

ADDICTION AND TBI

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Definition of Traumatic Brain Injury

- ❑ Closed head injury (CHI) – Skull intact, brain not exposed.
- ❑ Penetrating head injury (PHI) – Open head injury where skull and dura are penetrated by an object.
- ❑ Vascular insults (due to stroke, anoxia, etc. will also be included for today's purposes.)

▣ Centers for Disease Control TBI Definition

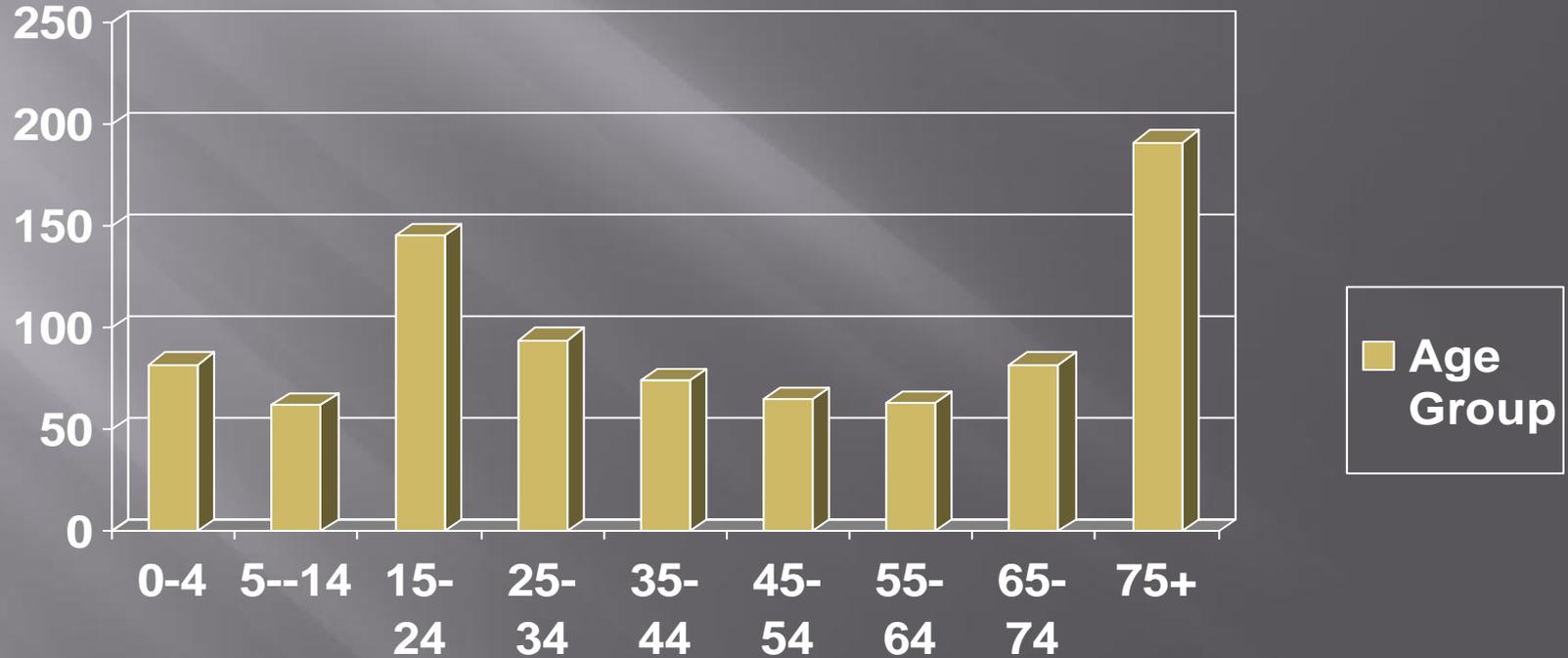
- Craniocerebral trauma, specifically, an occurrence of injury to the head (arising from blunt or penetrating trauma or from acceleration/ deceleration forces) that is associated with any of these symptoms attributable to injury: decreased level of consciousness, amnesia, other neurologic or neuropsychological abnormalities, skull fracture, diagnosed intracranial lesions, or death.
- Thurman DJ, Sniezek JE, Johnson D, et al., Guidelines for Surveillance of Central Nervous System Injury. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, US Department of Health and Human Services, 1995.

Prevalence of TBI

- ▣ Associated w/
 - 50,000 – 75,000 deaths annually;
 - 230,000 – 373,000 hospitalizations – nonfatal TBI
 - 80,000 = long term disability
 - 1,975,000 individuals attended to medically
- ▣ US Statistics
 - Incidence average 220/100,000

