All Rise Justice for Vets

Acquired Brain Injury (ABI) and the Justice-Involved Veteran Population

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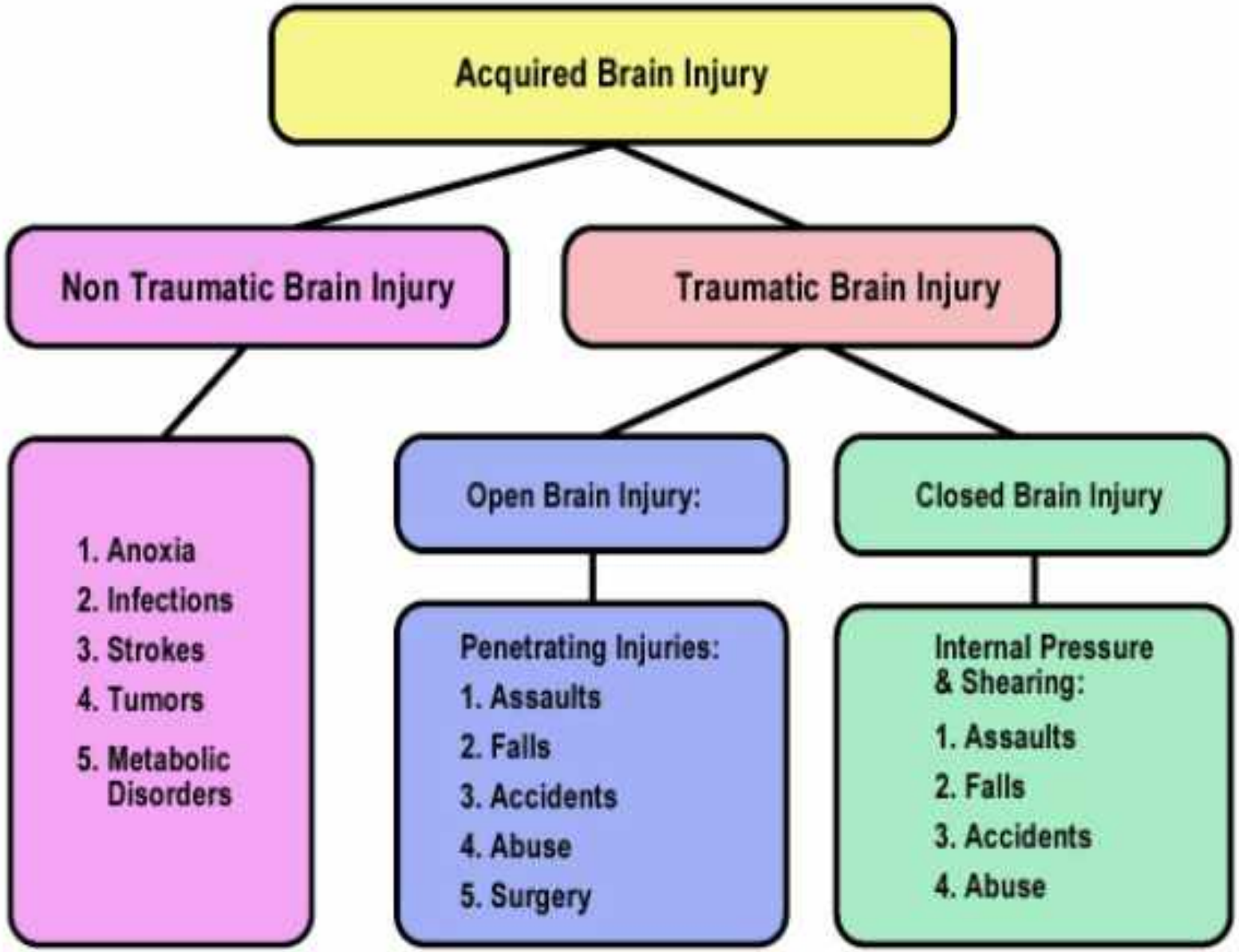
The presenter has no conflict of interest to disclose

Objectives

1. Define brain injury including mechanisms of injury and severity levels.
2. Review prevalence of traumatic brain injury among the Veteran population.
3. Explore behavioral correlates of traumatic brain injury
4. Review clinical implications in working with adults presenting with brain injury and behavioral dysfunction.

Brain Injury


Acquired Brain Injury
Non Traumatic Brain Injury
Traumatic Brain Injury
1. Anoxia
2. Infections
3. Strokes
4. Tumors
5. Metabolic Disorders
Open Brain Injury:
Penetrating Injuries:
1. Assaults
2. Falls
3. Accidents
4. Abuse
5. Surgery
Closed Brain Injury
Internal Pressure & Shearing:
1. Assaults
2. Falls
3. Accidents
4. Abuse

Acquired Brain Injury: Non-Traumatic

- Anoxia/hypoxia – Complete or partial lack of oxygen to the brain.
- Stroke – Decrease or stop in blood flow to a part of the brain.
- Infections – Bacterial meningitis, syphilis, herpes.
- Tumors – abnormal growth of tissue in the brain
- Metabolic – Problems with the brain's cells getting the right kind of energy (i.e., chemistry is off).

Traumatic Brain Injury (TBI)

An alteration in brain function or other evidence of brain pathology caused by an external force and characterized by the following:

a. Any period of loss or decreased consciousness
b. Any loss of memory for events immediately before (retrograde) or after (posttraumatic) the injury
c. Any neurological deficits and/or
d. Any alteration in mental state at the time of injury

Types of TBI - OPEN

<u>Penetration to the brain</u>

-Causes *localized* brain damage

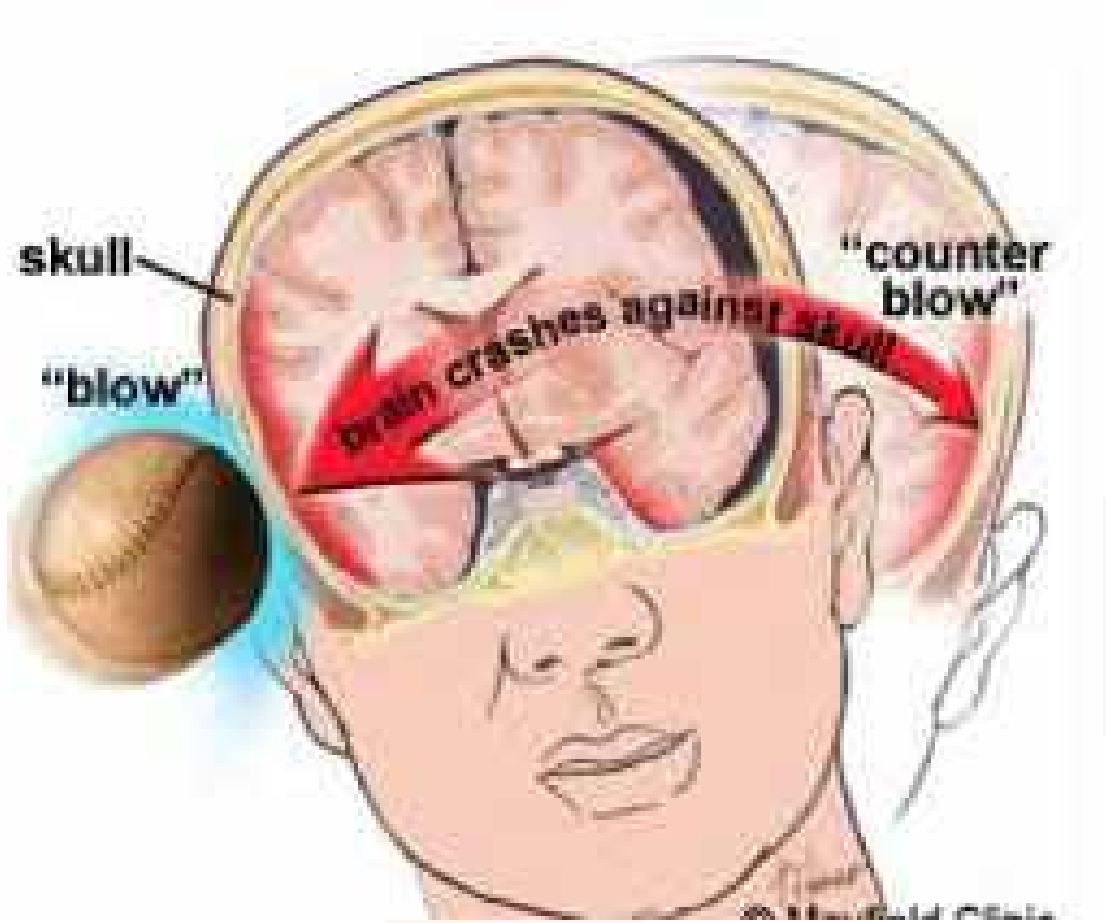
-Result in discrete and relatively predictable disabilities

