Traumatic Brain Injury in the Criminal Justice Population

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Why Did You Pick This Session and What You Hope to Take Away From Today?
Today’s Presentation

What is TBI

TBI and Behavior

TBI in Criminal Justice Populations

Implications for Supervision and Rehabilitation
Prevalence

In the United States...

- At least 3 TBIs occur every minute.
- 15.3 million people live with TBI-related disability
- TBIs cost Americans $76.5 billion in medical care, rehabilitation, and loss of work every year
According to the CDC...

A traumatic brain injury (TBI) is caused by a blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain. Not all blows or jolts to the head result in a TBI. The severity of a TBI may range from “mild,” i.e., a brief change in mental status or consciousness to “severe,” i.e., an extended period of unconsciousness or amnesia after the injury.
Traumatic Brain Injury

- Leading cause of death and disability in children.

- 400,000 brain injuries in children under 15 every year.

- More than half of TBIs occur before age 25.

Source: CDC, 2001
Traumatic brain injury is now classified as a “public health epidemic” in America.
Data and Research
TBI Incidence & Prevalence - USA

- 1.7 million injured
- 50,000 die from a TBI
- 235,000 are hospitalized
- 1.1 million treated and released from ED
- 80,000 - 90,000 result in long-term disability
- 5.3 million with long-term, lifelong disability
- 6.5 million Americans living with some effect
Annual number of TBI’s in AZ

1,288
Deaths

6,943
Hospitalizations

43,369
Emergency Department Visits

???
Receiving Other Medical Care of No Care

Arizona Department of Health Services
Underestimation of the Problem

• The number reported with TBI underestimates the magnitude of the problem because the following are not included in those estimates:—
  – Those treated by private physicians.—
  – Those treated in private clinics, and urgent care centers.—
  – Individuals who did not seek medical care.
Leading Causes of Injury

- 35.2% Falls
- 16.5% Struck By/Against
- 21% Unknown/Other
- 17.3% Motor Vehicle–Traffic
- 10% Assault
Who is at the Highest risk?

• Approximately 18% of all TBI-related emergency department visits involved children aged 0 to 4 years.
• Approximately 22% of all TBI-related hospitalizations involved adults aged 75 years and older.
• Males are more often diagnosed with a TBI (59%).
• Blasts are a leading cause of TBI for active duty military personnel in war zone
• Other vulnerable populations:
  • -Veterans
  • -Persons who are homeless
  • -persons in jail or prison
  • -DV Survivors
Types of Brain Injury

- Congenital Brain Injury
- Acquired Brain Injury
  - Traumatic Brain Injury
  - Non-traumatic Brain Injury
    - Closed Head Injury
    - Open Head Injury

Source: Savage, 1991
How Brain Injury Occurs

• The brain is a complicated organ, with millions of cells and connections

• While specific areas may be related to specific functions, in reality each function involves many areas of the brain communicating with each other
Most common mechanism of injury

• Coup – contrecoup injury from acceleration - deceleration forces such as motor vehicle crashes or shaken baby syndrome.
If you’ve seen one brain injury, you’ve seen one brain injury.
Severe TBI
Mild TBI (concussion)

- May or may not result in a loss of consciousness.
- Clear structural damage may or may not be present.
- Can result in dysfunction in the absence of structural damage.
- A clustering of symptoms is known as post-concussive syndrome (PCS).
Mild TBI

- 97% of people with mild TBI or concussion see resolution of symptoms within 3-7 days
- 3% will have longer lasting symptoms
  - Cumulative effect
  - Psychiatric issues
  - History of complex migraines
mTBI

- Repeated concussions, such as repeated incidents of abuse and sports related injuries, can have cumulative effects.
- Symptoms related to post-concussive syndrome can lead to significant life-long impairments and debilitating effects on those who survive them.
What do DV survivors, football players and homeless people have in common?

- Vulnerability to cumulative effects of repeated concussions
- History of 3 previous concussions increases risk of repeated concussions 3 fold
- Symptoms following repeat concussions may be more serious and resolve at a slower rate
- Worse case-Second Impact Syndrome
Non-Traumatic

Examples of non-traumatic brain injury from medical conditions include:

- Infectious disease (e.g., meningitis, encephalitis)
- Brain tumors
- Cerebral-vascular dysfunction (e.g. stroke, cardiac disorders)
- Toxic chemical or drug reactions (e.g., lead poisoning, carbon monoxide poisoning)
Hypoxia/Anoxia

- Suffocation
- Suicide attempts
- Near drowning
- Other injuries (cardio or pulmonary) can reduce blood flow and oxygen to the brain
- Lack of oxygen/blood flow for more than 3 - 4 minutes causes generalized damage
Defining Severity