Rates of TBI hospitalization and death by age group

Rates per 100,000

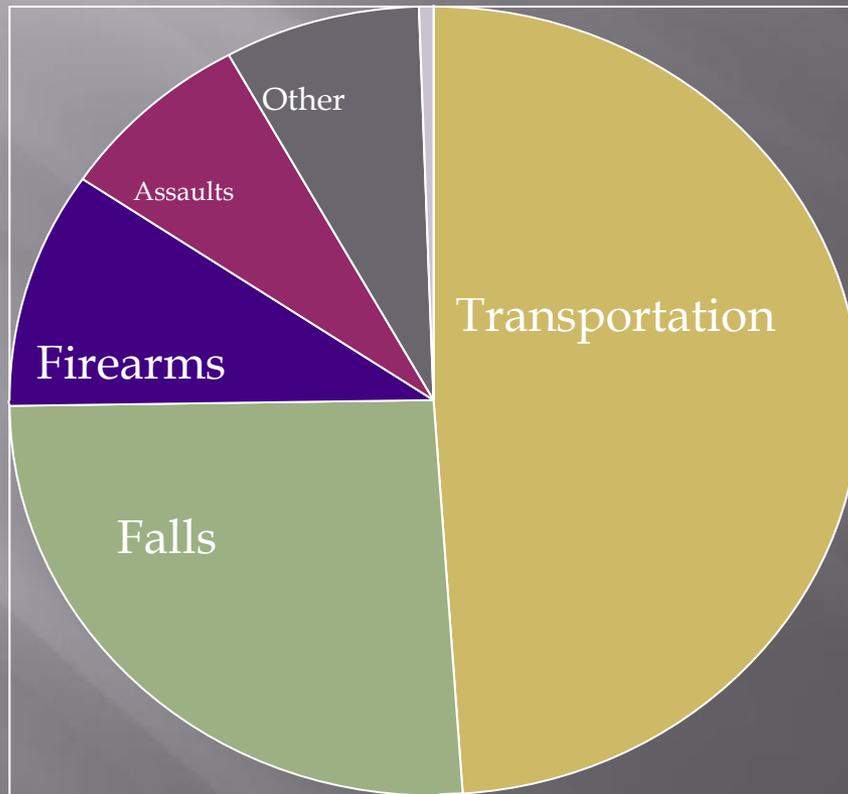




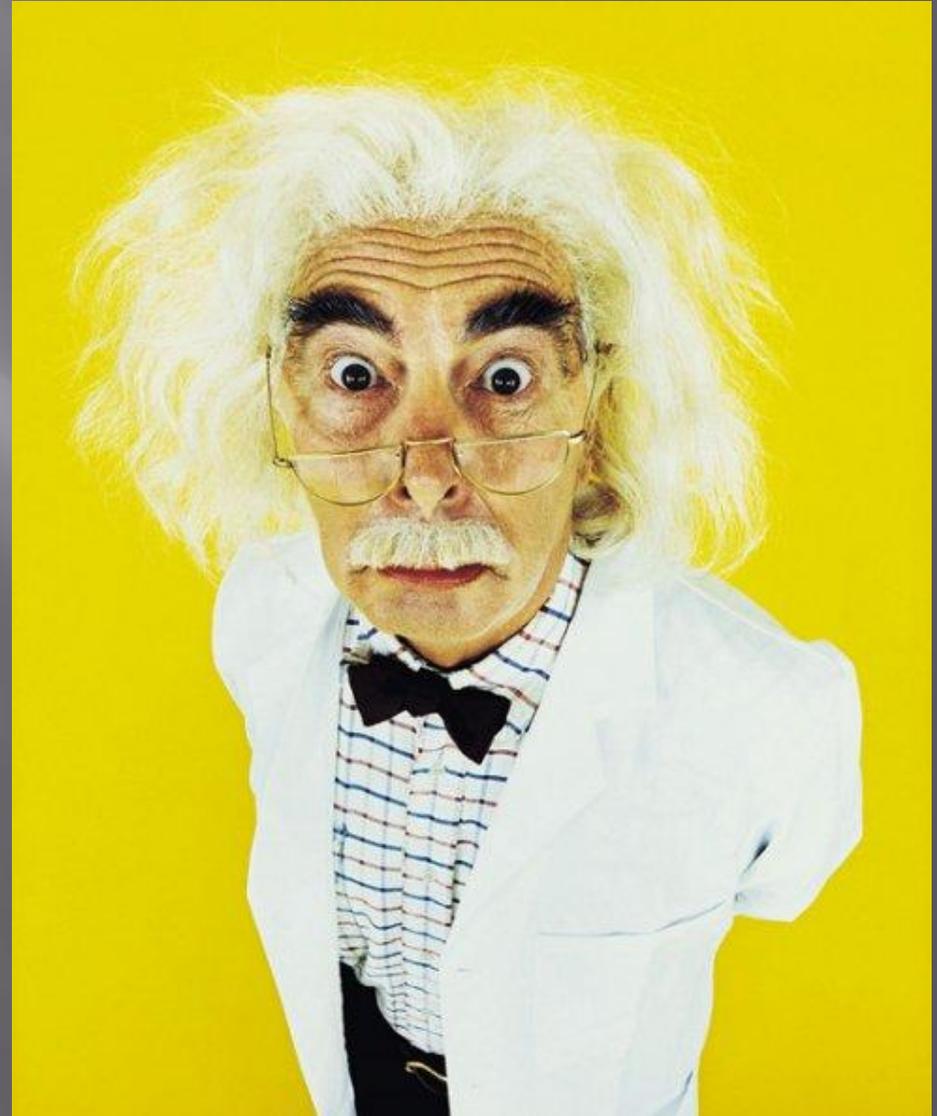




Proportion of TBI related hospitalizations and deaths



- ▣ Estimated cost of TBI was \$260 billion spent in the United States



Mechanism of Brain Injury

▣ Primary Injury

- Damage that results from shear forces; seen in the initial minutes/hours after the insult
- Cortical disruption
- Axonal Injury
- Vascular Injury
- Hemorrhage

▣ Secondary Injury

- Evolution of brain damage
- Post traumatic ischemia
- Excitotoxicity
- Cell Death
- Axonal Injury
- Cerebral Swelling
- Inflammation/regeneration

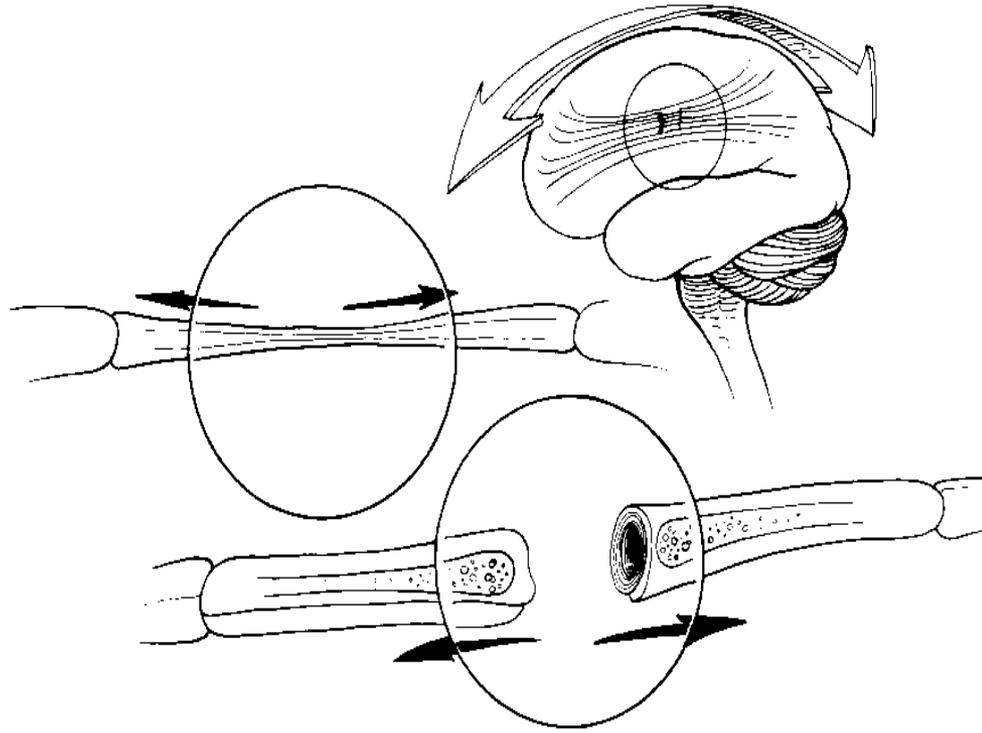


Figure 1-16. Axonal shearing may occur in acceleration as well as deceleration injuries. The nerve fiber may be stretched or completely severed, producing the manifestations of diffuse head injury.