Types of TBI - Closed

<u>Internal damage to the brain; no open head wound</u>

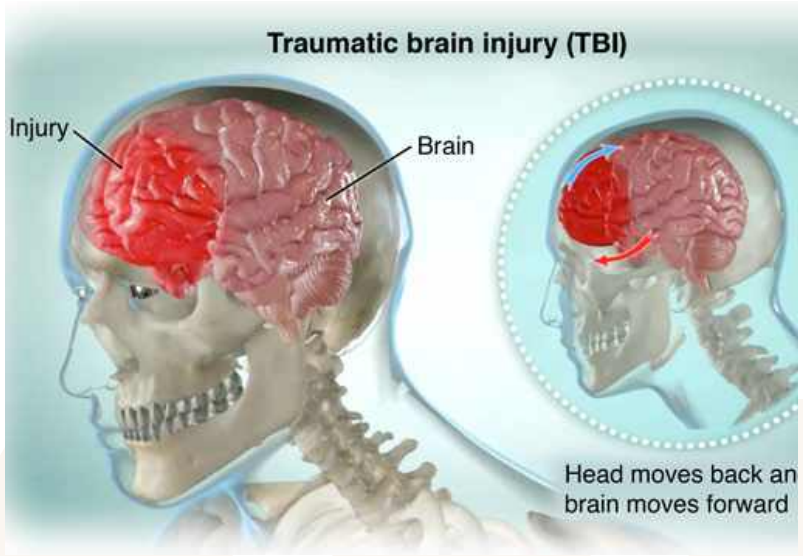
-Causes diffuse tissue damage

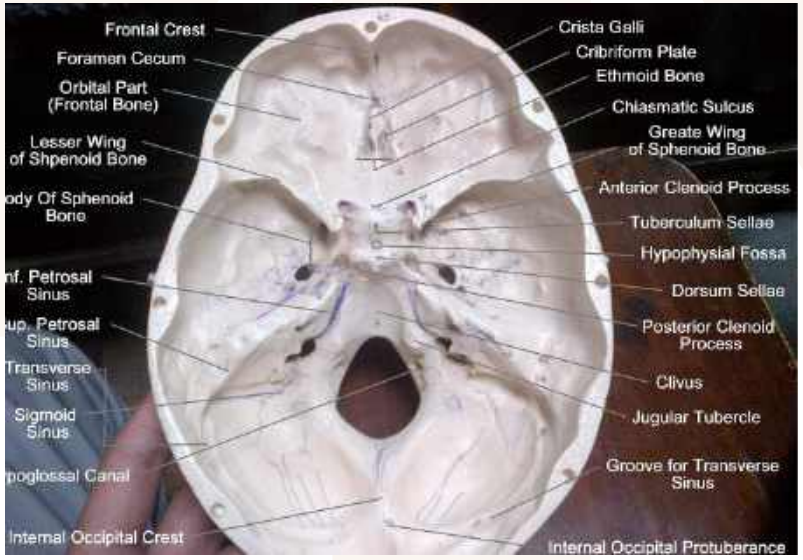
-Result in generalized and highly variable disabilities



Causes of TBI

- Falls
- Motor Vehicle Crashes
- Gunshot Wounds
- Sports Injuries
- Workplace Injuries
- Child Abuse
- Intimate Partner Violence
- Military Actions
- Other injuries caused by trauma





How IS TBI Assessed?

Classification of TBI severity: Glasgow Coma Scale (GCS)

- The most recognized and widely used method for grading TBI severity
- Provides an indicator of gross neurologic status by assessing:
  - Motor functioning (6 = obeys commands fully…1- no response)
  - Verbal responding (5 = alert and oriented…1= no sounds)
  - **Eyes** open voluntarily or in response to external commands and stimuli (4=spontaneous eye opening…1= no eye opening)

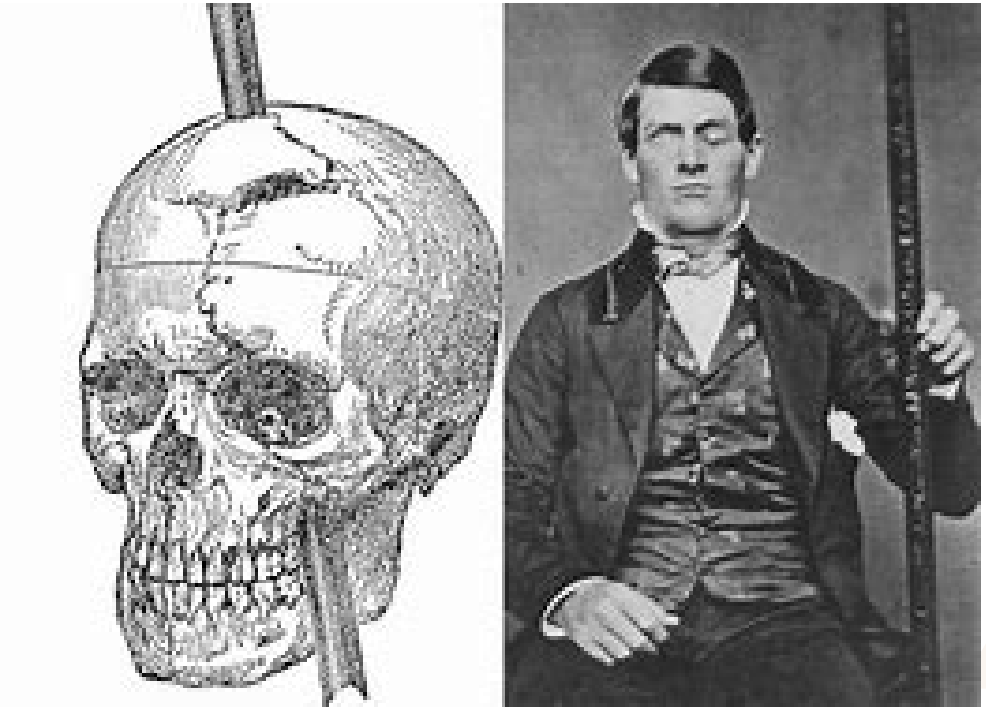
Classification of TBI severity: Post Traumatic Amnesia

- Period of time after an injury when the brain is unable to form continuous day-to-day memories
- Includes a state of disorientation to time, place, and person.
- Can exhibit:
  - Marked agitation
  - Short attention span
  - Severe mood swings
  - Perseverate on words, ideas, activities
  - Difficulty processing complex information

The Classification of Brain Injuries

CLASSIFICATION OF BRAIN INJURY			
Mild	LOC less than 30 minutes	**GCS 13-15**	PTA less than 24 hours
Moderate	LOC greater than 30 minutes, but less than 24 hours	**GCS 9-12**	PTA 24 hours to 7 days
Severe	LOC greater than 24 hours	**GCS 8 or less**	PTA more than 7 days

Injuries are classified according to mild, moderate and severe injuries.



