Section 3

Traumatic Brain Injury

WORKBOOK

The Knowledge of Human Healing

FIG
Nursing Education and Consultancy
Nurse Life Care Planning - Through the Ages

Section 3 – Traumatic Brain Injury

OBJECTIVE 1: Explain the anatomy/physiology/function of the brain. Identify levels of impairment based on severity of traumatic brain injury.


OBJECTIVE 3: Apply and demonstrate the nursing process as a life care planning foundation for a traumatic brain injury client.

Agenda
Overview
Nurse Life Care Planning Process
Case Study

Overview

Incidence (HANDOUT - TBI Model System Update)

Age
- Average age – 39 years

Ethnicity
- 68% - Caucasian
- 20% - African-Americans
- 8% - Hispanics
Gender
- 74% - males

Marital Status
- 47% - single
- 32% - married
- 16% - divorced/separated
- 5% - widowed

Employment Status
- 63% - employed at time of injury
- 28% - employed 1 year post injury

Etiology
CDC noted at risk groups
- Males - twice as likely as females to sustain TBI
- 0 to 4 year olds
- 15 to 19 year olds
- Adults 75+ - highest rate of TBI related hospitalization/death
- African Americans - highest death rate from TBI
- African Americans & American Indians/Alaska natives - highest hospitalization rate from TBI

Adults
- 1.4 million/year - sustain TBI in U.S. & receive medical attention
- 50,000 - deaths/year
- 235,000 - hospitalizations/year
- 1.1 million - ED visits/year (treated/released)

Children (ages 0 to 14)
- 2,685 - deaths/year
- 37,000 - hospitalizations/year
- 435,000 - ED visits/year (treated/released)
Common causes of TBI

- 55% - MVA
- 21% - falls
- 13% - violence

- 1.6 - 3.8 million - sports & recreation
- bicycle & MVA - most common in older children
- falls - most common in ages 2 to 4 group
- 19% - child abuse
- other causes - work/industrial, domestic violence

Anatomy  (HANDOUT - Anatomy of Brain)

- From the outside inward - scalp, skull, epidural space, subdural space, meninges, and brain
- Meninges (membranes) consist of dura mater, arachnoid, and pia mater
- Dura mater is outside leather-like tissue that protects brain - dura mater is fused to skull and has partitions, which separates parts of brain and act to restrict movement of brain
- Arachnoid is middle layer and laced with tiny blood vessels
- Pia mater adheres to brain like - laced with finer blood vessels or capillary beds and is brain's main supply of nutrients
- Subarachnoid space - space between pia mater and arachnoid, contains cerebro-spinal fluid, cerebrospinal fluid transports nutrients between blood vessels and brain, also protects brain from impacts to skull
- Brain - gelatin consistency, cushioned by cerebro-spinal fluid
- Violent blow to head can cause brain to slide forcefully against inner wall of skull, results in bleeding in/around brain and tearing of nerve fibers
Anatomy

Cerebral Cortex
- Hemisphere - left & right
- Frontal Lobe - most anterior lobe, just behind forehead
- Parietal Lobe - top back of head
- Occipital Lobe - very back of head
- Temporal lobes - side of head

Brain Stem
- Pons
- Medulla oblongata
- Cerebellum
- 12 cranial nerves (HANDOUT - Anatomy of Brain)
  1. Olfactory nerve - smell
  2. Optic nerve - vision
  3. Oculomotor nerve - eyelid & eyeball movement
  4. Trochlear nerve - turns eye downward & laterally
  5. Trigeminal nerve - chewing, touch & pain for face & mouth
  6. Abducens nerve - turns eye laterally
  7. Facial nerve - controls most facial expressions, secretion of tears & saliva, taste
  8. Vestibulocochlear nerve - hearing, equilibrium, sensation
  9. Glossopharyngeal nerve - taste, senses carotid blood pressure
  10. Vagus nerve - senses aortic blood pressure, slows heart rate, stimulates digestive organs, taste
  11. Spinal accessory nerve - controls trapezius & sternocleidomastoid, controls swallowing movements
  12. Hypoglossal nerve - controls tongue movements

Limbic system
- Fornix
- Hippocampus
- Cingulate gyrus
- Amygdala
- Parahippocampal gyrus
- Thalamus
- Hypothalamus
Function