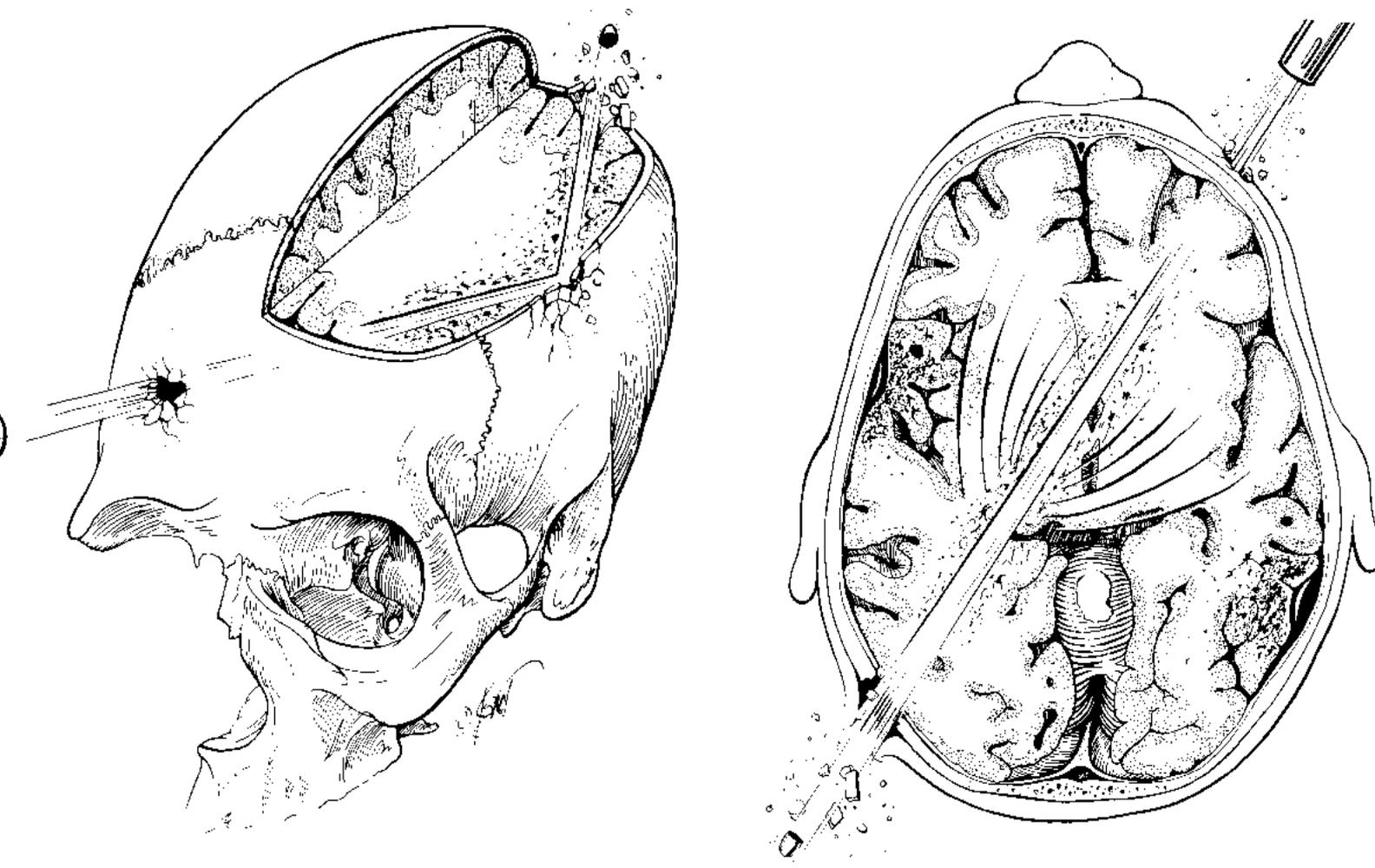
Closed Head Injury

- ▣ Resulting from falls, motor vehicle crashes, etc.
- ▣ Focal damage and diffuse damage to axons
- ▣ Effects tend to be broad (diffuse)
- ▣ No penetration to the skull