Penetrating TBI/Open Head Injury

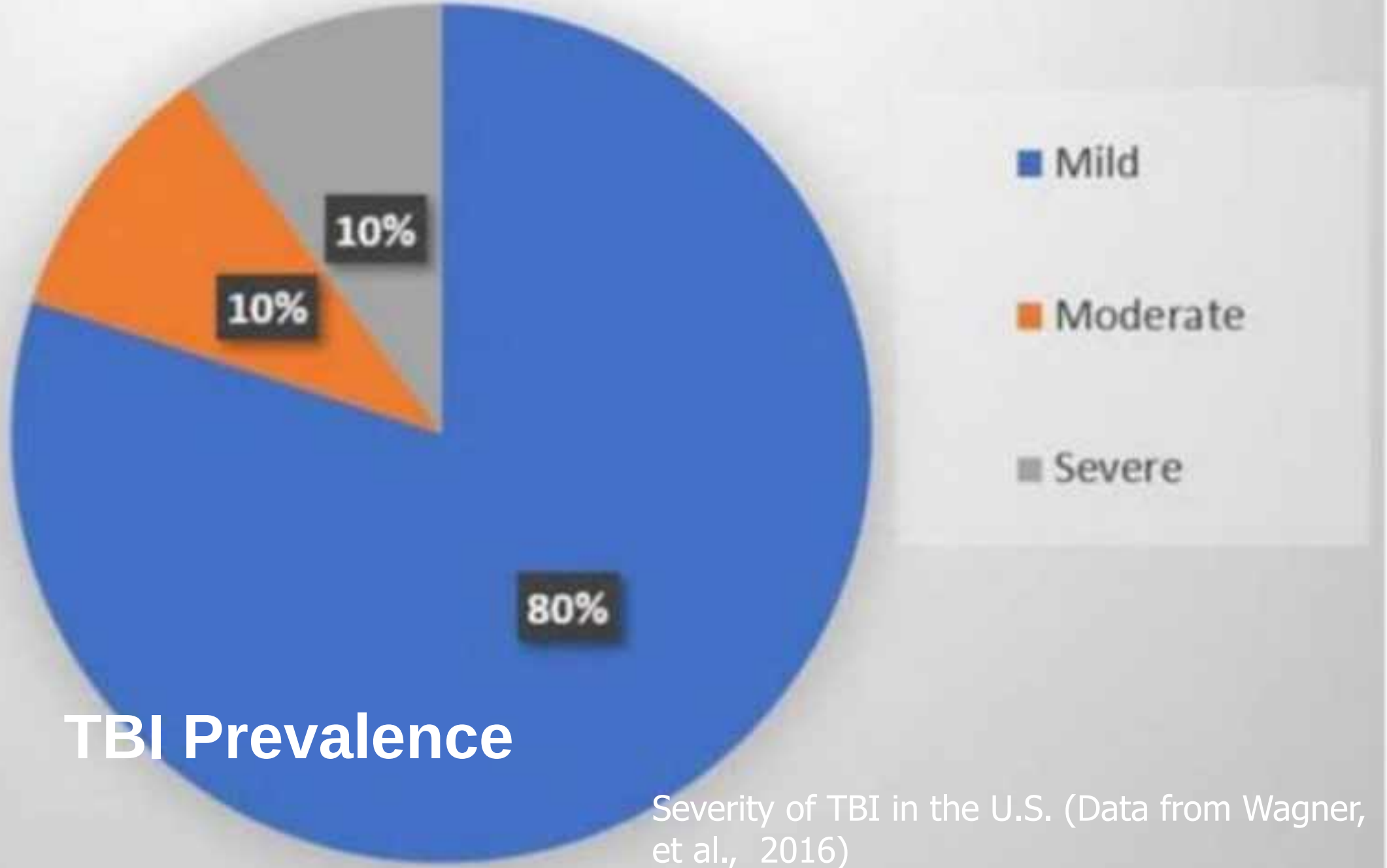
- A head injury in which the scalp skull and dura mater (the outer layer of the meninges) are penetrated.
- Penetrating injuries can be caused by high-velocity projectiles or objects of lower velocity such as knives, or bone fragments from a skull fracture that are driven into the brain.

Epidemiology of TBI

- Every *23 seconds*, one person in the United States sustains a traumatic brain injury.
- More than *50,000* people die every year as a result of traumatic brain injury.
- 284,000 people are hospitalized each year with traumatic brain injury.
- 80,000-90,000 Americans experience the onset of a long-term disability following traumatic brain injury each year.

(CDC, 2011)

TBI Prevalence



Severity of TBI in the U.S. (Data from Wagner, et al., 2016)

Epidemiology of TBI

After one traumatic brain injury, the risk for a second injury is *three times greater*; after the second injury, the risk for a third injury is *eight times greater*.

Who is at highest risk for TBI

- Males are about 1.5 times as likely as females to sustain a TBI
- Males have higher rates of Hospitalization, Death, and Emergency Department Visits
- The three age groups at highest risk for TBI are
  - 0 to 4
  - 15 to 19
  - 75+

Incidence & Age

- Incidence of TBI is highest in the 0-4 age group (1121 per 100,000)
- Deaths from TBI are highest in the 75 or older age group (51 per 100,000)
- Emergency Department visits are highest in the 0-4 age group (1035 per 100,000)

Who is at highest risk for TBI

- A high proportion of individual who sustain TBI have a criminal history
- High prevalence of history of TBI in prison populations with studies reporting prevalence rates ranging from 9.7% to 100%, averaging 46% (Durand, 2017).

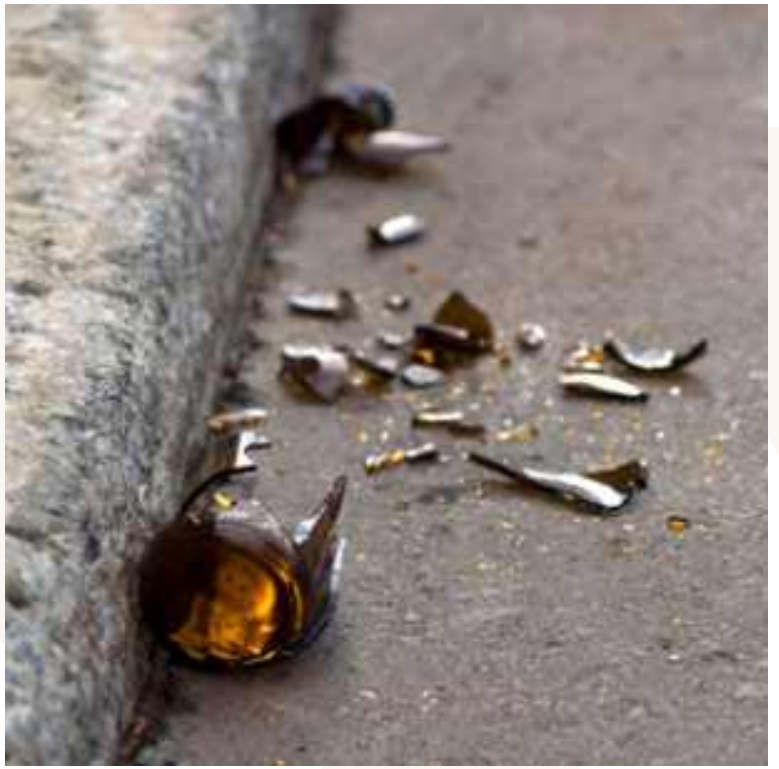
TBI - Inmates

- Across various TBI studies examining offender populations, 25% to 87% of offenders reported having a TBI. (Shiroma et al., 2012; Farrer & Hedges, 2011)

- These estimates suggest that TBI appears more frequent in offender populations (i.e., prisons) than in general population.

Problems associated with Brain Injury: ALCOHOL/SUBSTANCE USE

- Strong link between intoxication and incurring TBI
- Incidence of positive blood alcohol findings (>50% and BAC >.08) in motor vehicle crashes and violence-related TBI (Kraus & McArthur, 1998)
- Hospitalized for TBI– 21% (BAC .08) (Whiteneck et al., 2001)
- Receiving rehab for TBI – 37% (BAC .10) (Corrigan et al., 2003).
- Of study participants with co-occurring mental health and substance use disorder, 80% screened positive for TBI, with 25% reported at least 1 moderate or severe TBI. McHugo et al., 2017)