Cerebral Cortex (*HANDOUT - Brain Functions*)

- Frontal lobe - judgment, decision making, reasoning, personality, motivation, inhibition, concentration, emotion, expressive language, motor activity
- Parietal lobe - receives/processes sensation of touch, spatial relationships, singing/playing music, processing nonverbal visual experiences, interprets taste impulses
- Occipital lobe - sight and visual recognition
- Temporal lobes - hearing, memory, and emotion

Brain Stem - *relay station, passing messages back/forth between various parts of body and cerebral cortex, basic attention, arousal, consciousness, controls breathing, heart rate, swallow, reflexes of hearing and vision, sweating, blood pressure, sleep/wake cycle, digestion, temperature (autonomic nervous system function)*

- Pons - control center for breathing, heartbeat, coordination of eyes and balance
- Medulla oblongata - control center for heart rate, respiratory rate, blood pressure, swallowing
- Cerebellum - voluntary movement, coordination, equilibrium

Limbic system

- Fornix - *connects hippocampus to other parts of limbic system*
- Hippocampus - *formation of long-term memories*
- Cingulate gyrus - *process conscious emotional experience*
- Amygdala - *process reflexive emotions*
- Parahippocampal gyrus - *connection pathway of system*
- Thalamus - *relay station between cortex and senses*
- Hypothalamus - *pain and pleasure awareness, emotions, controls hormones from pituitary, survival center, controls sleep/wake center*

Autonomic nervous system - symptoms resulting from brain injury

- Changes in pulse and respiratory rates or regularity
- Temperature elevations
- Blood pressure changes
- Excessive sweating, salivation, tearing, and sebum secretion
- Dilated pupils
- Vomiting
Classification

Acquired brain injury (ABI) - occurring after birth, divided into traumatic and non-traumatic, examples of non-traumatic would be stroke, tumors, infection, or substance abuse

Traumatic brain injury (TBI) - form of acquired brain injury that occurs when sudden trauma causes damage to brain

TBI Model Systems National Data Base defines TBI as "damage to brain tissue caused by external mechanical force, as evidenced by loss of consciousness (LOC) due to brain trauma, post-traumatic amnesia (PTA), skull fracture, or objective neurological findings that can reasonably be attributed to TBI on physical examination or mental status examinations."

Two types of TBI

- Open or penetrating brain injury occurs with break in skull
- Closed brain injuries occurs with no break in skull, caused by rapid forward or backward movement and shaking of brain inside skull that results in bruising and tearing of brain tissue and blood vessels

TBI further defined by location

- Skull fracture - associated with risk of underlying brain injury, non-displaced fractures heal on own, displaced fractures can press against brain tissue - requires corrective surgery
- Concussion - transient and reversible post-traumatic alteration in mental status (e.g., loss of consciousness or memory) lasting from seconds to minutes, symptoms include confusion, amnesia, slurred speech, headache, dizziness, nausea, vomiting, altered vision/hearing/tasting/smelling/balance/coordination/sleep/sensation, fatigue, and altered emotional regulation
- Contusion - can impair wide range of brain functions, depends on contusion size and location, larger contusion may cause brain edema and increased intracranial pressure (ICP), contusion may enlarge in the hours or days following initial injury and cause neurological deterioration, symptoms include weakness, numbness, lack of coordination, imbalance, vision, cognition, and emotional regulation
- Diffuse axonal injury (DAI) - occurs when deceleration causes shear-type forces that result in generalized, widespread disruption of axonal fibers and myelin sheaths, few DAI lesions may also result from minor head injury, DAI results in small petechial hemorrhages in white matter, DAI sometimes defined as loss of consciousness lasting >6 hours, edema from injury often increases ICP leading to various manifestations
- Hematoma/hemorrhage - rupture of blood vessels, collection of blood in/around brain

- Epidural hematoma - between skull and dura mater, less common than subdural, commonly results from skull fracture, large/rapidly expanding hematoma usually caused by arterial bleed - can cause damage to middle meningeal artery by temporal bone fracture, patient with arterial epidural hematoma may rapidly deteriorate and die, small venous hematoma are rarely lethal

- Subdural hematoma - between dura mater and pia mater, acute hematoma arises from laceration of cortical veins or avulsion of bridging veins between cortex and dural sinuses, commonly results from falls and MVA, compression of brain by hematoma and swelling of brain due to edema or hyperemia (increased blood flow due to engorged blood vessels) can increase ICP, then mortality/morbidity can be high