Open Head Injury

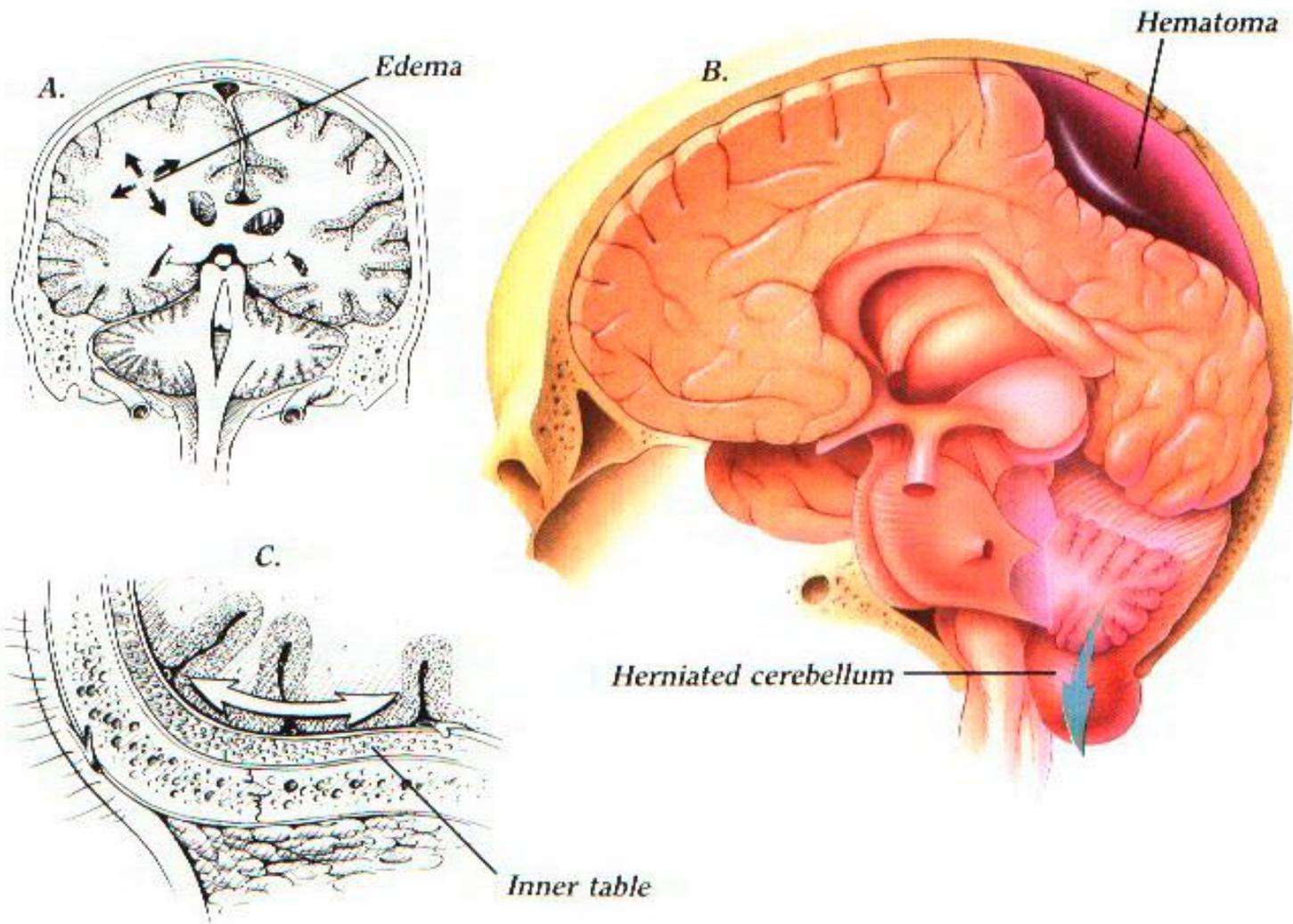
- ▣ Results from bullet wounds, etc.
- ▣ Largely focal damage
- ▣ Penetration of the skull
- ▣ Effects can be just as serious

Traumatic Damage and Mechanisms of Repair 3



*TBI: A **biological** event within the brain*

- ▣ Tissue damage
- ▣ Bleeding
- ▣ Swelling
- ▣ Cell death
- ▣ Stroke
- ▣ Seizure
- ▣ Other multiple medical complications



Study Time: 9
MF





TBI: Changes in functioning

- ▣ Loss of consciousness/coma
- ▣ Post-traumatic amnesia (PTA)
- ▣ Other changes due to the TBI

Injured Brain

- ▣ Does not mend fully
- ▣ Leads to problems in functioning

What Do We Mean by Severity of Injury

- ▣ Amount of brain tissue damage

How to measure “severity”?

- ▣ Duration of loss of consciousness
- ▣ Initial score on Glasgow Coma Scale (GSC)
- ▣ Length of post-traumatic amnesia
- ▣ Rancho Los Amigos Scale (1 to 10)

Mild injury

0-20 minute loss of consciousness GCS = 13-15

PTA < 24 hours

Moderate injury

20 minutes to 6 hours LOC

GCS = 9-12

Severe injury

> 6 hours LOC

GCS = 3-8

*WHAT HAPPENS AS THE
PERSON WITH MODERATE
OR SEVERE INJURY BEGINS
TO RECOVER AFTER
INJURY?*

Recovery and Plasticity

- ▣ Plasticity refers to the ability of the brain to recover and regenerate.
- ▣ Controversial idea; definition and mechanisms are not clear
- ▣ Idea that the CNS is a dynamic system capable of reorganization in response to injury

Determining Recovery Potential

▣ Some guidelines

- Lower Glasgow Coma Scale (GCS) Score;
- Longer coma duration (greater than 4weeks);
- Longer duration of Post Traumatic Amnesia (PTA)(good recovery unlikely when <3months)
- Older age assoc. with worse outcomes
- Neuroimaging features (presence of SAH, cisternal effacement, significant midline shift, EDH or SDH on acute care CT = worse outcomes).

Cognitive Impairments after TBI

- ▣ Post Traumatic Amnesia
- ▣ Information processing and attention;
- ▣ Anosognosia (unawareness of deficits);
- ▣ Intellectual functioning
- ▣ Memory
- ▣ Confabulation and delusions
- ▣ Spatial Cognition
- ▣ Chemical Senses (Olfaction and Taste)
- ▣ Executive Functions
- ▣ Social Cognition and Behavior

Comprehensive Rehabilitation

- ▣ Physical Therapy
- ▣ Occupational Therapy
- ▣ Speech Therapy
- ▣ Medical Management
- ▣ Psychological/Neuropsychological
- ▣ Emotional/Psychiatric Management as appropriate
- ▣ Family Support
- ▣ Case Management

I've had a brain injury, can I
have a drink?

Addiction/TBI Relationship

- ▣ Evidence shows brain injury and substance use are related.
- ▣ Several studies show decreased drinking after TBI, but other evidence shows individuals returned to preinjury substance use (Walker et al., 2007).
- ▣ Between 38% and 63% of SUD treatment clients report brain injuries (Corrigan, 2005).
- ▣ Individuals who drank alcohol are shown to have 4 times the risk of sustaining a brain injury than those who did not drink alcohol (Levy, Maloney, and Miller, 2004).

- ▣ Individuals with preinjury SUD's are likely to be heavy substance users post injury(Horner, et al., 2005).
- ▣ Both TBI and substance use disorders, in addition to premorbid mental health problems, can cause cognitive and behavioral problems.

Risks of Substance use

- ▣ Persons w TBI and Substance Abuse
 - Are less likely to be working;
 - Have lower subjective well being
 - Increased likelihood of suicide
 - Greater risk for seizure
 - Additive effects of negative consequences for brain structure and function
 - Persons with no history of pre-injury substance abuse were more than 8x more likely to be employed at follow up (Shere, Bergloff, High, and Nick (1999)).