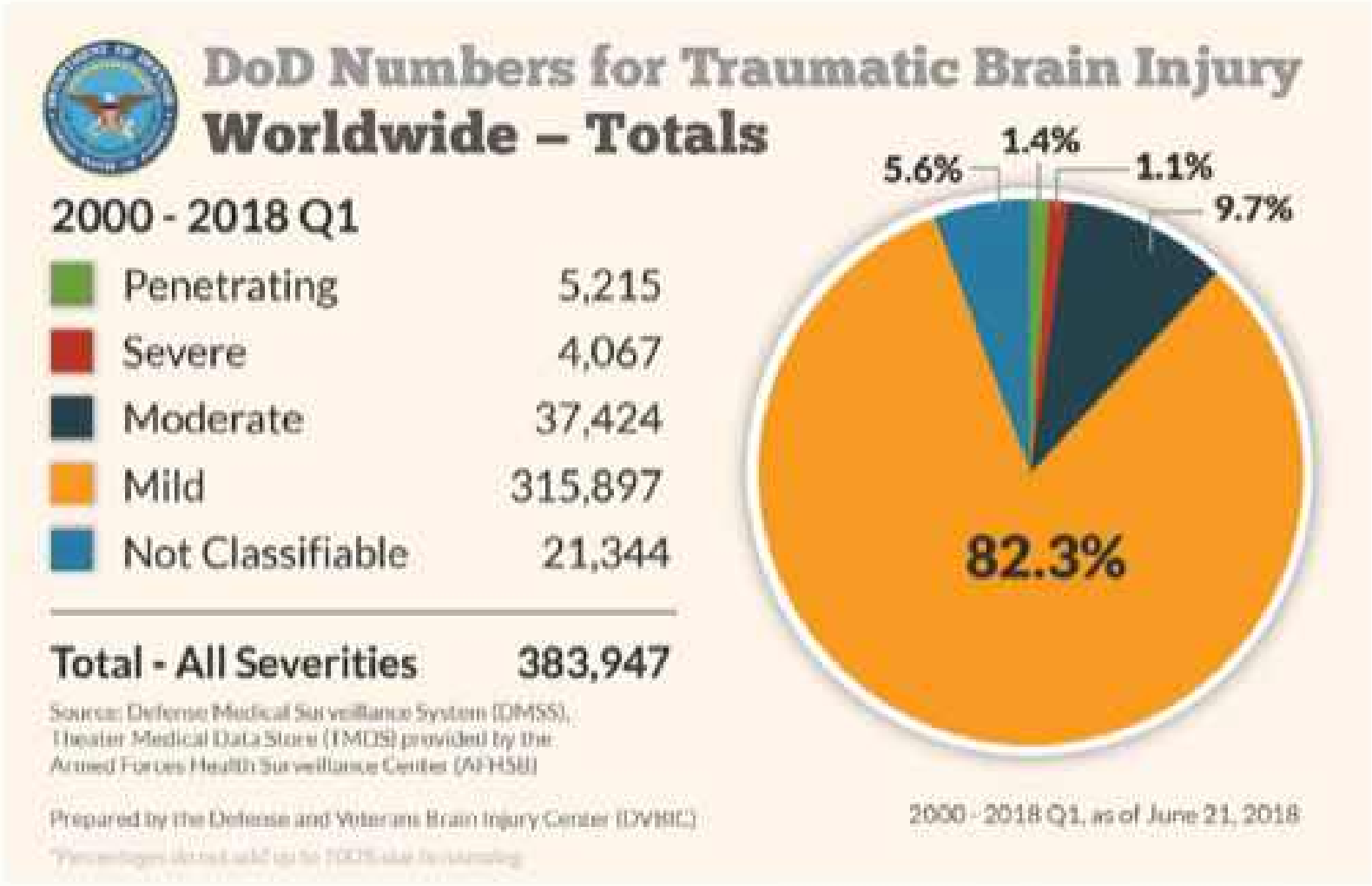


Problems associated with Brain Injury: Substance abuse/ALCOHOL

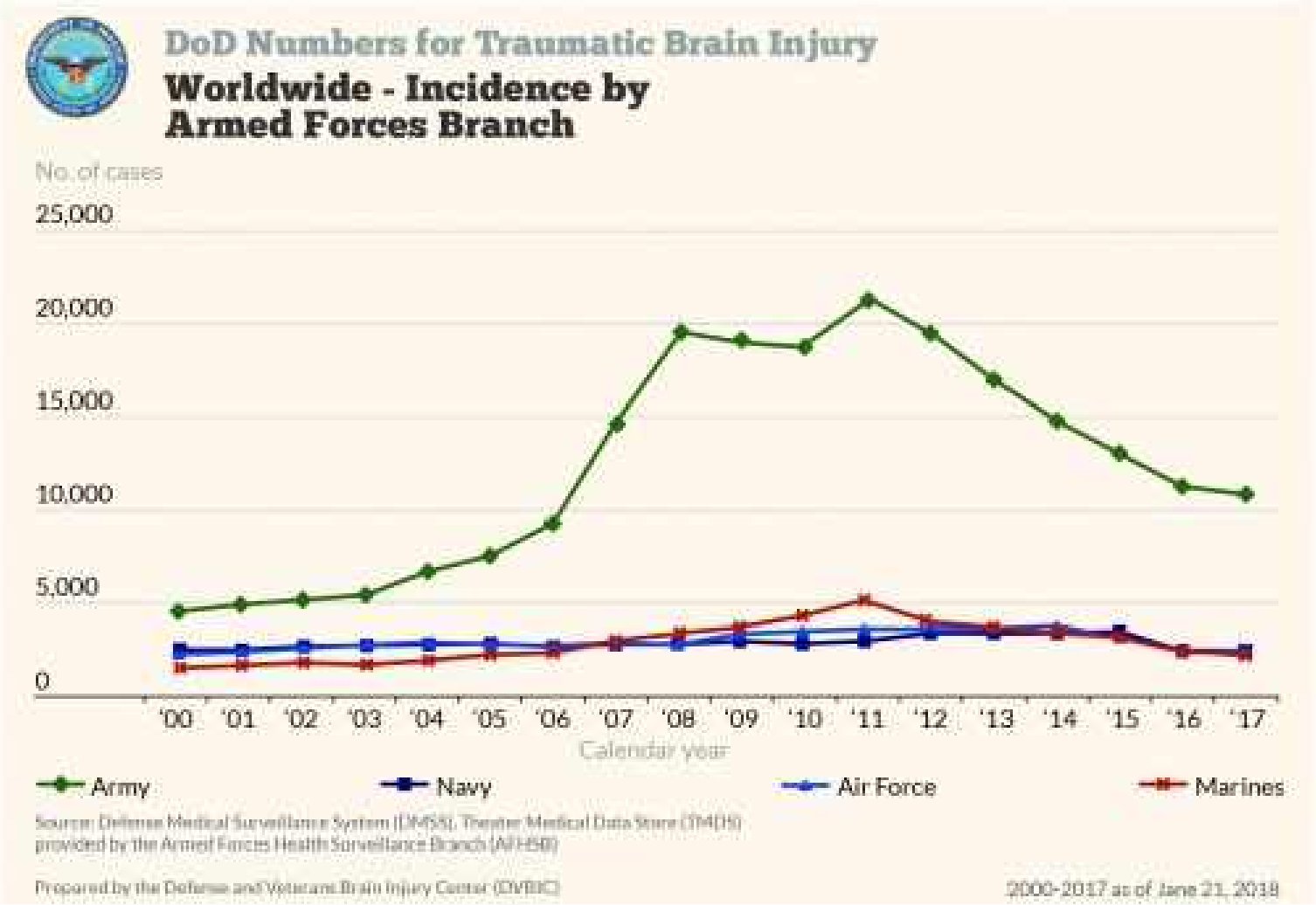
- Those who had substance use issues prior to TBI are likely to return to substance use following injury.
- Alcohol use can be a risk factor for TBI, particularly among older adults. (Dams-O'conner et al., 2016; Bombardier et al., 2002)
- 10%-20% of those with no prior substance use have developed substance abuse disorder following TBI

Military TBI

TBI Severity



TBI Incidence by Armed Forces Branch



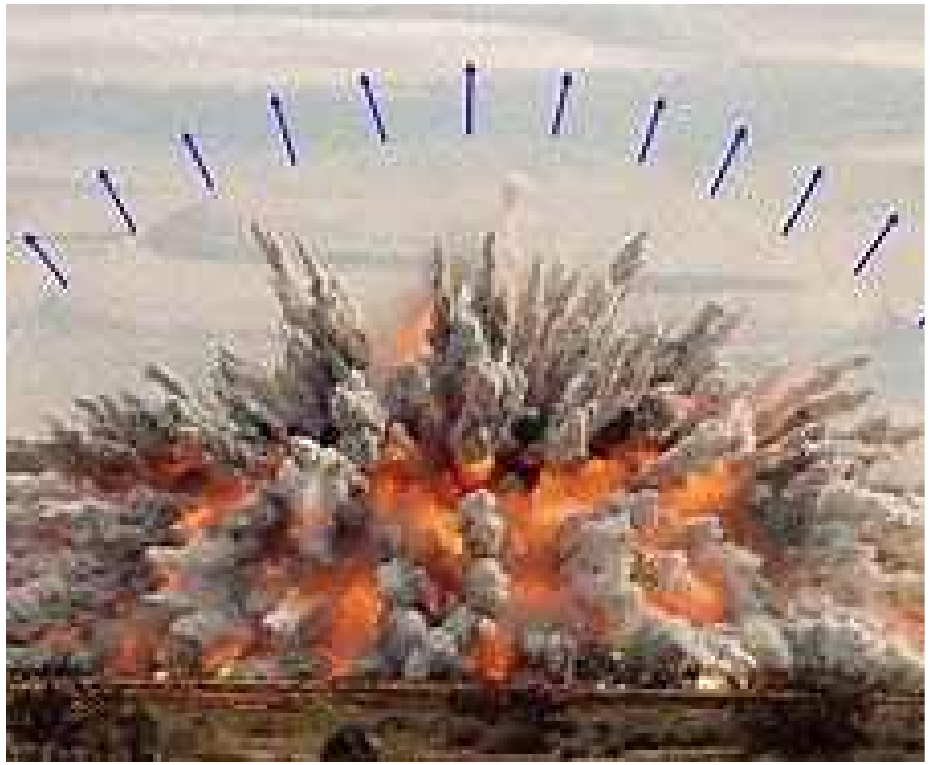
TBI and Veterans

- The relative incidence of penetrating head injuries is especially high compared with civilian population
- The incidence of TBI among US military personnel deployed to Iraq and Afghanistan is reportedly the highest of any military conflict in US history (Okie, 2005; Warden, 2006)
- “Signature Wound”

TBI and Veterans

- Approximately one out of five OIF/OEF Veterans screen positive for TBI.
- An estimated 20% of Veterans who have served since 2001 report experiencing a probable Traumatic Brain Injury (Mathias & Alvaro, 2012)
- Most VA patients with a TBI diagnosis also carried a mental health diagnosis, with PTSD being the most common.