- Subarachnoid hematoma - abnormal and very dangerous condition, blood connects beneath arachnoid mater in subarachnoid space (subarachnoid space contains cerebro-spinal fluid), can lead to stroke/seizures/other complications, may cause permanent damage and number of harmful biochemical events in brain, hemorrhage can be fatal

- Intra-cerebral hematoma - bleeding occurs directly within brain, can lead to blood clot within brain, can result from penetrating wounds or blood vessels that rupture

Existence and severity of TBI usually defined by:
- Occurrence and period of loss of consciousness (LOC)
- Degree of loss of memory for events immediately before or after accident
- Degree and duration of alteration in mental state at time of accident
- Degree of focal neurological deficits

TBI also defined by severity
- Mild - no LOC or moment of LOC, symptoms can include headache, dizziness, confusion, ringing in ears, blurred vision, fatigue, memory loss, symptoms should resolve

- Moderate - same as mild but does not resolve or may worsen, symptoms can also include nausea, vomiting, seizure, difficult to awake, dilated pupils, slurred speech, loss of coordination

- Severe - same as mild/moderate but does not resolve or may worsen

Degree of severity dependent on extent of damage & can be measured
Most common psychological factors affecting prognosis and recovery outcome after TBI:
- Age at TBI onset (older clients tend to show poorer recovery prognosis)
- History of previous brain injury or neurological impairments
- Pre-morbid intellectual, academic, and vocational functioning
- History of chemical abuse
- Pre-morbid history of psychiatric disorder
- Pre-morbid history of cognitive dysfunction

Glasgow Coma Scale (HANDOUT - Glasgow Coma Scale) (HANDOUT - Glasgow Coma Scale for Infants & Children)
- Scoring system used to estimate initial severity of TBI
- System based on eye opening, verbal response, and best motor response
- Lowest total score (3) indicates likely fatal damage
- Higher total score (15) initially tends to predict better recovery
- Modified Glasgow Coma Scale for infants and children
  - If score is 14 to 15 - mild TBI
  - If score is 9 to 13 - moderate TBI
  - If score is 3 to 8 - severe TBI

  < or = 8 (coma)
  < or = 8 @ 6 hours post injury (50% chance of fatality)
  >9 (awake)
  8 is critical score

Rancho Los Amigos Scale
- Scoring system of 1 to 8 to assess patient's function after initial injury
- Majority of TBI recover within 1st six months to 1 year after trauma
- Rancho Los Amigos Scale measures extent and pace of recovery
- Used primarily by rehabilitation facilities/programs
• RLAS Levels
  I. No response
  II. Generalized response (inconsistent, non-purposeful movement, open eyes - no focus, delayed response to pain)
  III. Localized response (move eyes - look at specific people/objects, turn head in direction of noise, inconsistent response to simple command or stimuli)
  IV. Confused-agitated (disoriented, unaware, bizarre/inappropriate behavior)
  V. Confused-inappropriate, non-agitated (confused, inappropriate, able to follow simple commands, non-purposeful random/fragmented responses, stressful situations evoke agitation)
  VI. Confused-appropriate (speech makes sense, simple tasks, behavior goal-directed, incorrect responses due to memory difficulties)
  VII. Automatic-appropriate (can perform ADLs, difficulty with remembering recent events/discussion, rational judgment/calculations, multi-tasking presents difficulties, poor insight)
  VIII. Purposeful-appropriate

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Severity of TBI
• Developed by Department of Defense & Department of Veterans Affairs
• Uses three criteria - GCS after resuscitation/LOC, duration of post-traumatic amnesia (PTA) and altered mental status
• Proposes focal neurological deficits on neuro-imaging

<table>
<thead>
<tr>
<th>Severity</th>
<th>GCS</th>
<th>PTA</th>
<th>LOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>13 - 15</td>
<td>&lt;1 day</td>
<td>0-30 minutes</td>
</tr>
<tr>
<td>Moderate</td>
<td>9 - 12</td>
<td>&gt;1 to &lt;7 days</td>
<td>&gt;30 to &lt;24 hours</td>
</tr>
<tr>
<td>Severe</td>
<td>3 - 8</td>
<td>&gt;7 days</td>
<td>&gt;24 hours</td>
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Acute Care
Initial focus is to reduce magnitude of secondary head injury