Measures

- Glasgow Coma Scale (GCS)
  - Eye opening
  - Motor response
  - Verbal Response

- Loss of Consciousness (LOC)

- CT Scan

Mild:
  - Altered or Loss of Consciousness <30 min. with normal CT and/or
  - MRI GCS 13-15 PTA < 24 hours

Moderate:
  - LOC < 6 hours with abnormal CT and/or
  - MRI GCS 9-12 PTA <7 days

Severe:
  - LOC > 6 hours with abnormal CT and/or
  - MRI GCS<9 PTA>7 days
TBI Severity

Mild 85%
- Seen in ER or MD office
- Often unreported or undiagnosed
- 15% of these will continue to have chronic problems
- The majority of pediatric TBIs are mild, especially in children ages 5 to 14

Moderate/Severe 15%
- Hospitalized
- Rehabilitation

Sources: Asarnow, et al., 1995; DiScala, Osberg, & Savage, 1997; Kraus, 1995
TBI Severity and Recovery

- Most people with mild TBI make a complete recovery (80% to 90%)

- “Miserable minority” have chronic disability

- Recovery typically takes place in weeks or months (if at all)

Source: Ruff et al., 1996
Three main areas of impact

• 6.5 million living with some effect:
  – Physical
  – Cognitive
  – behavioral
Simplified Brain Behavior Relationships

Frontal Lobe
- Initiation
- Problem solving
- Judgment
- Inhibition of behavior
- Planning/anticipation
- Self-monitoring
- Motor planning
- Personality/emotions
- Awareness of abilities/limitations
- Organization
- Attention/concentration
- Mental flexibility
- Speaking (expressive language)

Temporal Lobe
- Memory
- Hearing
- Understanding language (receptive language)
- Organization and sequencing

Parietal Lobe
- Sense of touch
- Differentiation: size, shape, color
- Spatial perception
- Visual perception
- Sense of taste and smell

Occipital Lobe
- Vision
- Visual Perception
- Recognition of Printed Word

Brain Stem
- Breathing
- Heart rate
- Arousal/consciousness
- Sleep/wake functions
- Attention/concentration

Cerebellum
- Balance
- Coordination
- Skilled motor activity
Impacts of Brain Injury
Physical

• Impaired Mobility
• Impaired Sensory Experiences—overstimulation
• Seizure disorders – alterations in brain functioning between seizures - may introduce a variety of psychiatric dimensions.
• Fatigability – physical and mental
• Chronic Pain
• Headaches
• Sleep Disorders (especially important during adolescence. Sleep – critical for adolescent brain development and brain function. Sleep or lack of can effect new learning and memory.)
• Dizziness
Impacts of Brain Injury
Common Cognitive Deficits

- Reduction in abstract reasoning capacity
- Difficulty grasping the main point of a discussion
- Difficulty applying points of interest to one’s life
- Reductions in complex information processing skills
- Impaired attention and concentration
- Heightened distractibility
- Difficulty with new learning and short term memory
- Increased mental fatigue

- Subtle communication problems (e.g. tangentially)
- Judgment problems
- Visual-spatial impairments, including trouble with directions, mechanical tasks, or visual field defects
- Low fatigue thresholds
- Problems with planning and organizing
- Initiation deficits
- Confusion and perplexity
- Problems with flexibility of thinking
- Basic intellectual deficits as measured by IQ
- Slowness in thinking and performance
What cognitive deficits may look like….

- Difficulty remembering info
- Difficulty keeping appointments
- Difficulty following instructions
- Difficulty or inability to read/write
- Difficulty finding their way to appointments
- Difficulty Relating to others “social failure”
- Difficulty Taking meds as prescribed
- Difficulty with waiting
- Difficulty maintaining good boundaries
- “difficult to engage” “poor historian”
- Difficulty learning new information or the rules
- Problems recalling already learned information
- Difficulty initiating
Understanding Brain Injury
Impacts of Brain Injury: Emotional/Behavioral Changes

- Disinhibition
- Suspiciousness
- Impulsivity
- Lack of awareness of deficit and unrealistic appraisal
- Reductions in or lack of the capacity for empathy; inability to experience emotions
- Childlike emotional reactions or behavior
- Uncontrolled laughing or crying; mood swings (emotional labality)
- Preoccupation with one’s own concerns (egocentrism)
- Poor social judgment
- Rage reactions
- Euphoria
- “Flat” affect
- Agitation
- Reduced or altered sense of humor
- Low frustration tolerance
- Misperception of other people’s facial expressions/intentions; inability to perceive emotions
- Hyper-sexuality or hypo-sexuality
- Catastrophic emotional reactions
Common Psychosocial problems after brain injury