Combat Injuries



- Blast exposure
- The majority of OIF-OEF injuries during combat are caused by blasts, and most are mild in severity
- Motor vehicle accidents
- Falls

CONSEQUENCES OF BRAIN INJURY

Layman's View of How The Brain Works…

And How It Might Look After A TBI…

Frontal lobe

Initiation
Problem solving
Judgement
Inhibition of behavior
Planning
Self monitoring
Motor planning
Personality
Awareness of abilities
Organization
Attention/concentration
Mental flexibility
Expressive language

Temporal lobe

Learning and Memory

- Left side – verbal
- Right side- nonverbal
- Understanding speech and language
- Hearing, organization, sequencing

Parietal Lobe

Sensory information and integration

- Sense of touch
- Differentiation of size, color, shape
- Spatial and visual perception

Occipital lobe

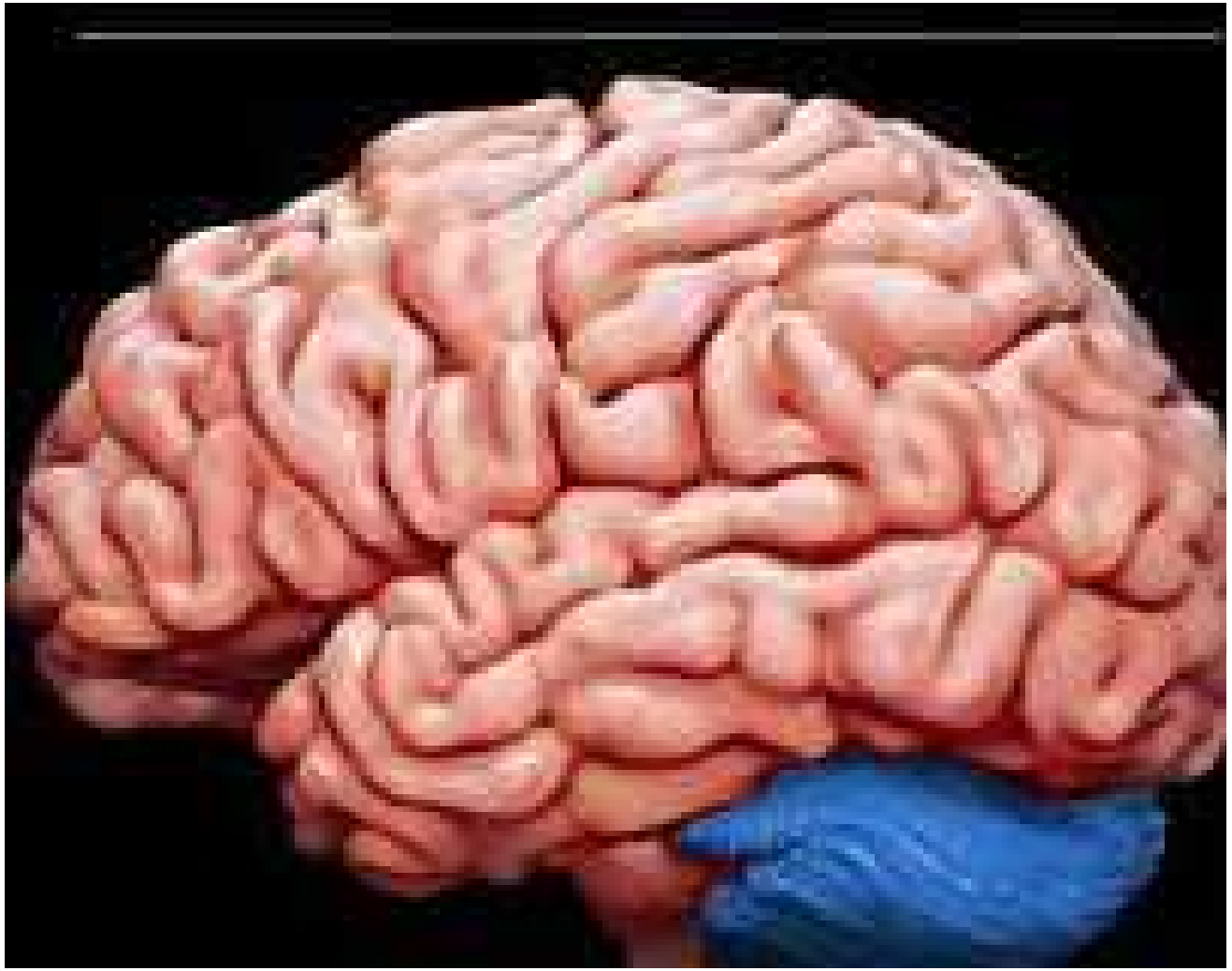
Vision and visual integration

Cerebellum

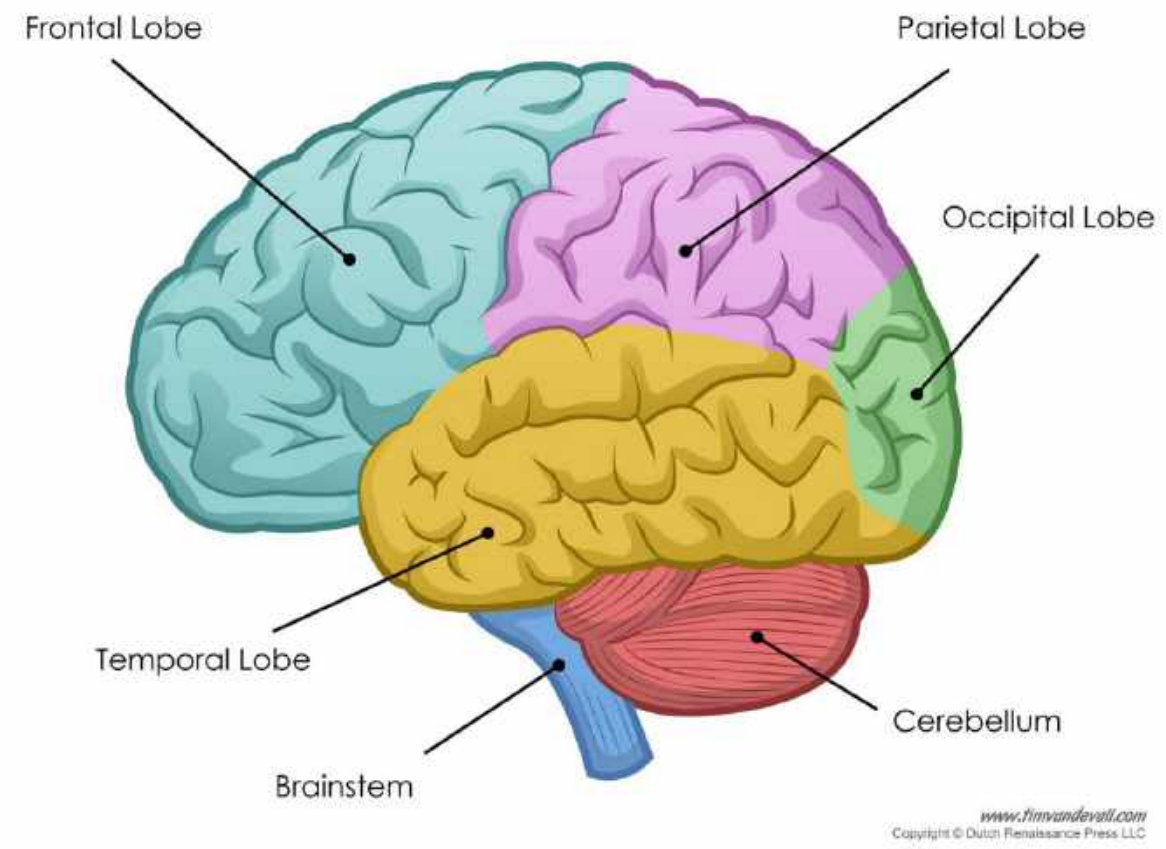
Balance

Coordination

Skilled motor activity

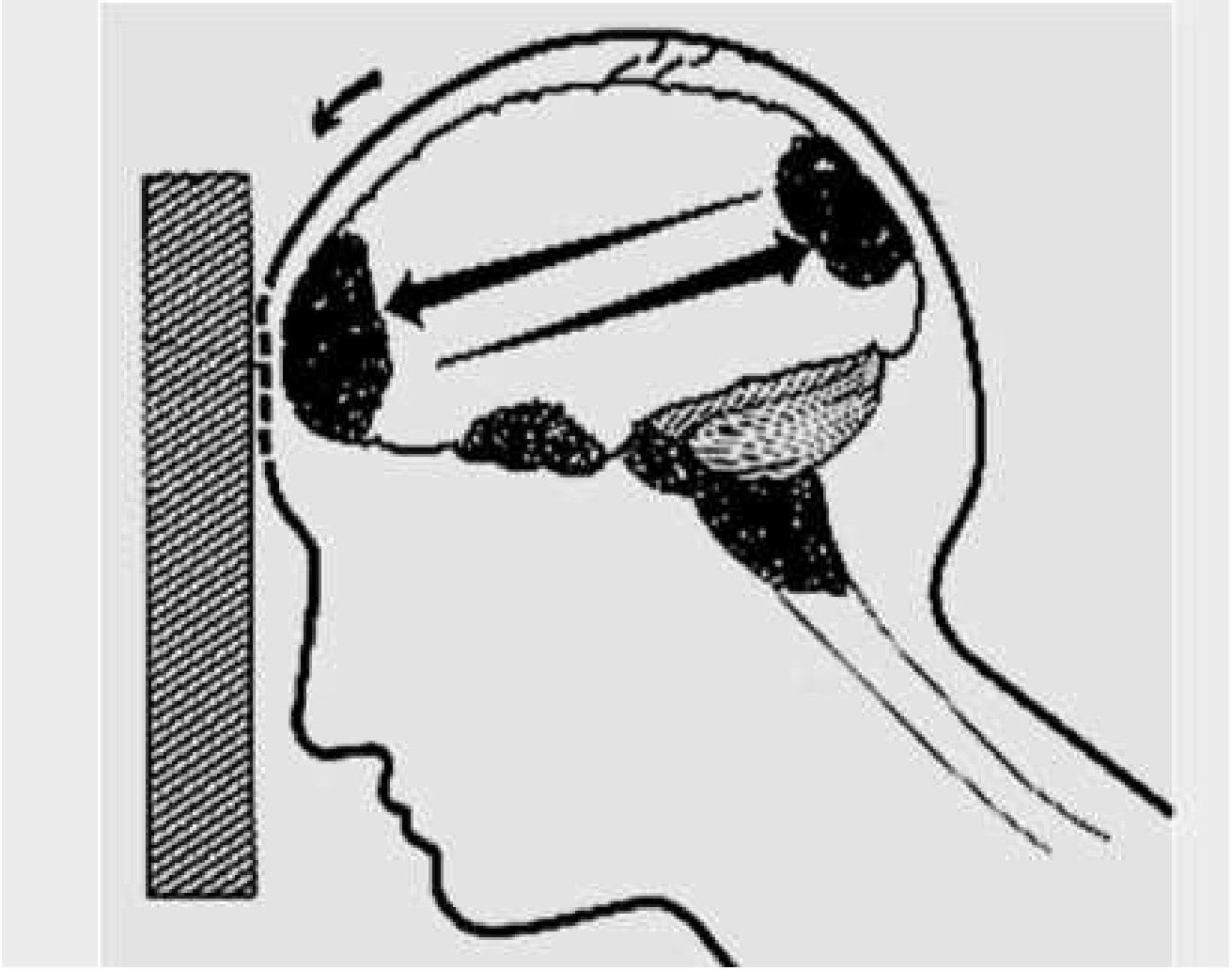


Most Common Areas Affected?



Mechanism of Damage

- Bruising of brain due to forward/backward movement against skull
