Understanding Traumatic Brain Injury (TBI) and Efforts to Aid Ex-Offenders Living with TBI

Lisa Osterman, MA
Quratulain Khan, Ph.D

Community Solutions
Rehabilitation Hospital of Indiana
Learning Objectives

• Increased knowledge of physiology and impact of traumatic brain injury.
• Increased knowledge of the prevalence of traumatic brain injury among incarcerated and formerly incarcerated individuals.
• Increased knowledge of promising practices for assisting reentrants who have a TBI in return to work and successful reentry.
• The relationship between TBI and Substance Abuse
TBI Basics

• What is Traumatic Brain Injury (TBI)?
• Why is it important to talk about TBI?
• How does TBI impact functioning?
• TBI and Substance Abuse.
What is Traumatic Brain Injury?
Acquired Brain Injury (ABI)

• It is an injury to the brain which is not hereditary, congenital, degenerative, or induced by birth trauma.
• Includes both non-traumatic and traumatic injuries.
What is a Non-Traumatic Brain Injury?

• A non-traumatic brain injury includes injuries to the brain that are not caused by an external physical force to the head.

• Common non-traumatic causes of BI include:
  • Anoxic injury (near drowning, airway obstruction, strangulation, cardiopulmonary arrest)
  • Toxic exposures (substance misuse, ingestion of lead, inhalation of volatile agents)
  • Infectious Disease (Encephalitis, Meningitis)
  • Seizure Disorders
  • Brain tumors and methods used to treat them (surgery, radiation, chemo)
  • Stroke (hemorrhage or blood clots)
  • Metabolic disorders (insulin shock, diabetic coma, liver and kidney disease)
  • Drug abuse
What is a Traumatic Brain Injury (TBI)?

• “TBI occurs when an external mechanical force causes brain dysfunction.” (Mayo Clinic)

• “Traumatic brain injury is a nondegenerative, noncongenital insult to the brain from an external mechanical force, possibly leading to permanent or temporary impairment of cognitive, physical, and psychosocial functions, with an associated diminished or altered state of consciousness.”

• Common traumatic causes of BI
  • Falls, assaults, MVAs, sports/recreational injuries, gunshot wounds, military/blast injury.
Types of Traumatic Brain Injury (TBI)

- Open head injury
  - Object penetrates skull and enters the brain
  - Primarily focal damage
  - Epidural hematomas, subdural hematomas, intracerebral hemorrhage, infections
  - Gunshot, stabbing, falls, MVAs, sports accidents

- Closed head injury
  - Non-penetrating
  - Damage is focal or diffuse
  - Brain contusions and lacerations, subdural hematomas, diffuse axonal injury
  - Assaults, falls, MVAs, sports accidents
Focal TBI: Contusions and Lacerations

- Coup-Contrecoup Injury
- A blow to the head causes the initial contusion or laceration directly beneath the point of impact (coup) and then opposite to the side of impact (countrecoup)
Focal TBI: Intracranial Hematomas

• Extradural Hematoma
• Intradural Hematoma
  • Subarachnoid Hematoma
  • Subdural Hematoma
  • Intracerebral and Intracerebellar Hematomas
Focal TBI: Subdural Hematoma

- Collection of Blood on the Brain’s Surface
- Acute SDH: Bleeding Fills Rapidly
- Chronic SDH: Slow leaking
- Compress the brain
- Can lead to increased intracranial pressure
- To relieve Pressure
  1. Burr Holes- allows drainage
  2. Crainiotomy
Focal TBI: Subdural Hematoma
Focal TBI: Intracerebral Hemorrhage
Diffuse TBI: Diffuse Axonal Injury

A. Trauma causes the axon to twist and tear
B. The result is permanent death of the brain cell
Diffuse TBI: Diffuse Axonal Injury

**Figure 2-6.** Diffuse axonal injury: twisting, tearing, and breaking of axons associated with primary impact damage in traumatic brain injury.
Nontraumatic TBI: Hypoxic Encephalopathy