Risks of Substance use

- ▣ Persons w TBI and Substance Abuse
 - Pre-Injury Substance Abuse is assoc. with post injury unemployment;
 - Prior hx of substance abuse is associated with post injury life satisfaction;
 - Relationship between depression, substance abuse, and suicide following TBI.
 - Higher risk of seizure episode.
 - Increased risk of criminal activity

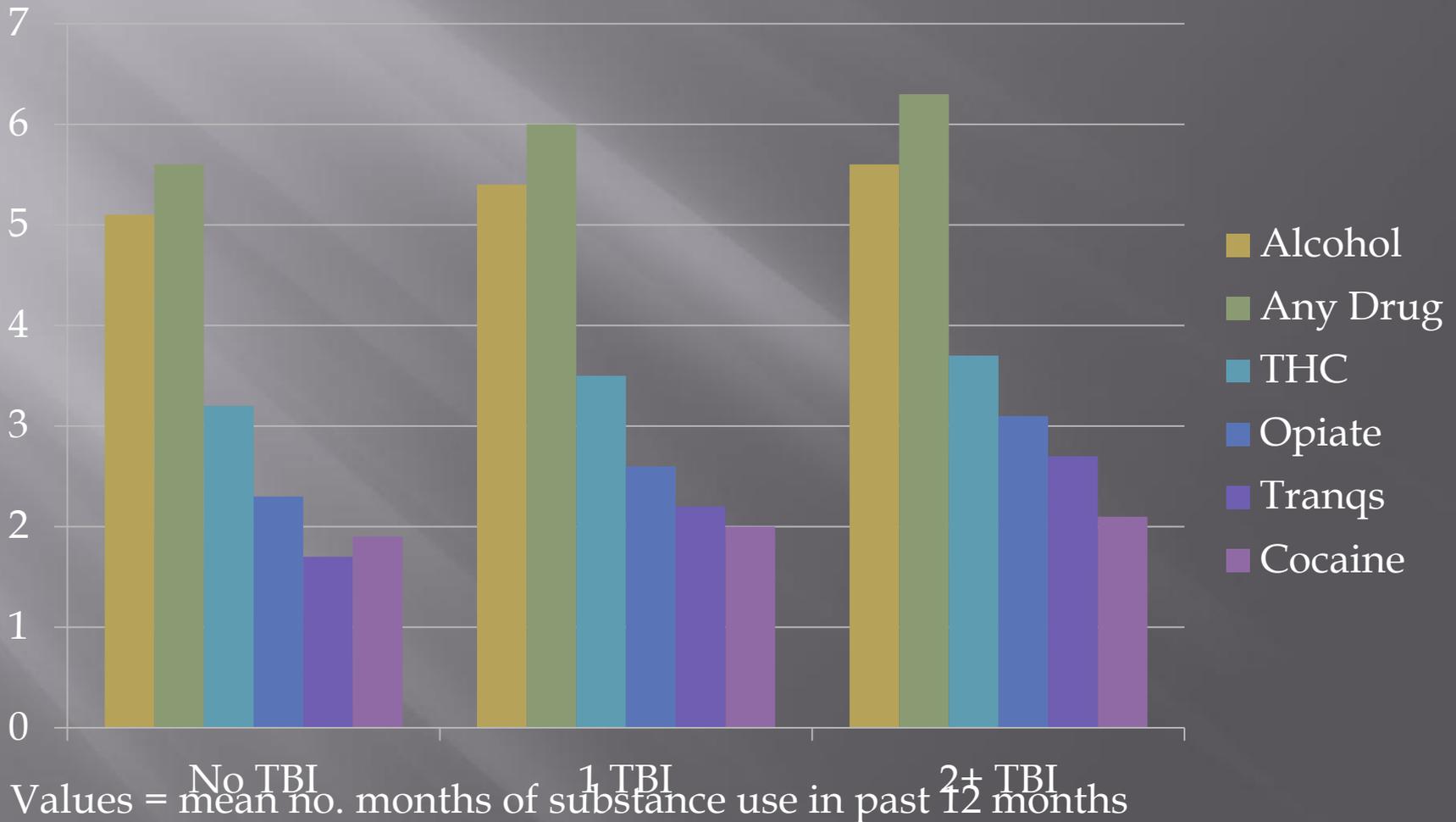
Screening for SUD

Walker et al., 2007

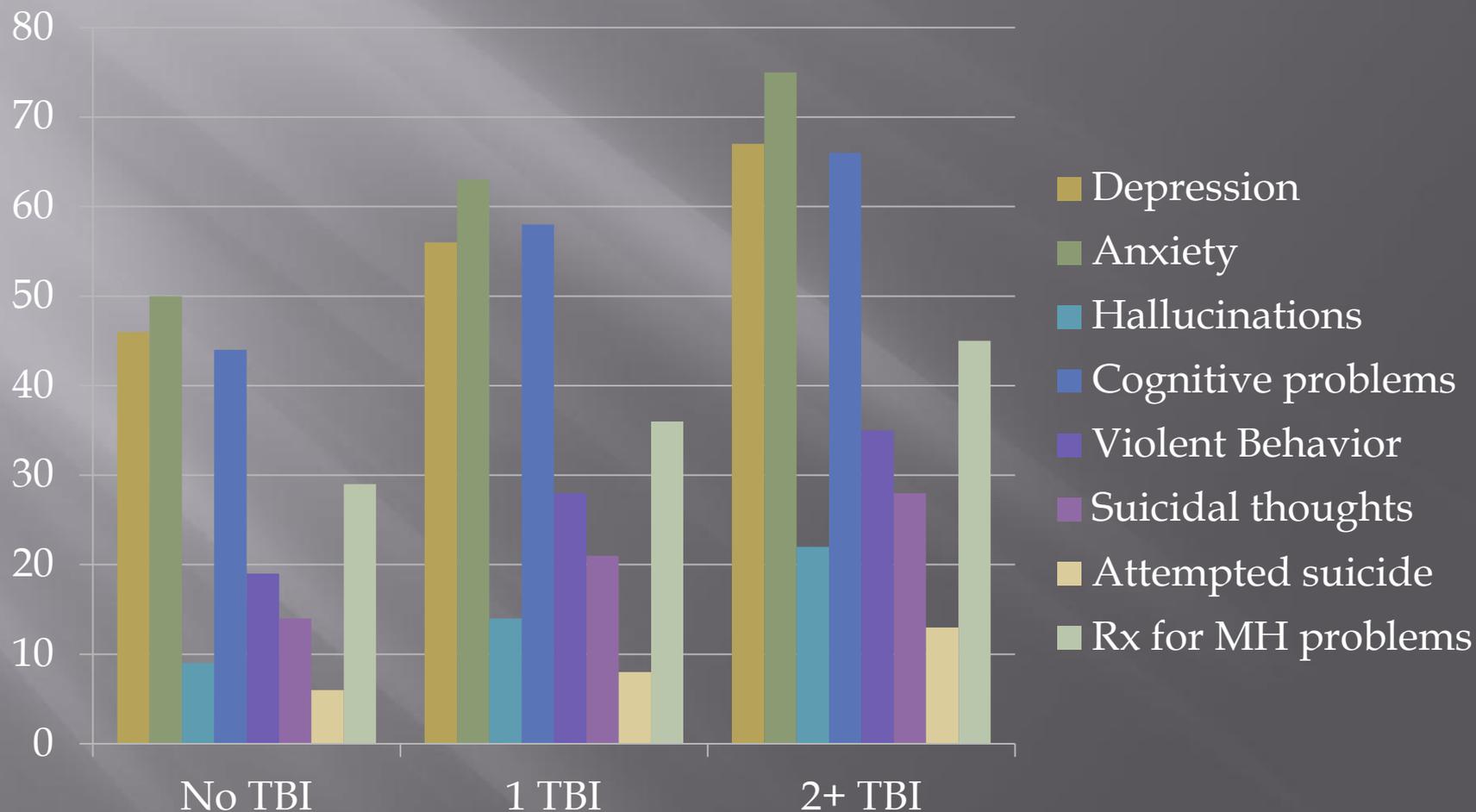
- ▣ Screened over 7700 adults in a state funded SUD treatment facility in Kentucky
- ▣ Self reported number of head injuries defined as:
 - “being knocked out or kept in the hospital at least one night”.
 - Authors indicate screening was more likely to identify severe TBI is versus less severe TBI’s.

Substance Use in 12 Months

Walker, et al., 2007



Mental Health Problems over 12 Months



Most Common Cognitive Effects

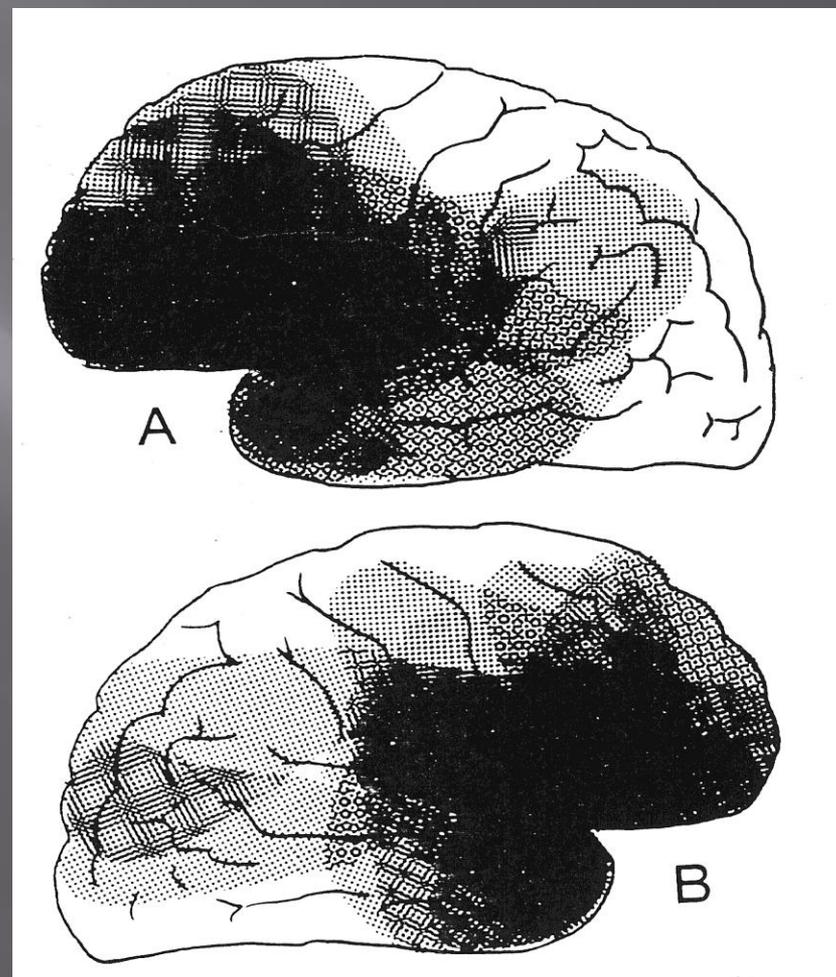
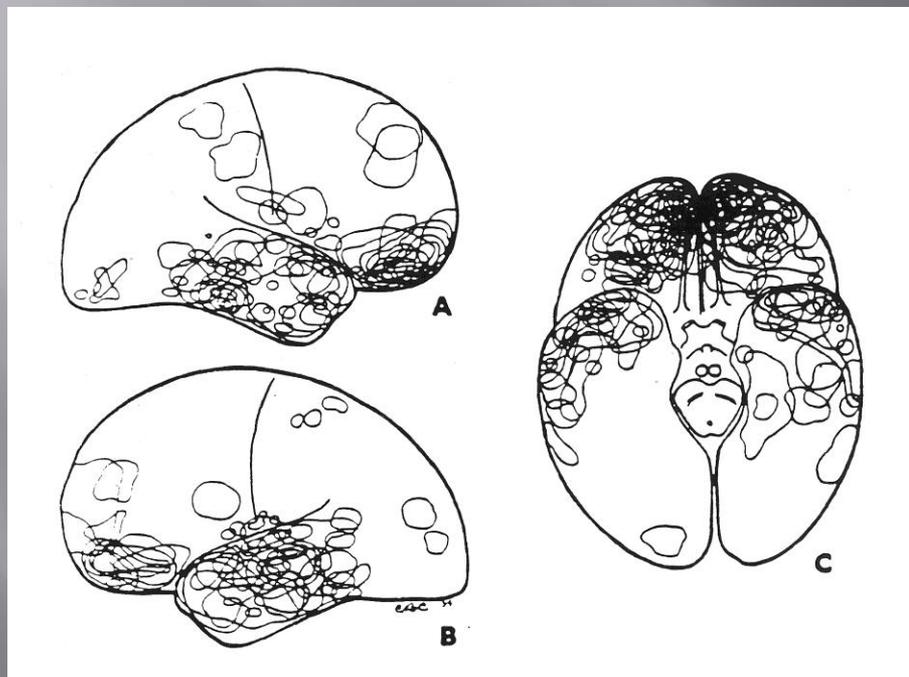
- **TBI - Frontal-Executive Processes:**
 - Attention, mental flexibility, effortful processing, willed action, response inhibition,
 - Self Regulation: Affect monitoring, behavioral planning, Cognitive resource allocation
- **Substance Abuse Cognitive functions impaired**
- **Alcohol:** Attention, concentration, executive functioning, problem solving, visual spatial and complex perceptual motor integration, learning ability, short and long term verbal and nonverbal memory ability. ^{12,13,35}
- **Cocaine:** Lower IQ scores, mental flexibility, attention, concentration, visuomotor ability, verbal and visual learning and memory, decision making, nonverbal problem solving, abstracting ability, and impulsivity. ^{27,35,42,53}
- **Cannabis:** Attention, executive functioning, mental arithmetic, mathematical ability, verbal expression, semantic memory retrieval processes, visual scanning ability, recognition of sensory information, tracking ability, reaction time, and immediate recall of verbal information. ^{22,23,26,35,36,54}
- **Opiates:** Diffuse cognitive impairment, deficits in motor speed, visuospatial and visuomotor abilities, attention, verbal fluency, and memory. ^{35,36}
- **Polydrug Abusers:** Global cognitive impairment, verbal fluency, abstraction, problem solving, complex spatial and motor tasks, executive functioning, attention, memory learning, and cognitive flexibility. ⁵⁰⁻⁵²

