexualism
  - Precocious puberty
  - Dysmenorrhea

- Sleep Disorders
  - Sleep apnea - hypopnea
  - Periodic limb movement disorders
  - Hypersomnolence
- Coronary Disease
  - Coagulopathies
  - Hypertension
  - Hyperlipidemia
Brain Injury as a Disease

- Average life expectancy reduction of 6 years
  - 39 times more likely to die of aspiration pneumonia
  - 25 times more likely to die of seizures
  - 10 times more likely to die of septicemia
  - 4 times more likely to die of:
    • All respiratory conditions
    • Pneumonia

Harrison-Felix et al., 2006

Causes of Death

- 3 times more likely to die of:
  - Digestive conditions
  - Suicide
- 2 times more likely to die of:
  - Respiratory conditions other than pneumonia
  - External causes of injury/poisoning
  - Unintentional injuries
- 1.3 times more likely to die of circulatory conditions.

Harrison-Felix et al., 2006

Case Study

**The Shared Mission of Disease Management is Essential**

Demographics

- DOO: Oct. 21, 2006
- MOI: Grocery cart fell from a flag pole
- DOA: Nov. 26, 2006
- D/C: Jan 25, 2007

Diagnosis

- TBI
  - Parietal hematoma
- C1 and C2 Fractures
- S/P ORIF of C1-C3
- Bone graft: Iliac crest to cervical spine

Multi-factor Management

[Diagram showing physical, cognitive, psychosocial, medical, cultural aspects]
Deficits Upon Admission

- Physical
  - Halo
  - FWW with unsteady gait
  - Vestibular dysfunction with severely impaired balance
  - Dysphagia (pureed)
  - UE/LE ROM, strength, coordination, endurance
  - Vision Deficits
  - Perceptual/Spatial deficits
  - Pain
  - Poor bed mobility

- Cognitive
  - ST, working, LT, prospective, functional memory
  - Auditory Comprehension
  - Processing speed
  - Attention
  - Problem solving
  - Poor insight
  - Disinhibition

- Emotional
  - Pain
  - Fear
  - Denial/poor insight
  - Dependent
  - External locus of control
  - Poor self-worth

- Medical
  - Neurology
  - Neurosurgery
  - Physiatry
  - ER visit
  - ENG/Vision
  - Multiple scans
  - Halo adjustments
  - Dietician
  - Swallow study
  - Dev. Optometry

Treatment in the Context of Haitian Culture

- Matriarchal
- Communication: affectionate and unrestrained
- Eating influences health: hot cold, light heavy
- Special diet/food preparation
- Husband: "Disabled"
- Family acted as her voice
- Spiritual/folk explanations and Tx for illness
- Improvement through caring and attention

Independent Living Scale (ILS)

- Hygiene 2.64
- Dressing 2.64
- Medications 1.56
- Meal Prep 1.56
- Eating 0.10
- Dishes 4.72
- Time Mgmt 1.78
- Cleaning 2.89
- Laundry 6.00
- Initiation (100) 91%
- ADLs (61) 31.1
- Behavior (30) 30.0
- TOTAL ILS 69.3

Primary Participants and Communication

Participants in Aggregate
Admission Request to reduce MD to 5% discount off WC fee schedule

Request for neurosurgeon, VPIO, Dr. Suter, Dr. Bermejo Edwards
Saw neurosurgeon
ER Visit - Chest
X-Ray Spine

Helvie Staffing
Edwards Staffing
Helvie staffing
CT Spine
VIPO screws
VIPO screws
Halo removed
Helive Staffing
X-ray - Spine
Edwards Staffing
Med Imaging
NeuroSurgeon
Transition: Encino

28-Nov
29-Nov
8-Dec
11-Dec
15-Dec
21-Dec
22-Dec
26-Dec
27-Dec
28-Dec
3-Jan
12-Jan
15-Jan
18-Jan
19-Jan
22-Jan
25-Jan

Current Status

• Volunteers at a local Senior Center
• Takes classes including yoga and ceramics
• Neck pain persists
• Manages money with assistance for long-term finance issues
• Lives independently with her husband

Traumatic Brain Injury
Common Persistent Symptoms

• Headaches
• Blurred vision
• Dizziness
• Paralysis or paresis

Traumatic Brain Injury
Common Persistent Symptoms

• Disorientation
• Confusion
• Difficulties returning to work or school
• Problems reading or watching TV
• Attention/concentration problems

Traumatic Brain Injury
Common Persistent Symptoms

• Depression
• Anxiety
• Irritability
• Aggression
• Phobias
• Somatization/Hypochondriasis
• Denial

Traumatic Brain Injury
Common Persistent Symptoms

• Pain
• Fatigue
• Sensitivity to noise, crowds, movement, heights
• Changes in olfaction and gustation
• Photophobia
### Traumatic Brain Injury Seizure Symptoms
- Loss of consciousness
- Shaking or trembling of body or extremities
- Incontinence
- Stop-stare phenomena
- Lip-smacking
- Hallucinations

### Traumatic Brain Injury Seizure Symptoms
- Paranoia
- Mania
- Hyperreligiosity
- Stereotypic behaviors

### Traumatic Brain Injury Hydrocephalus Symptoms
- Lethargy or loss of consciousness
- Apraxic gait
- Incontinence

### Traumatic Brain Injury Common Diagnostic Studies
- EEG - electroencephalography
- ENG - electronystagmography
- BAEP - brainstem auditory evoked potentials
- VEP - visual evoked potentials
- SEP - somatosensory evoked potentials

### Traumatic Brain Injury Common Diagnostic Studies
- MRI/CT/PET
- Neuropsychological evaluation
- Vestibular evaluation
- Cisternogram
- Angiography

### Traumatic Brain Injury Complications of No Treatment
- Family disruption
- Behavior problems
- Social consequences
- Chronic repetitive hospitalization
- Involvement with legal system
**Traumatic Brain Injury**

*Complications of No Treatment*

- Psychological and emotional secondaries
- Learned behavior
- Family system adaptation
- Iatrogenesis
- Re-injury

**Traumatic Brain Injury**

*Carrier Role*

- Recognize there is a problem
- "The early bird gets the worm."
- Become active participants in the treatment processes
- Define criterion for success

**Traumatic Brain Injury**

*Red Flags in File Review*

- Blow to or striking of the head
- Whiplash
- Toxic exposure
- Loss of oxygen
- Cardiac or respiratory arrest

**Traumatic Brain Injury**

*Red Flags in File Review*

- Fall
- Electrical injury
- Seizure
- Alteration or loss of consciousness

**Traumatic Brain Injury**

*Benefits to Early Identification*

- Early claimant/family education
- Ability to direct to best care
- Reduced complications
- Reduced litigation expense
- Reduced long-term costs

**Centre for Neuro Skills**

[www.neuroskills.com](http://www.neuroskills.com)