Physical exam - airway/breathing/circulation, frequent monitoring of vital signs/reflexes/cranial nerves, prevent shock and cardiac arrest, GCS, RLAS

Primary concern to maintain proper oxygen supply to brain and other vital organs by sustaining adequate blood pressure

Maintain metabolic issues - blood pressure, electrolytes, hydration, nutrition, infectious processes, sleep apnea, and medications

Diagnostic studies - skull and neck x-rays, brain CT scan, brain MRI, PET scan, SPECT scan, electroencephalogram (EEG), cerebral angiography, blood/urine lab work

Initial treatment - prevent/control increased ICP with surgery or other methods, hypothermia blanket, ventriculostomy (measures ICP), control bleeding, maintain adequate blood pressure, airway management, ventilator support with endotracheal/tracheal tube, maintain adequate supply of oxygen to brain and other vital organs, prevent/control seizures, arterial/intravenous lines, maintain fluid balance, cardiovascular monitoring, promoting normal elimination patterns (Foley catheter), chest drainage system, nasogastric tube feedings, prevent infection, support all body systems, preventative rehabilitation care

Comprehensive rehabilitation - multi-disciplinary team, prevention/early recognition of complications, range of motion, positioning, bowel & bladder management, establish goals & equipment needs for maximizing function, interdisciplinary approach, individualized rehab program with consideration of unique barriers and facilitators, inclusion of patient in rehab program, inpatient & outpatient care with goal of community re-integration
Acute Complications *(HANDOUT - Brain Injury Assoc of America)*

**Neurological**
- Increased ICP
- Autonomic dysfunction syndrome/paroxysmal autonomic instability with dystonia
- Ataxia
- Anoxia
- Coma *(minimally responsive vs. persistent vegetative state)*
- Subdural hematoma vs. hygroma
- Infection
- Shunt malfunction/erosion
- Seizures
- Post-traumatic hydrocephalus
- Focal neurological deficit
- Peripheral nerve injury
- Peripheral neuropathy
- Cochlear nerve injury
- Vestibular disorders
- Tinnitus
- Diplopia
- Anosmia
- Post-concussive syndrome
- Post-traumatic amnesia (PTA)
- Sensory

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**Cardiovascular**
- Cardiac contusions
- Myocardial infarction
- Arrhythmias

**Respiratory**
- Atelectasis
- Pulmonary embolism
- Tracheotony
- Pleural effusions
- Abnormal breathing patterns
- Pneumonia
Circulatory
- Venous thrombo-embolism

Integumentary
- Wounds
- Pressure sores
- Skin grafts
- Dehiscence

Endocrine
- Syndrome of Inappropriate Antidiuretic Hormone (SIADH)
- Diabetes Insipidus
- Anterior Hypo-pituitarism
- Cerebral salt wasting
- Primary adrenal insufficiency
- Growth hormone deficiency

Gastrointestinal
- Stress ulcers
- Gastroparesis
- Neurogenic bowel
- Ileus
- Constipation/diarrhea
- Dysphagia
- Elevated liver function tests

Genitourinary
- Urethral stricture
- Urinary tract infections
- Urinary incontinence
Musculoskeletal
- Spasticity
- Heterotopic ossification
- Contractures
- Movement disorders (dystonia, tremors)

Cognitive/psychosocial
- Sensory impairment - perceptual abilities, attention, memory, language, reduced capacity for processing information, and limited executive skills (initiation, task-persistence, planning, organization, and problem solving)
- Emotional and behavioral disruption - as direct result of brain injury - can seriously impede adaptation process
- Impaired impulse control
- Inability to effectively regulate emotion
- Inability to take perspective of others
- Inability to detect non-verbal nuances
- Inability to accurately assess own strengths or weaknesses - self awareness
- Impaired social networking
- Impaired coping

Length of stay
- 19 days - acute care in hospital
- 24 days - inpatient rehabilitation facility
- 98% - private residence before TBI
- 83% - private residence after rehab facility discharge
- 91% - private residence after 1 year
- 91% - private residence after 2 years

Mean hospital charges for TBI related care
- Acute care - $162,799 ($8,034/day)
- Rehabilitation - $60,417 ($2,227/day)
**Nurse Life Care Planning Process**