• Oxygen shortage
• Purkinje cells
• Cerebellum, basal ganglia, & hippocampi
• Memory, motor coordination, executive functions
# Classification of Severity in TBI

<table>
<thead>
<tr>
<th></th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
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<tbody>
<tr>
<td>Imaging</td>
<td>Normal</td>
<td>Normal / Abnormal</td>
<td>Normal / Abnormal</td>
</tr>
<tr>
<td>LOC</td>
<td>0-30 minutes</td>
<td>&gt; 30 minutes &lt; 24 hours</td>
<td>&gt; 24 hours</td>
</tr>
<tr>
<td>AOC</td>
<td>A moment up to 24 hours</td>
<td>&gt; 24 hours</td>
<td>Severity based on other criteria</td>
</tr>
<tr>
<td>PTA</td>
<td>0-1 day</td>
<td>&gt; 1 and &lt; 7 days</td>
<td>&gt; 7 days</td>
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<tr>
<td>GCS</td>
<td>13-15</td>
<td>9-12</td>
<td>3-8</td>
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Classification based on 2009 VA/DoD Clinical Practice Guidelines for Management of Concussion/Mild Traumatic Brain Injury

*LOC = loss of consciousness
*AOC = alteration of consciousness / mental state
*PTA = post-traumatic amnesia
*GCS = Glasgow Coma Scale
TBI Incidence by Severity

10,000 TBI in Indiana each year = 1,500 MTBI with Persisting Symptoms
Mild TBI (MTBI)

• A traumatically induced physiological disruption of brain function, as manifested by _at least one_ of the following:
  • Any loss of consciousness
  • Any loss of memory before or after injury
  • Any alteration of mental state
  • Focal neurological deficit that may or may not be transient
• Severity of Injury does not exceed the following:
  • LOC $\leq$ 30 minutes
  • After 30 minutes, an initial GCS score of 13-15
  • PTA $\leq$ 24 hours
Mild TBI (MTBI)

• Most MTBI have no neuroimaging abnormalities
• Concussive injuries thought to be more metabolic in nature  
  (Collins, Stump, & Lovell, 2004)
  • Injured cells exposed to dramatic changes in intracellular/extracellular environments
  • Energy demand and supply mismatched
  • Cells become vulnerable to even minor changes in blood flow, pressure, etc.
• This state lasts ≥ 2 weeks in animal models, perhaps longer in humans
• Problems worst in first 72 hours, rapid improvement over first week
Why is it important to talk about TBI?
Incidence of TBI

- [www.cdc.gov](http://www.cdc.gov)
- 1.4 million TBI each year in USA
  - 4,000/day
  - 3/minute
- There is no estimate for the number of people with non-fatal TBI seen outside of an emergency department or hospital or who receive no care at all.
Figure 2. Traumatic brain injury-related death rates by age and gender, United States, 1994
Causes of TBI

Estimated Average Percentage of Annual TBI by External Cause in the United States, 2002–2006

- 35.2% Falls
- 17.3% Motor Vehicle–Traffic
- 21% Unknown/Other
- 16.5% Struck By/Against
- 10% Assault
How Does TBI Impact Functioning?
Impact of Moderate to Severe TBI

**Physical**
- Muscle weakness
- Problems with balance/coordination
- Disruptions to sensory systems (e.g., taste/smell, hearing, vision)
- Problems swallowing
- Difficulty with speech
- Headaches
- Fatigue

**Behavioral - Emotional**
- Decreased initiation
- Disinhibition
- Impulsivity
- Decreased awareness
- Irritability
- Anxiety
- Depression
- Disturbed sleep

**Cognitive**
- Slowed processing speed
- Difficulty with Attention/Concentration
- Difficulty with Memory
- Word-finding problems
- Difficulty with comprehension
- Inflexibility in thinking
- Perseverative
- Difficulty with multi-tasking
- Difficulty with planning, problem-solving, organization
# Mild TBI: Acute Symptoms