Psychiatric Disorders

- ❑ Depressed patients exhibit impairment in memory and visuomotor spatial skills and speed, sensory perception (facial recognition), implicit learning, attention, conceptual reasoning, and cognitive flexibility.^{15,41,55}
- ❑ Patients with bipolar disorder often show diffuse pattern of impairment in multiple areas including general intellectual functioning as well as specific deficits in verbal and declarative memory, executive functions, abstraction ability, attention, and concentration, psychomotor functioning, verbal fluency, inhibitory control, and affective shifting.^{17,18,}
- ❑ Few studies conducted on cognitive functioning in non-psychotic dual disorder patients indicate deficits in general intellectual functioning, problem solving, abstraction, verbal and visual memory, attention, calculation, comprehension, and visuospatial ability.^{14,19,20}

Effects on Brain Structure

Common areas of TBI occurrence



Identification of SUD

- ▣ 1. Tolerance: Need for markedly increased amounts of substance for desired effect/intox.
 - Marked diminished effect with continued use.
- ▣ 2. Withdrawal as manifested by
 - Characteristic w/d sx of substance
 - Same or closely related substance taken to reduce w/d
- ▣ 3. Substance taken in larger amounts over longer period than intended.
- ▣ 4. Persistent desire or unsuccessful attempts to control or cut down.

Identification of SUD

- ▣ 5. Great deal of time in activities to get substance.
- ▣ 6. Important social, occupational, or recreational activities given up or reduced.
- ▣ 7. Substance use continued despite knowledge of persistent physical/ psychological problems or problems exacerbated by substance use.

Risk factors for developing SUD in TBI patients.

- ▣ Young age;
- ▣ Prior hx of high frequency substance use;
- ▣ Unknown regarding effect on recovery process;
- ▣ Decreased tolerance for any drug;
- ▣ Interactions with Rx'd meds;
- ▣ Potential for seizures;
- ▣ Exacerbation of TBI sequelae;
- ▣ Stresses of prolonged recovery from serious TBI.

Risk for Poor Outcomes

- ▣ Patients intoxicated at the time of injury:
Usually receive the most scrutiny
- ▣ Patients with SUD history but may not have
been intoxicated at time of injury

Risk for Poor Outcomes

- ▣ Intoxication at time of injury
 - Increased risk of more severe injuries, require intubation, respiratory distress, manifest greater neurological impairment at discharge, require greater time from admission to rehabilitation.
 - Other studies have found the opposite.
 - Mixed results regarding neuropsychological dysfunction.
 - Evidence of deleterious and neuroprotective effects of alcohol.

Risk for Poor Outcomes

- ▣ Prior history of SUD
 - Associated w mortality, mass lesions, poor GCS at discharge, poor neuropsychological performance 1 month/1 year post injury.
- ▣ Substance use following TBI
 - 10% of patients may use an illicit drug first year after injury
 - 25% likely alcohol use disorder
 - 11% likely drug use disorder

Risk for Poor Outcomes

- ▣ South Carolina TBI Study
 - Patients interviewed one year after hospitalization
 - N = 1,606
 - 15% - heavy drinking in prior month
 - 14% moderate level of drinking
 - Risk factors for heavy drinking = preinjury SUD, diagnosis of depression since the injury, better physical functioning, male, younger age, uninsured or on Medicaid, not married.
 - Similar patterns for moderate drinking