- Educational/Vocational Problems
- Interpersonal difficulties
- Intra-Personal Difficulties
- Family Issues
  - Intimacy
  - Dependency Issues
  - Alcohol and Drugs
  - Loss of Self esteem
  - PTSD
Ideal Brain Injury Rehabilitation

- Physical Therapy
- Occupational Therapy
- Speech Therapy/Cognitive Retraining
- Neuropsychology
- Neuro-psychiatry
- Social Work
- Recreational Therapy
- Psychiatry
- Neurology
Physical Effects of TBI

- Impaired Mobility
- Impaired Sensory Experiences - overstimulation
- Seizure disorders – alterations in brain functioning between seizures - may introduce a variety of psychiatric dimensions.
- Fatigability – physical and mental
- Chronic Pain
- Headaches
- Sleep Disorders (especially important during adolescence. Sleep – critical for adolescent brain development and brain function. Sleep or lack of it can effect new learning and memory.)
- Dizziness
Cognitive Effects of TBI

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Higher Prevalence of TBI in Justice Involved Populations

- Prevalence of TBI in prisoners is as high as 60%
- Childhood TBI is predictive of future offending behavior
  - Defined 3 groups who sustained childhood injuries age 0-17, at least 5 years ago
    - Moderate/Severe TBI group
    - Mild TBI group
    - Orthopedic control group (sustained fractured limbs without TBI)
  - Moderate/Severe TBI group were more likely to have a history of
    - Offending behavior
    - Arrest
    - Conviction
    - Petty Crime

Source: McKinlay et al., 2013
Associated With Infraction in Prison

- Prospective Cohort Study, Shiroma et al 2010
  - Defined individuals with medically attended TBI as ED or hospital discharges with TBI ICD-9s
  - Those without TBI were older, more likely to be black, had a higher proportion of violent offence convictions, had longer sentences, and had served more time
  - Overall prevalence of a history of medically attended TBI while incarcerated was 1.19% in males and 0.93% in females
Associated With Infraction in Prison

- TBI cohort had higher rates of infractions per year (1.81 vs 1.57)
- Controlled for age, violent crime conviction, prior criminal history, security level, sentence length
- Found an increased rate of infraction for males (32% more) and non-significant increased rate for females (8%)

Still, causality has not been established

Source: Shiroma et al., 2010
Male/Female Violence and TBI

- Among male prisoners, history of TBI is strongly associated with perpetration of violence and other kinds of violence.

- Women inmates who are convicted of a violent crime are more likely to have sustained a pre-crime TBI and/or some other form of physical abuse.

Sources: Cohen RA, et al. 1999; Brewer SK, Burgess AW, Shults J, 2004
TBI and Intimate Partner Violence

- Women prisoners report significant histories of domestic violence. Between 57 and 75% of imprisoned women experienced physical, psychological and/or sexual violence before prison.

- BRAINS and Domestic Violence Project
Homelessness

Homelessness has been found to be related to both head injury and prior imprisonment

- Lack of appropriate care following TBI
- Street related violence
- Foster care
- Street Living
- Modes of transport

Source: Kushel MB, et al. 2005
Healthcare Disparities

- TBI’s sustained following homelessness may go undetected-intoxicated in the ED
- A Study of homeless persons presenting in the ED in Denver found that homeless persons were less than half as likely to be admitted to the hospital
U.S. Military Casualty Statistics - TBI:
Operation New Dawn, Operation Iraqi Freedom, and
Operation Enduring Freedom 2000-2012

Mild TBI: 194,561 (77%)
Moderate TBI: 42,083 (17%)
Severe or Penetrating TBI: 6,476 (2%)
Not Classifiable: 10,210 (4%)

Source: Congressional Research Service, 2013;
Original chart created by Dr. Micheal Carino, Army Office of the Surgeon General, 2012
Veterans and TBI

- Blasts account for 2/3 of combat injuries in Operation Iraqi Freedom and Operation Enduring Freedom
- 1 in 5 U.S. soldiers from Iraq and Afghanistan return with a mild TBI
- Among veterans, high association of mild TBI and PTSD

Types of Blast Injuries

**Primary Blast Injury**
Direct injury from blast overpressure waves, shock waves

**Secondary Blast Injury**
Energized fragments propelled by the explosion impact head

**Tertiary Blast Injury**
Individuals thrown by the blast and collide with objects or structures

Source: Elder, GA and Cristian, A, 2009; BrainlineMilitary2009; Photo credit: Graphic by Al Granberg, Krista Kjellman-Schmidt, and ProPublica
Substance Abuse Disorders