- Twisting of nerve fibers due to twisting of brain within skull
- Nerve fibers are broken or stretched = temporary or permanent brain damage

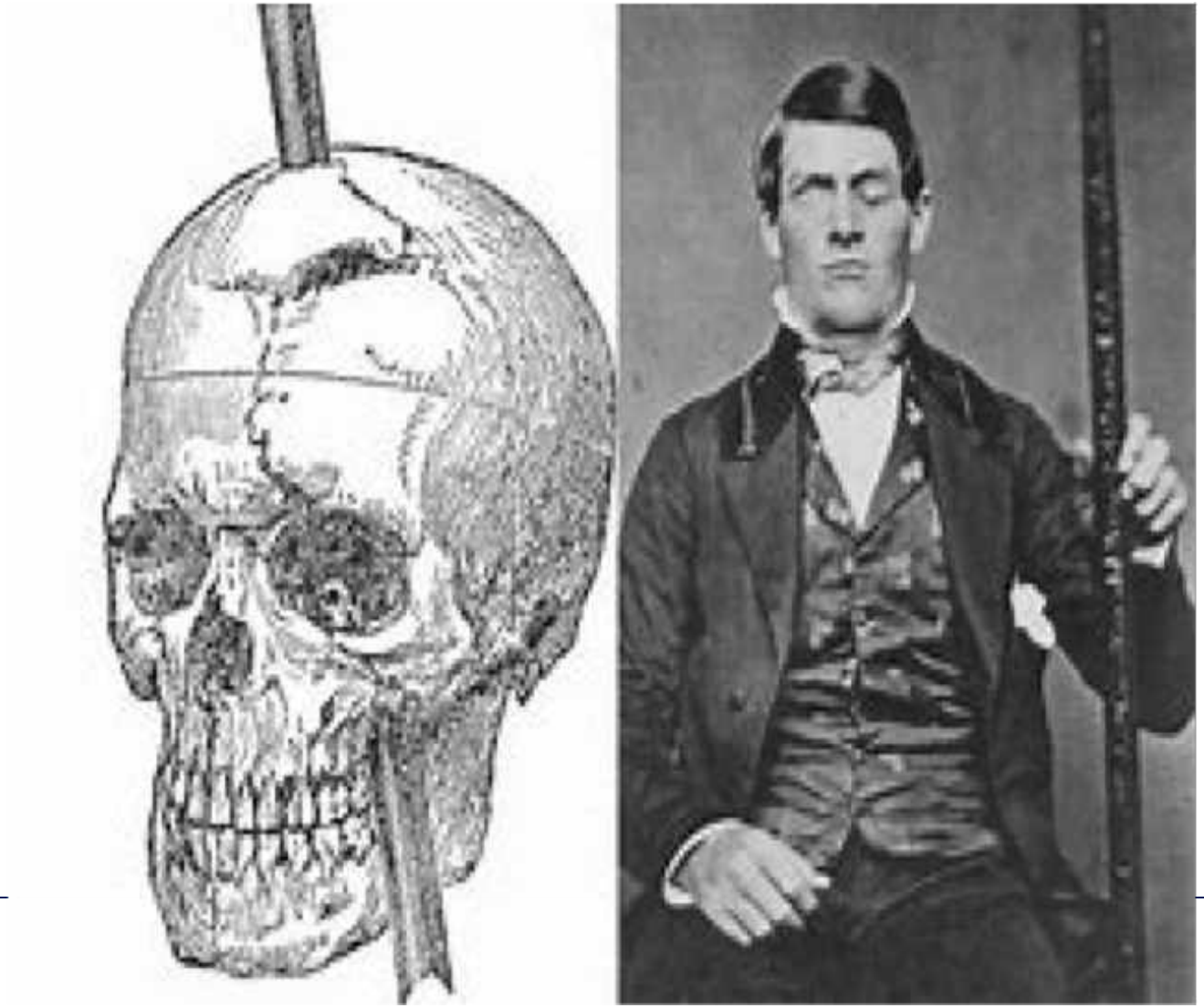


Changes After TBI

IN A SPLIT SECOND…

- Who we are
- The way we think
- The way we feel
- Can dramatically change

Changes After TBI



What Happens in a TBI

Nerve fibers within specific areas of the brain are severed, never to be regained

Nerve fibers are stretched, resulting in inefficient and slowed functioning

Onset of physical, cognitive and behavioral changes after the TBI reflect impaired functioning due to these broken or stretched nerve fibers

Physical Problems

- Overall slowing
- Clumsiness
- Decreased vision/hearing/smell
- Dizziness
- **Headaches**
- **Fatigue**
- Increased sensitivity to noise/bright lights

Sleep Problems following a TBI

Sleep disorders are three times more common in TBI patients than in the general population.

Nearly 60% of people with TBI experience long-term difficulties with sleep.

Sleep problems are more likely to develop as the person ages.