Risk for Poor Outcomes

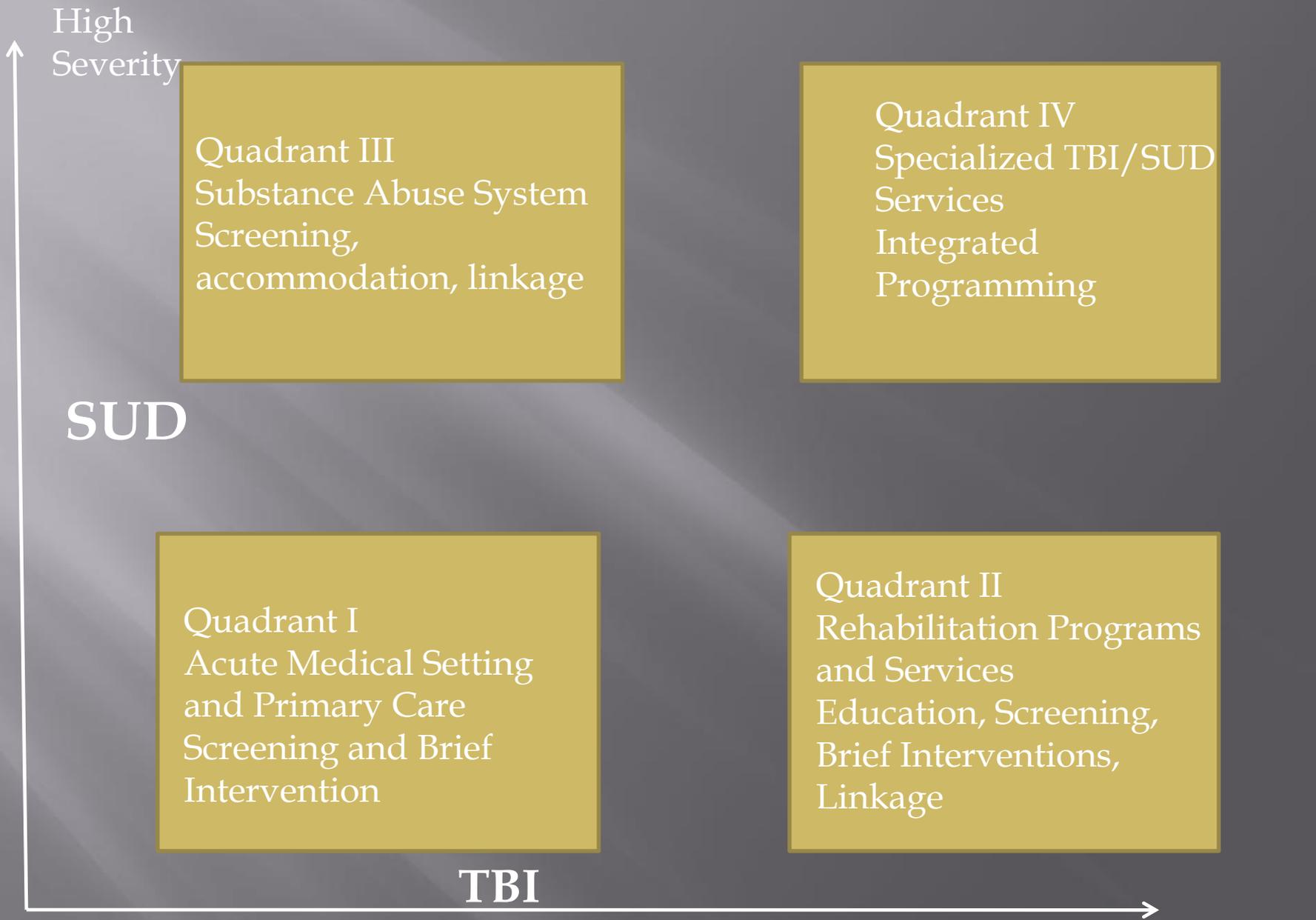
- ▣ Kreutzer, 1990
 - Pts with TBI consumed more alcohol prior to injury than same aged peers.
 - After injury reduced to levels similar to peers
 - However almost 25% increased their alcohol use between years 1-2 post injury.
 - Similar for drug use but an increase in the 2nd to 3rd year.
 - Bombadier (2003) 15% of patients with preinjury abstinence or light drinking were consuming moderate or heavy amounts one year post injury.

Treatment Interventions

- ▣ Studies almost non-existent.
- ▣ One study examining treatment engagement (Corrigan 2005).
- ▣ Overall modest support for Motivational Interviewing and Case management for treatment entry.
- ▣ There are parallels between the TBI patient population and the dual diagnosis patient population (cognitive and emotional problems, emotional dysregulation, multiple psychosocial needs).

Treatment Interventions

- ▣ Mixed results for motivational interventions as efficacious for treatment engagement.
- ▣ Financial incentives and addressing logistical systemic barriers have resulted in better engagement.
- ▣ Corrigan's Model
 - ▣ Borrowed from literature on dual diagnosis patients.
 - ▣ Consumer/professional education, intensive case management, inter-professional consultation
 - ▣ 3 Outcomes: abstinence, return to work/school, subjective well being



Quadrant III
Substance Abuse System
Screening,
accommodation, linkage

Quadrant IV
Specialized TBI/SUD
Services
Integrated
Programming

Quadrant I
Acute Medical Setting
and Primary Care
Screening and Brief
Intervention

Quadrant II
Rehabilitation Programs
and Services
Education, Screening,
Brief Interventions,
Linkage

Screening Tools

- ▣ CAGE
 - Tried to cut down?
 - Annoyed when asked?
 - Guilt over something done when using?
 - Eye Opener
- ▣ MAST (Michigan Alcohol Screening Test)
- ▣ DAST (Drug Abuse Screening Test)
- ▣ Alcohol Use Disorders Identification Test (AUDIT)
- ▣ DSM -IV-TR Criteria

Upcoming DSM-V Changes

- ▣ Proposal that diagnostic category include both substance use disorders and non-substance addictions (Gambling/Internet)
- ▣ Tentatively re-title the category, Addiction and Related Disorders.
- ▣ Elimination of “dependency” criteria, now limited to physiological dependence.
- ▣ “The presence of tolerance and withdrawal symptoms are not counted as symptoms to be counted for the diagnosis of substance use disorder when occurring in the context of appropriate medical treatment with prescribed medications.”

Martino et al., (2002) MI adaptation with DD patients.

STANDARD PRACTICE

- ▣ Targets substance use
- ▣ Presumes cognitively intact
- ▣ Uses open-ended questions and reflective listening

MODIFICATION

- ▣ Address his interaction, addresses compliance.
- ▣ Incorporates strategies such as repetition, simple materials, and breaks.
- ▣ Avoids compound questions, queries and clear and concise terms. Reflections are simply stated, uses metaphors.

Martino et al., (2002) MI adaptation with DD patients.

STANDARD PRACTICE

- ▣ Provides personalized feedback about substance use.

MODIFICATION

- ▣ Feedback across different symptoms.

“I’ve had a brain injury, can I have a drink?”

- ▣ Factors to consider:
 - Severity of injury and medical complications;
 - Premorbid drinking/ drug use;
 - Improvement in symptoms over the 12-18 month window of recovery;
 - Mental health history / Mental health symptoms, stress, anxiety, post injury;
 - Risk factors: Age, gender, lifestyle, economic, employment, life satisfaction, etc.
 - Medical comorbidities;
 - Social supports

FINALLY,

There is no known safe level of
drinking post TBI.