- Before their injury, people who sustain a TBI are twice as likely as others in the community to have issues with substance abuse – the use may have led to the injury
- Some studies suggest that use may get worse 2 to 5 years post injury
- Prisoners self reported health indicate those with one or more head injuries have significantly higher levels of alcohol and/or drug use during the year preceding their incarceration

Behavioral Health and TBI

- 73% of women in state prison have been diagnosed with a mental health problem
- Research is showing that there is a high prevalence of individuals reporting TBI with co-occurring substance disorder and severe mental illness, one study reports up to 72%
- Symptoms like paranoia, obsessional disorder, depression
- PTSD
Suicide and TBI

- People with TBI are 4 times as likely to commit suicide
- One study screened 172 participants with TBI using the Beck Scale for Suicide Ideation
  - 35% had significant levels of hopelessness
  - 23% had suicide ideation
  - 18% had made a suicide attempt
“TBI, mental illness, substance abuse, PTSD – they all go together like peanut butter and jelly.” -- George
# Impact on Behavior in Corrections

<table>
<thead>
<tr>
<th>TBI Consequences</th>
<th>Functional Impact on Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention Deficits</td>
<td>Difficulty focusing on or responding to required tasks or directions</td>
</tr>
<tr>
<td>Memory Deficits</td>
<td>Difficulty to understanding or remembering rules or directions</td>
</tr>
<tr>
<td>Irritability or Anger</td>
<td>Incidents with other inmate or correctional officers</td>
</tr>
<tr>
<td>Slowed Verbal and Physical Responses</td>
<td>May seem uncooperative</td>
</tr>
<tr>
<td>Uninhibited or Impulsive Behavior</td>
<td>Problems controlling anger and unacceptable sexual behaviors</td>
</tr>
</tbody>
</table>
Screening and Assessment

- **Screening**
  - Several instruments
    - TBIQ – about 15 minutes to administer, validated in correctional populations, may be longer if multiple positives
    - OSU TBI-ID- about 5 minutes to administer
    - HELPS TBI – about 5 minutes to administer
  - **Drawbacks**
    - Time consuming, especially with several positives
    - Unclear how a positive for an individual should inform care, given the high prevalence across the board
  - **Rikers strategy**
    1. Screen a small sample to establish high prevalence
    2. Consider population level interventions
    3. Decided against implementation of system-wide intake screening
Other ways to Assess

- Scar Inventory
- Missing Teeth
- “long forgotten head injury”
- special education
- Head injury vs. brain injury
Strategies for working with BI and other cognitively impaired people

• WRITE EVERYTHING DOWN-IF ITS SAFE
• Help develop a memory system, phone, calendar etc.
• Develop and use checklists
• Break tasks and goals into small, tangible steps
• Allow extra time for completing tasks
• Provide feedback immediately, respectfully and positively
• Minimize distractions
• Keep meeting short and direct
Additional Strategies

- Be concrete; break information into small pieces
- Focus on one task at a time; stick to that topic
- Double check to make sure she understands
- Access Services through Medicaid-start with her PCP
What can we do in jail?

- Assess prevalence (incoming adolescent patients)
  - TBIQ*
  - Screening (head injuries)
  - Injury detail (mechanism, amnesia)
  - Symptom checklist
- Assess incidence
  - Injury surveillance

# Prevalence of TBI Among Newly Admitted Adolescents

<table>
<thead>
<tr>
<th></th>
<th>No injury or 1 minimal injury but no altered state</th>
<th>Multiple minimal</th>
<th>TBI (≥ 1 injury with altered mental state)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>125</td>
<td>68</td>
<td>191</td>
<td>384</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td>98</td>
<td>52</td>
<td>149 (50%)</td>
<td>300</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>27</td>
<td>16</td>
<td>41 (48.8%)</td>
<td>84</td>
</tr>
<tr>
<td><strong>Age (mean)</strong></td>
<td>17.1</td>
<td>17.2</td>
<td>17.2</td>
<td>17.2</td>
</tr>
<tr>
<td><strong>M status</strong></td>
<td>5.6%</td>
<td>10.3%</td>
<td>15.2%**</td>
<td>11.2%</td>
</tr>
<tr>
<td><strong>N of reported Injuries</strong></td>
<td>.72</td>
<td>3.5</td>
<td>5.4**</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Assault related injuries</strong></td>
<td>20.0%</td>
<td>70.6%**</td>
<td>68.1%**</td>
<td>53.0%</td>
</tr>
<tr>
<td><strong>TSSI</strong>*</td>
<td>1.01</td>
<td>1.26</td>
<td>1.70**</td>
<td>1.40</td>
</tr>
<tr>
<td><strong>TSFI</strong>**</td>
<td>0.96</td>
<td>1.43</td>
<td>2.07**</td>
<td>1.59</td>
</tr>
</tbody>
</table>