**Assessment**

FIM-FAM Scale (Functional Independence Measure & Functional Assessment Measure)

*(HANDOUT - FIM FAM)*

- FIM scale assesses eating, grooming, bathing/showering, dressing (upper and lower body), toileting, bladder management, bowel management, bed/chair/wheelchair transfer, toilet transfer, tub/shower transfer, walking/wheelchair locomotion, stairs, comprehension, expression, social interaction, problem solving, & memory
- FAM scale assesses swallowing, car transfer, community access, reading, writing, speech intelligibility, emotional status, adjustment to limitations, employability, orientation, attention, & safety judgment
- FIM -FAM Scale to be completed by trained healthcare professional through direct observation
- Scores range from total assistance (1) to complete independence (7)

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**Nurse Life Care Plan Assessment**

- Neurologic
- Respiratory
- Cardiovascular
- Musculoskeletal
- Integumentary
- Gastro - bowel management program
- Urinary - bladder management program
- Psychosocial
- FIM-FAM
  - Bathing/showering/hygiene
  - Grooming
  - Dressing
  - Feeding
- Mobility
- Transportation
- Living arrangements

- Appropriate behavior
- Decision making/judgment
- Safety
Nursing Diagnosis

Activity intolerance
Impaired swallowing
Self-care deficit
Impaired memory
Sensory perception alterations
Altered thought processes
Unilateral neglect
Risk for falls
Altered health maintenance
Impaired verbal communication
Ineffective community coping
Impaired social interaction

Outcomes

Measures for long term outcomes

- Glasgow Outcome Scale (GOS)
- Rancho Los Amigos scale
- FIM / FAM
- Disability Rating Scale (DRS)

Outcomes

Collaboration

Physiatrist/specialist
Physicians
Therapists (OT, PT, speech, respiratory)
Home health providers
Equipment vendors
Medical Research *(HANDOUT - TBI Model System)*

Traumatic Brain Injury Model Systems of Care - funded by National Institute of Disability and Rehabilitation Research (tbimodelsystems.org)

Traumatic Brain Injury Model Systems National Database, Craig Hospital, Englewood, CO (tbindsc.org)

Model Systems Knowledge Translation Center (msktc.washington.edu/)

Center on Outcome Measurement in Brain Injury (COMBI) (tbims.org/combi/index.html)

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**Chronic Complications**

**Neurological**

- Seizures
- Focal neurological deficit
- Cochlear nerve injury
- Vestibular disorders
- Tinnitus
- Diplopia
- Anosmia
- Sensory
- Pain
- Sleep disorders
- Speech impairment (aphasia, dysarthria, prosodic dysfunction)

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**Endocrine**

- Syndrome of Inappropriate Anti-diuretic Hormone (SIADH)
- Diabetes Insipidus
- Anterior Hypo-pituitarism
- Primary adrenal insufficiency
- Growth hormone deficiency
Sexual dysfunction
Studies show 50 to 60% have disruption of sexuality after head injury

Gastrointestinal
- Stress ulcers
- Dysphagia
- Bowel incontinence
- Elevated liver function tests

Musculoskeletal
- Spasticity
- Heterotopic ossification
- Contractures
- Movement disorders (dystonia, tremors)

Cognitive disorders
- Personality changes - easily angered, lack of enthusiasm, aggressive, withdrawn
- Memory loss - short term vs long term, able to remember - but not able to learn
- Lack of impulse control - aggressive, self-centered, inappropriate sexual behaviors or lack sexual interest
- Lack of concentration

Psychological disorders
- Mood disorders
- Agitation
- Aggression
- Depression
- Anxiety
- Bipolar disorders
- Affective lability
- Fatigue
Planning

Treatment Recommendations in Nurse Life Care Plan

Medical

Physician appointments/evaluations
  - Physiatrist
  - Neurological
  - Musculoskeletal
  - Respiratory
  - Cardiovascular
  - Genitourinary
  - Gastrointestinal
  - Integumentary
  - Endocrinology

Surgeries/Procedures (invasive vs. non-invasive)

For spasticity -
  - Injections (Botox, Phenol)
  - Tendon releases/transfers/lengthening
  - Rhizotomy - irreversible & not very popular
  - Peripheral neurectomy
  - Myelotomy
  - Dorsal column stimulator
  - Intrathecal Baclofen pump