## Physical
- Headache
- Nausea
- Vomiting
- Blurred or Double Vision
- Seeing Stars or lights
- Dizziness
- Sensitivity to light or noise
- Tinnitus

## Behavioral - Emotional
- Drowsiness
- Fatigue/Lethargy
- Irritability
- Anxiety
- Depression
- Sleeping more than Usual
- Difficulty Falling Asleep

## Cognitive
- Feeling “Slowed Down”
- Feeling “in a Fog” or “dazed”
- Difficulty Concentrating
- Difficulty Remembering
Services for Individuals with TBI

• Acute, post-acute, chronic phases of recovery
• Outpatient Rehabilitation (Neuropsychologist, Speech Therapist, Occupational Therapist, Physical Therapist, PM&R physician)
• Vocational Rehabilitation and Resource Facilitation
TBI and Substance Abuse
TBI and Substance Abuse

• Alcohol use and TBI
  • 29% to 52% of individuals admitted for TBI test positive for alcohol
  • Leading cause of death 17-21 yes is MVA. 50% of all fatal accidents in the US are MVAs. 50% of there are associated with alcohol and drugs.
  • Presence of TBI veiled by the affects of alcohol
  • Possible effects of brain injury are similar to pharmacological effects of drugs/alcohol
    • Poor memory
    • Impaired judgement
    • Fine and gross motor impairments
    • Poor concentration
    • Decreased impulse control
    • Impaired language skills
TBI and Substance Abuse

- Neuropathological effects
  - Neuroimaging has shown that in patients with both TBI and substance dependence exhibited greater atrophic changes when compared with individuals with either a TBI or A/DD and healthy controls.
  - TBI and A/DD groups have lower GCS scores that TBI patients without A/DD and health controls (Bigler et al., 1990)

- Brain Injury Association of America = There is no safe amount of alcohol to drink after brain injury
  - Alcohol as a neurotoxin
  - Interferes with recovery (slows progress, cause regression)
  - Cause another TBI
  - Risk of seizures
  - Further challenges in cognitive functioning
  - Can impact effectiveness of medication
  - Can cause sleep disturbance
TBI and Substance Abuse

- Concurrent treatment required
- Individuals with TBI have specific persistent problems that may interfere with participation in mainstream A/DD programs (Jong et al., 1999).
- The role of cognitive sequelae of TBI. E.g., problems with memory, attention, organization.
  - Redirect them using appropriate cues and reinforces
  - Do not assume understanding or memory from previous sessions
  - Always repeat the purpose, duration, and guidelines for each meeting
  - Summarize previous progress and restate where previous meeting left off (Sparadeo et al., 1990)
TBI and Incarceration
TBI Prevalence

Meta-analysis of 20 epidemiological studies found 60% of offenders had history of TBI

Compared to 8.5% of people in the community

Relationship Between TBI and Incarceration

- 7% of survivors of severe TBI had had legal involvement within 1 year after the injury. \(^1\)
- By 5 years after the head injury, 31% had had legal involvement. \(^1\)
- 24% of subjects with TBI had committed crimes leading to arrests within a 2-year period. \(^2\)

\(^1\) Brooks, Campsie, Symington, Beattie, McKinlay (1986). \emph{J Neurol Neurosurg Psychiatry}, 49 (7), 764–770.
\(^2\) Hall, Karzmark, Stevens, Englander, O'Hare, Wright (1994). \emph{Arch Phys Med Rehabil}, 75 (8) (1994), pp. 876–884
TBI in IDOC

- Study conducted by Indiana Public Policy Institute
- December 2012 – one month screening of all male IDOC inmates
- Nearly 1/3 likely have TBI
  - Mild: 19.7%
  - Moderate: 5.8%
  - Severe: 4.3%
  - Possible: 5.9%

% of IDOC Inmates with TBI

N = 873
TBI in IDOC

• No difference in TBI prevalence between racial or ethnic groups
• As compared with those who have no history of TBI, those with TBI are:
  • Younger, on average (31.9 years old versus 34.7 years old)
  • 2.2 times as likely to have a psychiatric disorder
  • 1.5 times more likely to have committed a crime against person
  • 1.5 times more likely to have been incarcerated in the IDOC in the past 10 years
TBI State Implementation Partnership Grant Program
About the Indiana TBI Grant

Funded by 4 year grant through US Department of Health & Human Services, Health Resources and Services Administration Maternal and Child Health Bureau

Goals
1. Decrease recidivism and improve reentry outcomes for ex-offenders with moderate-severe TBI through participation in resource facilitation and related services
2. Increase community-based provider knowledge and awareness
Desired Outcomes

For Clients:
• Decrease in return to incarceration
• Decrease in re-arrest
• Increase in employment
• Increase in employment retention
• Improved functionality

For Service Providers:
• Increased knowledge and capacity to recognize and address TBI in clients
Partners

• **Indiana Department of Correction** – Lead Agency
• **Rehabilitation Hospital of Indiana** – Project Co-Manager; Programmatic Partner
• **Community Solutions** – Project Co-Manager
• **American Institutes for Research (AIR)** - Evaluator
• **IDOC Parole District 3**
• **Marion County Community Corrections/Duvall Residential Facility** – Programmatic Partner
• **Public Advocates in Community re-Entry (PACE)** – Programmatic Partner (Resource Facilitation)
TBI Project Timeline

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<td>• Provide RF Services</td>
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Phase One Accomplishments

- Trained PACE and IDOC Parole staff to conduct the OSU-TBI-ID
- Determined baseline and established comparison group
  - 11.0% moderate – severe TBI (N=1,354)
- Developed educational materials and began educating program partners on TBI
- Education of correctional and clinical staff on TBI
- Initiated monthly support groups
- Established system for services
Phase Two Progress-to-Date (6/1/2015-9/6/2016)

- Phase Two Screenings: 12.1% moderate – severe TBI (N=1127)
- Program participation LOW
- Modified RF for this setting – Feasibility Study
- Focus on educating key sectors
Screening for TBIP

- IDOC Parole Officers in Marion County
- PACE staff at Duvall Work Release Center of Marion County Community Corrections
Resource Facilitation (Light)

• Initial comprehensive PACE and RHI intake
• (Mini) Neuro-vocational Evaluation: RBANS, SASSI, WRAT4 reading, Card Sorting Test, Trail Making Test, BSI 18 (brief symptom inventory), NSI (neurobehavioral symptom inventory), FRSBE
• Client staffing with neuropsychologist with recommendations
• Possible referral to Vocational Rehabilitation for testing authorization (full NVE testing if authorized)
Resource Facilitation (Light) – cont’d

- Individual Case Management Sessions
- Emergency assistance (bus tickets, food, housing, etc.)
- Referral to other needed resources
- Education and Support Groups:
  - TBI Education group
  - TBI Life Skills Group
  - TBI Career Networking Group
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What can you do?

• Refer folks who you suspect have TBI to:
  • **PACE, Inc. (Public Advocates in Community re-Entry):** Phone: 317-612-6800 Website: [www.paceindy.org](http://www.paceindy.org)
  • **Vocational Rehabilitation:** Phone: 1-800-545-7763 Website: [http://www.in.gov/fssa/ddrs/2636.htm](http://www.in.gov/fssa/ddrs/2636.htm)
  • **Rehabilitation Hospital of Indiana:** Phone: 317-879-89400 Website: [http://rhin.com/rhi-nrc/](http://rhin.com/rhi-nrc/)

• Learn how to use the OSU-TBI-ID screening; incorporate into intake protocol (contact Wendy Waldman at RHI)

• To learn more about TBI and the potential impact on clients:
  • **Brainline:** [http://www.brainline.org/](http://www.brainline.org/)
  • **Brain Injury Association of America:** [www.biaa.org](http://www.biaa.org)