Table note: differences among categories determined by One Way ANOVA, Post Hoc Tukey

*P<0.05

** P<0.01

*** F(2,381) = 25.26, p<.001

**** F(2,380) =37.68, p<.001

TSSI: Total Symptom Severity Index. TSFI: Total Symptom Frequency Inventory
Overall Prevalence

- 384 screened patients
- Overall prevalence of TBI 49.5% (44.5%-54.5%)
- 63.9% had more than 1 arrest
- 56.1% of the no injury/minimal was a recidivist (Nov. 2008 – Sept. 2013)
- 71.7% of the multiple minimal was a recidivist
- 66.7% of the TBI group was a recidivist
# TBI and Other Injuries. NYC Jails
**June 1, 2012 – September 30, 2013 (16 Months)**

<table>
<thead>
<tr>
<th></th>
<th>Injuries</th>
<th>Head Injuries</th>
<th>Risk per 1000 days</th>
<th>RR head injury</th>
<th>TBI Injury</th>
<th>Risk per 1000 days</th>
<th>RR TBI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ADULTS</strong></td>
<td>20,317</td>
<td>2,761 (13.6%)</td>
<td>.389</td>
<td>Ref</td>
<td>530 (2.6%, 19.2%)</td>
<td>.0747</td>
<td>Ref</td>
</tr>
<tr>
<td><strong>ADOLESCENTS</strong></td>
<td>4,284</td>
<td>371 (8.6%)</td>
<td>.596</td>
<td>1.53* (1.37-1.70)</td>
<td>53 (1.2%, 14.3%)</td>
<td>.0851</td>
<td>1.13</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>24,601</td>
<td>3,132 (12.7%)</td>
<td>.405</td>
<td>-</td>
<td>583 (2.3%, 18.6)</td>
<td>.0755</td>
<td>-</td>
</tr>
</tbody>
</table>
Incidence of TBI in NYC Jails

<table>
<thead>
<tr>
<th>Methodology</th>
<th>TBI per 100,000 Person Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED Encounters</td>
<td>31.5</td>
</tr>
<tr>
<td>Hospital Treated</td>
<td>100-300</td>
</tr>
<tr>
<td>Estimate of Total, Accounting for Cases Not Seeking Hospital Care</td>
<td>600+</td>
</tr>
<tr>
<td>ED and Others</td>
<td>790</td>
</tr>
<tr>
<td>Active Surveillance</td>
<td>3107</td>
</tr>
<tr>
<td>Active Surveillance</td>
<td>2756</td>
</tr>
</tbody>
</table>

27/53 (50.9%) adolescent TBI were seen in ED or by on-island ED doctor

What Can We Do in Corrections?

- Provide acute care
  - Safe rooms
- Educate correctional staff
- Educate medical and mental health staff
- Provide programming to educate patients/begin group treatment
  - Our focus group experience
- Screening?
- Complexity of conferring special status
- Legal involvement?
ROWBOATS Tip Card

ROWBOATS
helping individuals with cognitive impairments

Reduce amount of information
One instruction at a time
Written & verbal when possible
Breaks are helpful
Often is better, routines help
Ask person to paraphrase/repeat
Take the time, go slowly
Simple & organized info best

ASU
Center for Applied Behavioral Health Policy
Arizona State University
more information at cathp.asu.edu

Traumatic Brain Injury (TBI)
Every 23 seconds a TBI occurs in US
 Symptoms worsen with multiple TBIs
High prevalence of TBI with co-occurring mental illness & substance abuse disorder
Convicted women are more likely to have sustained a pre-crime TBI and have been a victim of physical abuse

COMMON SYMPTOMS:
- easy overstimulated
- slowness in thinking
- difficulty grasping new information
- trouble following instructions
- difficulty with recall & new skills
- emotional, impulsive, or agitated
- interpersonal difficulties
- mental/physical fatigue

ASU
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ATTC
Addiction Technology Transfer Center
Minnesota Project

- 2006 Minnesota was awarded a State TBI Implementation Partnership Grant which is being conducted as an interagency effort entirely through the Minnesota DOC.
- *TBI in MN Correctional Facilities: Strategies for Successful Return to Community*, a three year project administered by US Department of Health & Human Services, Maternal & Child Health Bureau, Health Resources & Services Administration (HRSA)