For contractures -
  - Release of soft tissue and capsule contractures
  - Heterotopic excision
  - Correction of bony deformity

Hospitalizations
  - Pneumonia
  - Urinary tract infection
  - Decubitus ulcer
Therapeutic evaluations
OT
PT
Neuropsych - cognitive
Speech
Nutrition
Psychological

Therapeutic modalities
OT
PT
Neuropsych - cognitive
Speech
Nutrition
Psychological (individual & family)

Diagnostic studies
Musculoskeletal
Neurological - EEG (seizures), evoked potential studies, brain mapping, EMG/NCV studies
Genitourinary
Gastrointestinal

Lab work
Comprehensive metabolic panel
Hormones

Medications
Seizure
Analgesic
Non-steroidal anti-inflammatory
Spasticity
Depression/anxiety
Sexual function
Medical supplies
   Respiratory
   Bladder program
   Bowel program
   Skin care
   Wound care/dressing changes

Orthoses
   UE splints
   LE splints

Mobility  *(HANDOUT - Wheelchairs What LCP Should Know) (HANDOUT - Wheelchair Replacement Schedule)*
   Manual wheelchair *(standard vs. customized)*
   Power assist wheelchair
   Power wheelchair
   Wheelchair maintenance/replacement
   Wheelchair accessories

Durable medical equipment/Aids for Independent Function *(HANDOUT - Equipment Needs for ABI)*
   • Specifics of DME is dependent on level of physical/functional ability, and secondary issues related to TBI
   • Examples of DME
      Hospital bed vs. electric bed & mattress/overlay
      Patient lift (manual vs. electric)
      Transfer bench
      Gait belt
      Shower chair
      Elevated toilet seat with rails
      Adaptive clothing
Universal cuff
Tongue touch keypad
Computer & computer controls
Voice activated software
Household aids
Communication aids

Non-medical

Home care/living arrangements  *(HANDOUT - Residential Rehab Assessments)*

Present options *(present pros & cons)*
  - Home - *apartment, renovate home vs. purchase home*
  - Assisted living
  - Skilled nursing facility

Home health care vs. Respite care

Levels of home care
  - Skilled (RN or LPN) - *medications, catheterizations, wound care*

  Unskilled (Certified Nursing Assistant/Home Health Aide, Personal Care Attendant, or Companion) - *bathing/showering, hygiene, grooming, dressing, feeding, cooking, cleaning, transportation, errands*

  Level of skilled or unskilled care dependent on nursing board in state of residence

Architectural renovations

Safety
Barrier free
Wheelchair accessible design
Assistive technology

OT home evaluation
Contractor home evaluation
Transportation
- Wheelchair accessible transportation
  - Personal vehicle
    - Handicap driver evaluation
    - Handicap driver training
    - Handicap parking permit
    - Vehicle modifications
  - Public transportation
  - Private transportation

Association for Driver Rehabilitation Specialist (driver-ed.org)
National Mobility Equipment Dealer's Association (nmeda.org)

Educational/vocational
- Vocational evaluation
- Vocational case management
- Vocational retraining
- Vocational modifications

Other
- Case management
- Support group - TBI associations/conferences
- Fitness - gym vs. home
- Recreational modifications
- Guardian/conservator
TBI Case Study

Name: Ms. Carol TBI

DOB: 06/23/1986, Age 24

DOI: 06/21/09

Brief description of injury/accident:
Mistakenly took three 80mg Oxycontin
Presented to ER at 5:27am discharged (same morning) at 7:09am
Returned to ER at 12:57pm in respiratory arrest, comatose, unresponsive

Initial diagnoses:
- hypoxic-ischemic brain injury secondary to cardiac arrest
- moderate generalized anoxic encephalopathy
- sympathetic storming
- ataxia
- apraxia
- dystonia
- severe spasticity
- severe hypertonicity
- severe cognitive deficits
- severe motor deficits
- S/P rectus sheath hematoma
- chronic pain

Acute Care:
- Resuscitated, intubated, ventilator and admitted to ICU
- Diagnosed with cardio-respiratory arrest, anoxic encephalopathy
- Prognosis guarded
- Remained on ventilator, tracheostomy while in acute care/rehabilitation center
- PEG tube for nutrition
- Persistent episodes of sympathetic storming
- Referred to inpatient rehabilitation center for multi-disciplinary therapies
- Transitioned to outpatient rehabilitation center and stayed on campus in apartments with parent
- Returned home 5+ months later
Complications (that relate to LCP recommendations):
urinary tract infection
rectus sheath hematoma
continued sympathetic storming
restless agitation