Traumatic Brain Injury (TBI) and Sleep

- Traumatic Brain Injury has been associated with:
  - Alterations in Circadian Rhythms
  - Disrupted Sleep Patterns
  - Diminished Sleep Quality
- 20%-94% of Veterans with TBI experience insomnia

(Tanielian & Javcox, 2008; Mahmood et al., 2004; Farrell-Carnahan et al., 2013)

Functional Impairment: Loss of independence

- Driving
- Money management
- Medical decision making
- Preparing meals
- Grocery shopping
- Laundry/household chores

Cognitive Changes

- Attention
  - Reduced concentration
  - Reduced visual attention
  - Inability to divide attention between competing tasks
- Processing speed
  - Slow thinking
  - Slow reading
  - Slow verbal and written responses

Cognitive Changes

- Communication
  - Difficulty finding the right words, naming objects
  - Disorganized in communication
- Learning and Memory
  - Information before TBI intact
  - Reduced ability to remember new information
  - Problems with learning new skills

Cognitive Changes – Executive Functioning

- Difficulty planning/setting goals
- Problems being organized
- Concrete thinking – difficulty remaining flexible
- Problem solving deficits
- Difficulty prioritizing
- Decreased awareness of cognitive deficits in self (anonsognosia)

Emotional/Behavioral/Social Changes – frontal lobe

- Depression
- Anxiety
- Irritability/agitation
- Impatience
- Increased Impulsivity
- Difficulty with self-initiation
- Increased risk taking
- Rapid loss of emotional control (short fuse)/self monitoring
- Increased self focus
- Socially inappropriate
- Rebellious
- Inability to get along with others
- Intolerant

Important points to remember

- No two brain injuries are exactly the same
- The effects of brain injury depend on factors such as cause, location, and severity
- Adjustment depends on "before-after" changes in the person – perception.
- Brain injury does not occur in a vacuum

Long Term Challenges Post TBI

- **Vocational and/or school difficulties/failure**
- **Family life/social relationships collapse**
- **Increased financial burden on families and social service systems**
- **Alcohol and drug abuse**
- **Chronic depression/anxiety**

Chronic Comorbidities Following TBI: Mod-Severe

Years after Injury…

- Depression
- Aggression
- Psychosis
- Endocrine dysfunction
- Alzheimer's-type dementia
- Parkinsonism
- Premature death
  - Open or penetrating TBI contribute to unprovoked seizures

Health Comorbidities associated with TBI

- In comparison to uninjured control groups individuals with TBI have MORE THAN TWICE the rates of:
- Pain (Ponsford et al., 2013)
- Growth hormone deficiency (Tanriverdi et al., 2015)
- Insomnia and fatigue (Beaulieu-Bonneau and Morin, 2012)
- New onset stroke (Liao et al., 2014)
- Urinary incontinence (Keller, Liu, & Lin, 2013)
- Epilepsy (Yeh at al., 2013)

Rehospitalization

- Greater risk of rehospitalization, with greater risk increasing around 5 years postinjury (Marwitz, Cifu, Englander, and High, 2001).
  - Infections
  - Neurological events
  - Neurosurgical procedures
  - Psychiatric events
  - Orthopedic disorders

Uniquely at risk for death CAUSED BY:

- Seizure
- Accidental poisoning
- Infection (i.e., aspiration pneumonia, pneumonia, septicemia)
- Respiratory disorder
- Suicide
- Homicide
- Falls
- Vehicular collisions

(Harrison-Felix, Pretz, and Hammond, 2015)

Chronic Effects of Brain Injury: Moderate to Severe

Greater risk for Alzheimer's Disease, Parkinson's Disease, and ALS.

Veterans with severe TBI were 4 times more likely to have AD, whereas veterans with moderate TBI were twice as likely to have AD in late life compared with controls

Chronic Effects of Brain Injury

- In a cohort study of >350,000 veterans, even concussion/mild TBI without LOC was associated with a 2-fold increase in risk of dementia diagnosis (Barnes et al., 2018)

- Concussion/TBI was associated with 56% increased risk of Parkinson's disease, even after adjusting for demographics and medical/psychiatric comorbidities (Gardner et al., 2018)

Chronic Effects of Brain Injury: repetitive concussions

- Chronic Traumatic Encephalopathy – clinically characterized by mood and behavioral disturbances, progressive decline of memory and executive functioning, and cognitive deficits that eventually progress to dementia over the course of decades.
- Mood and behavioral disturbances: depression, apathy, impulsivity, anger, aggression, irritability, and suicidal behavior
- CTE can only be diagnosed definitively at postmortem neuropathological examination
- Found primarily in athletes

Factors that Impact Outcomes of Brain Injury

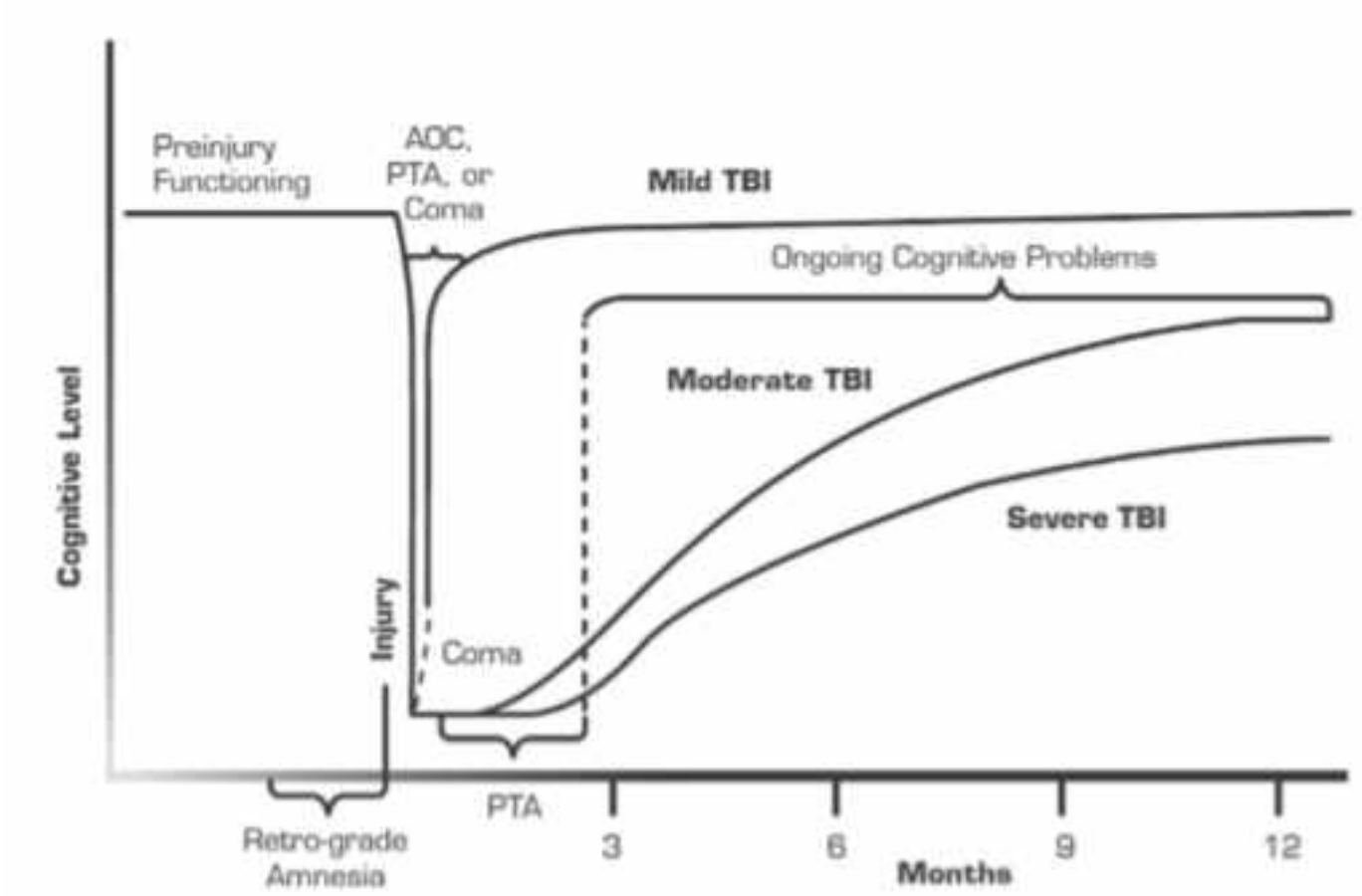
MEDICAL

- Severity of injury
- Duration of LOC
- Patterns of imaging abnormalities (focal vs. disseminated)
- Location of injury
- Host Factors

PSYCHOSOCIAL

- Social Support
- Level of education
- Employment prior to injury
- Substance abuse (before and after)
- Personality/coping
- Mental Health
- Secondary Gain

Natural Course of Recovery



Concussion - prognosis

- Chronic symptoms from concussion are RARE
- Most patients return to normal baseline in days to up to 3 months
- Ongoing symptoms after concussion are likely co-occurring conditions and not direct symptoms
- Symptoms are most severe in the hours to days following injury and gradually improve to the degree possible
- Progressive decline is not part of the natural history of TBI of any severity.

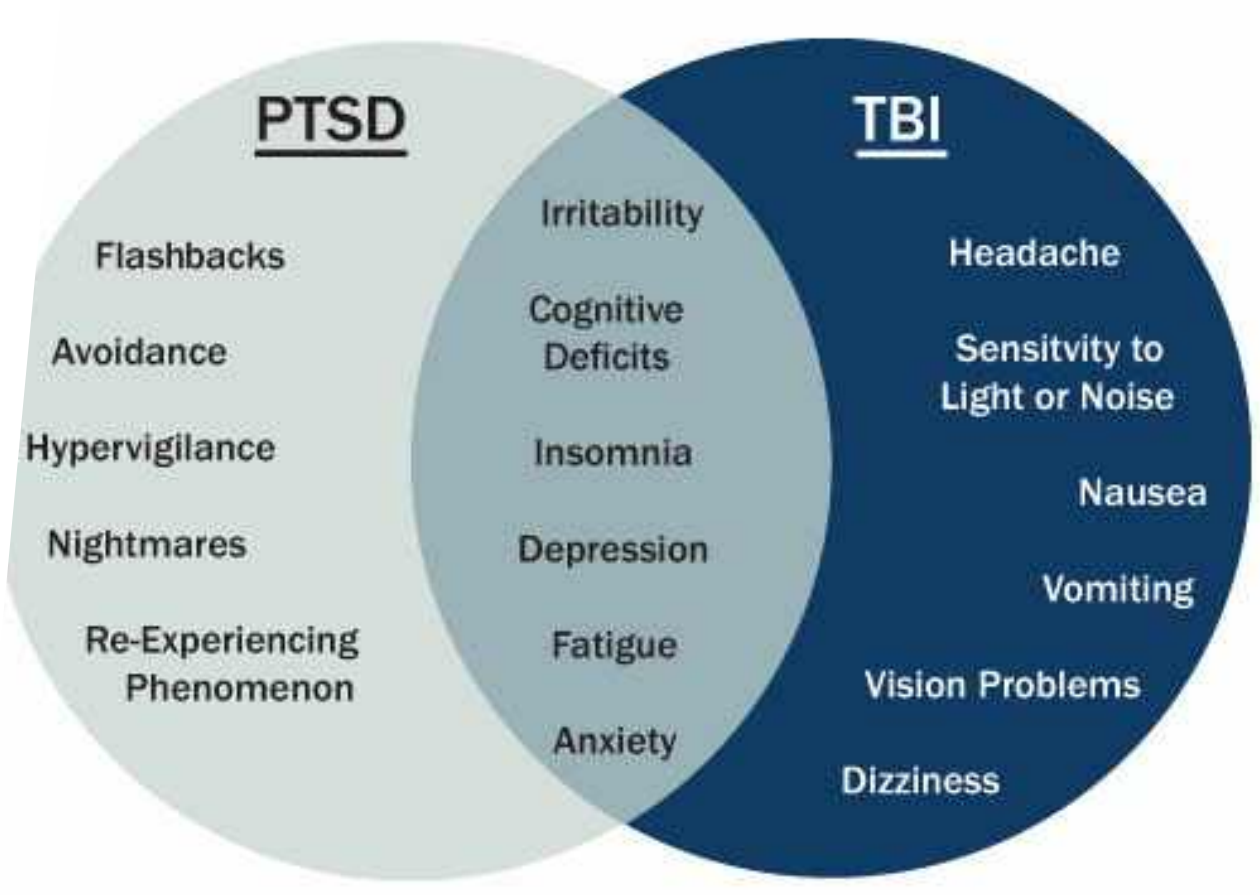
Post Concussive Syndrome

- A complex disorder in which various symptoms (e.g., headaches, dizziness, fatigue, irritability, etc.) persist for weeks, months, or a year (although rare) following mTBI/concussion.
- Quite Controversial
  - Conflicting findings regarding symptom duration
  - Absence of objective neurologic findings
  - Inconsistencies in presentation
  - Poorly understood etiology
  - Methodologic problems in the literature

Post Concussion Syndrome

- Per ICD10
- History of TBI with loss of consciousness preceding symptom onset by a maximum of 4 weeks
- 3 or more of the following categories
  - Headache, dizziness, malaise, fatigue, noise intolerance
  - Irritability, depression, anxiety, emotional lability
  - Subjective concentration, memory or intellectual difficulties w/o neuropsychological evidence of marked impairment
  - Insomnia
  - Reduced alcohol tolerance

Symptom Overlap



	mTBI	PTSD	Pain	Depression
Attention/ Concentration	X	X	X	X
Memory	X	X		X
Fatigue	X	X	X	X
Lightheadedness	X	X		
Sensitivity to light/sound	X	X	X	
Slowed thinking	X	X		X
Irritability	X	X	X	X

McCrae, 2008

	Headache	Dizziness	Irritability	Memory Problems	Concentration problems
College Students	36%	18%	36%	17%	42%
Chronic Pain Patients	80%	67%	49%	33%	63%
Depressed	37%	20%	52%	25%	54%
PI claimants (non-TBI)	77%	41%	63%	46%	71%
mTBI	42%	26%	28%	36%	25%

Research Findings

Being DEPLOYED is associated with cognitive change (regardless of TBI hx)

PTSD is more predictive of symptoms than history of concussion

Clinical Consideration – What to do?

Screenings

- TBI
- Anxiety
- Depression
- PTSD
- Etoh/SA

- Has there been an event that had the potential to cause a significant force to the head?
  - If yes, was this force to the head immediately followed by:
    - A. Any period of loss of or a decreased level of consciousness
    - B. Any loss of memory for events immediately before or after the injury (post traumatic amnesia).
    - Alteration in mental state at the time of the injury (mental confusion, disorientation, slowed thinking, etc.)

Mental Health Treatment

- Individual
- Group (psychoeducation, TBI, caregiver support)
- Couples/family
  - Communication skills
  - Interpersonal skill building

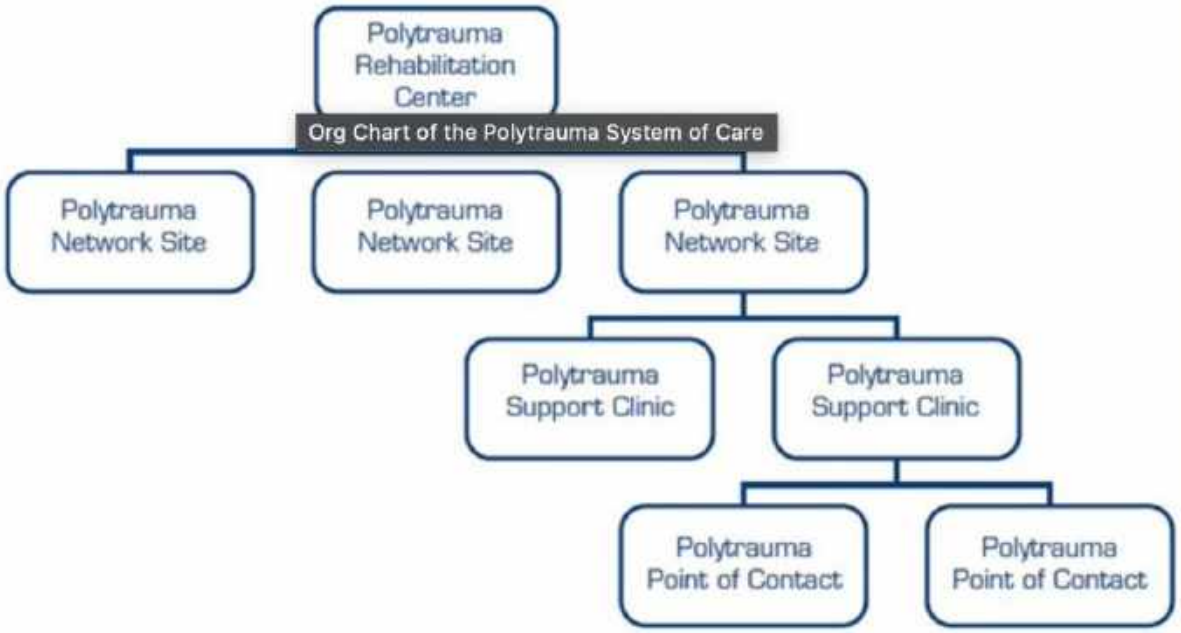
Consider Further Evaluation

- