Evaluating the neuropsychological presentation of traumatic brain injuries

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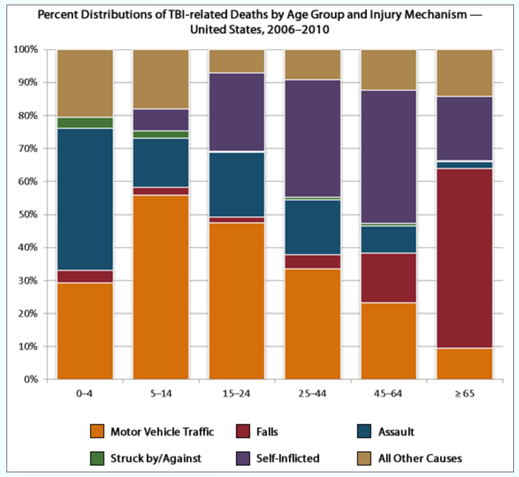
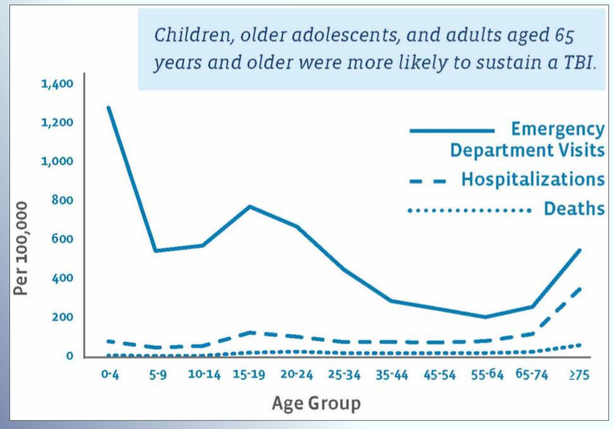
INTRODUCTION

This Neurobehavioral Capstone focused on traumatic brain injury (TBI), which is one of the leading causes of death and disability in the United States for children and young adults (1.7 million TBIs annually in US). TBI refers to a disruption of the brain's normal functioning as a result of an acute external force. The most common causes for a TBI include falls, vehicular accidents, struck by or against an object, and assaults. The incidence for each cause of a TBI changes with respect to age. Severity of a TBI is determined using the Glasgow Coma Scale, which monitors the patient's eye movements, verbal response and motor response. Neuropsychological testing assesses the patient's physical, cognitive, and behavioral deficits. These deficits include, but are not limited to, memory, processing speed, speech, executive function, and decision making. Results of neuropsychological testing help set a course for treatment and monitors the patient's recovery. This treatment course may include physical therapy, cognitive therapy, speech therapy, occupational therapy, and psychological counseling. Observations at Bancroft NeuroRehab, included the observation of neuropsychological testing of patients with TBIs and how their deficits helped direct their individualized treatment. The neuropsychological testing results also helped localize the specific areas in the brain affect by the acute injury for each patient. These observations will be discusses in light of the Neurobehavioral research in the area of TBI.





Bancroft NeuroRehab offers a wide variety of services to those affected by traumatic brain injuries, acquired brain injuries, and neurologic conditions. At Bancroft I shadowed the staff to observe all aspects of their assessment and treatment of TBIs. In the morning, the patients' orientation was assessed followed by brief mindfulness and physical activity. The patients were divided into group rooms that each follow a similar schedule. Based on their individual therapy program, the patients attended a combination of psychotherapy, cognitive therapy, physical therapy, occupational therapy, and speech therapy.

I was fortunate enough to converse directly with the patients and assist where appropriate. While completing puzzles and playing card games with the patients, I was able to personally evaluate each patients language skills, fine motor skills, visuospatial skills, executive function, working memory, processing speed, and emotional regulation. Staff also included me in conversations on how to best improve participation in the individual group rooms. In the mornings, I participated in seminars that cover real world case studies and presentations on topics in neuropsychology.

I have also observed neuropsychological testing. Long-term issues with cognitive function affects up to 65% of patients with moderate to severe TBIs. Neuropsychological testing allows for an individualized plan to be created and the effectiveness of the plan to be tracked over time. The following battery of tests is commonly used for assessing cognition in patients with TBIs, though supplemental tests may be performed at the discretion of the neuropsychologist:

Memory- Rey Auditory Verbal Learning, California Verbal Learning Test-II, Wechsler Memory Scale
Attention- Digit Span, Letter Number Sequencing, Cancellation Tests, Stroop test
Processing Speed- Wechsler Adult Intelligence Scale IV Processing Speed Index
Executive Function— Trail Making Tests (A and B), Controlled Oral Word Association, Color Word Interference, Wisconsin Card Sorting
Visuospatial- Facial Recognition, Judgement of Line Orientation, Clock Drawing. Rey Complex Figure Test
Language- Boston Diagnostic Aphasia exam, Controlled Oral Word Association Test
Effort- Test of Memory Malingering, Reliable Digit Span

PATIENT OBSERVATIONS

TD- poor personal hygiene, moderate cognitive impairment, dramatically reduced attention span, able to volunteer, recipient of kidney transplant; obsessively keeps lists to direct behavior; obsessively bites nails

JE- energetic, self correcting during testing, oriented, impaired working memory not short term memory, agitated at tester performance; visuospatial skills intact, resting tremor, unfocused left eye, inhibiton issues; verbally fluent; fatigued before finishing, ataxia

MA- left sided hemiplegia, ability to recognize and vocalize emotional state, dysarthria, above average reading skills; sense of humor intact; learned to use iPad in cognitive therapy; psychiatric comorbidity

EC- communicates through phone app, able to vocalize through simple grunts, no gait problems, front left of skull caved in, rushed to open door for patient in wheelchair (planning, goal oriented behavior, empathy), fine motor skills and decision making skills intact during card game, very competitive during card game

NEUROANATOMICAL REGIONS

Cognitive Deficit	Brain Area(s) Involved
Working Memory/Planning	Dorsolateral prefrontal cortex, parietal and cerebellar cortices, subcortical white matter
Short-term Memory	Frontal and hippocampal cortices
Attention	Frontal/cingulate/parietal cortices, subcortical white matter, reticular activating system
Processing Speed	subcortical white matter tracts
Disinhibition	Orbitofrontal subcortical circuit
Emotional Decision Making	Ventromedial prefrontal cortex
Executive Functions	Dorsolateral prefrontal cortex
Motivated Behavior	Medial frontal cortex, anterior cingulate, reward circuitry
Risk Adjustment	Thalamus, doral striatum, caudate
Impulsivity	Bilateral orbital frontal gyri, insula, caudate
Awareness	Right dorsal prefrontal cortex
Apathy	Subcortical lesions, right hemisphere dysfunction
Fatigue	Caudate

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