Current Care:
Dr. Proper Ability/Physiatrist
Rehab Roadways

Inpatient rehab treatment of brain injury, then follow-up outpatient care
Recommended therapies (OT, PT, speech, psych) multiple times per week
Recommended UE Botox injections & serial splinting/casting & aggressive OT/PT for spasticity/contractures
Recommended continued (AFO) splints ankle-foot
Recommended continued medications
Recommended home exercises
Discharged to physician close to home (Dr. Do It Right in Thompson, MS)

Dr. Do It Right/Physiatrist
Ms. Cammie Callher/Family Nurse Practioner
Communities Rehabilitation Center

Attending day program @ Brain Injury Outpatient Clinic
Serial UE splinting/casting with aggressive OT
UE Botox injections with benefit
Recommended diagnostic studies - upper extremity EMG/NCV studies, x-rays UE - to clarify UE diagnosis
Diagnostic studies revealed no major nerve damage & unable explain the flexed position and limited use of hands/fingers
Recommended orthotic evaluation for right knee

Dr. Clea Uptown/Neuropsychologist
Communities Rehabilitation Center

Recent neuropsychological evaluation
Diagnosis - Severe anoxic brain injury… demonstrates bilateral cortical deep white matter signal changes on
Recommended MRI
Dependent with ADLs
Continent, but forgets at times
Tone, spasticity, and apraxia/ataxia - challenges motor progression
Uses wheelchair – fatigued easily
Limiting factors for testing - fatigue, slowed speed of response, and right visual field preference
Decreased speed of processing, short-term memory deficits, and executive dysfunction
Lack of awareness of her deficits, such as wanting to return to college and drive a car
MD noted non-ambulatory
Does not initiate speech freely
Response time slow on tasks
Needs ongoing care
Not capable of handling finances/making decisions

Dr. Lindy Showman/Upper Extremity Orthopedist
College of Mississippi Medical Center/Orthopedic Surgery and Rehabilitation

Recommended Botox injections and serial casting discussion with Dr. Right
Concerned of right hand flexed position and ability to correct the positioning
Consider future surgical intervention if Botox unsuccessful

Dr. Paul Lastresort/Neurosurgeon
Saint Anne Neurosurgery Associates

Consider Baclofen pump

Dr. Tom Thumb/Primary Care Physician
General medical care related to TBI

Jill Request, Physical Therapist/Neurological Rehabilitation Therapy Manager
Communities Outpatient Rehabilitation

Attending PT (3x/week), OT (2x/week), and speech (2x/week) therapies
Therapists reported
  Attempted to use right hand, returned to using left hand
  Right hand flexed toward body
  Spoke with soft voice
  Therapist encouraged speaking louder
  Ms. TBI would not speak, nodded and facial grimace
  Worked on extending arms
  Swinging racket at balloon
  Constant supervision and hands on assistance with proper balance
  Easily distracted
  Facial grimaces of pain stretching of legs & kneeling on knees and hands

Recommendations for assistive technology evaluation & aids
**Medications:**
Parlodel 5mg, 3 capsules, 2 times/daily
Carbidopa/Levodopa 25/100mg, 1 tablet, 2 times/daily
Adderall XR 25mg daily
Zoloft 50mg, 1 ½ tablets daily
Risperdal ½ mg, 2 times/daily
Propanolol HCl 40mg as needed, average every few days
Trazodone 50mg as needed at bedtime, average every few days
Benzaclin gel daily
Ibuprofen 600mg, 1 tablet as needed, average following therapy
Bisacodyl 5mg as needed, average daily

**Durable Medical Equipment:**
Right upper extremity Dynasplint at bedtime
Bilateral lower extremity bi-valve splints at bedtime
Bilateral AFO splints daily
Right knee Don-Joy brace daily
Right shoe insert vs. shoe lift
Handicap parking permit
Semi-electric hospital bed with rails, prefer electric bed for height adjustments with care giving
Tub-transfer bench with rails
Elevated toilet seat with rails
Hand held shower
Wheelchair ramp at back door entrance
Quickie custom wheelchair, cushion/cover, and accessories

**Symptoms/Limitations:**
**Upper extremities**
Right hand non-functional
Right wrist turned inward
Right wrist in flexed/contracted position
Absent gross motor and fine motor coordination in right hand/fingers
Absent right grip strength
Does not initiate activity with right upper extremity, constant reminder to use right upper extremity
Unable to write
Difficulty with texting/computer keyboard/dialing telephone, frequent mistakes
Strong tone/spasticity
Drawn inward/guarded position, constant reminder to extend arms/elbows/wrists/fingers
Facial grimaces with range of motion in upper extremities
Prefers to use left hand, rather than dominant right hand
Lack of fine motor coordination in left hand/fingers
Difficulty with picking up small objects with left hand/fingers
Minimal gross motor coordination with left hand/fingers
Decreased left grip strength
Spastic/awkward movements
Stiffness
Extremely limited in lifting/reaching/pushing/pulling
Decreased range of motion
Minimal strength

Lower extremities
Wheelchair bound
Unable to stand or walk independently
Caregivers use gait belt with rising/lowering in wheelchair, changing positions, and walking short distances
Constant reminders of proper feet placement when changing positions
Requires full assistance with sitting/standing/pivoting
Walks with platform walker and 2-3 person maximum assist during therapy
Altered gait
Walks on heels
Scissor walk/cross legs
Altered proprioception
Off balance with sitting, needs reminders to straighten up and relies on wedges/pillows for support

Cognitive
Requires 24/7 supervision
Doesn’t keep eyes in one place for very long *(Dr. Uptown attributed to decreased attention span)*
Decreased attention span
Concentration deficits
Easily distracted
Severe lack of initiation, does not initiate conversation or let others know when in distress/pain, when hungry, when in need to use the bathroom, or when in need of changing positions
Severe lack of initiation, does not initiate conversation or let others know when in distress/pain, hungry, in need of the bathroom, or in need of changing positions
Lack of orientation

Other
Looks to left when reading
Darts eyes back and forth
Severe acne/scarring
Tracheostomy scar
PEG tube scar
Difficulty swallowing
Salads and apples skins are difficult to chew/swallow, spits out
Pockets food in side of mouth
Reminders are necessary to chew/swallow food
Prefers finger foods
Drinks with straw
Difficulty with using spoon/fork, unable to cut foods with knife
Teeth shifted, in need of dental assessment
Speaks in very soft voice
Short winded with long conversations
Constipation
Medications and immobility exacerbate pre-existing irritable bowel syndrome
Easily fatigued/tiredness requiring frequent rests/breaks
Decreased stamina/endurance
Overall weakness
Overall limited range of motion
Overall limited strength

**Psychosocial:**
Strong family support system
Parents recently divorced
Rental home, ranch style, lives with mother and brother
Mother took time off while in hospital and rehab center
Mother works full time, flexible schedule
Provides care when caregivers are not on duty
Father lives in same town, helpful with appointments when able
He visits weekly, does not provide hands on care
Bathrooms not wheelchair accessible

Right hand dominant

Height:  5’ 9”
Weight:  125 lbs.

**Educational/Vocational:**
High school grad
Was a senior college student, lacked 4 hours to graduate with bachelors
Majoring in broadcast/journalism/public relations
Planned to attend graduate school

**Collaboration (communication with treating providers):**
Letters were sent to Dr. Ability, Dr. Right, and Dr. Uptown requesting information.
Dr. Ability at Rehab Center re-evaluated Ms. TBI for future medical projection. Dr. Ability noted a diagnosis of anoxic brain injury and a poor prognosis of Ms. TBI being completely independent in ADLs and living arrangements. Dr. Ability recommended: ongoing specialty medical care related to TBI, medications, aggressive therapies (PT, OT, speech, neuropsychology), Botox injections for UE spasticity, DME, and 24/7 caregiver assistance.
Dr. Right responded and noted a diagnosis of anoxic encephalopathy with cardiac arrest secondary to accidental drug overdose. “unknown” prognosis. Dr. Right recommended ongoing/long term medical care, specialty consultations related to TBI, diagnostic studies, long term therapeutic evaluations/modalities; anticipated surgeries, long term care, DME, and medications.

Dr. Uptown did not respond.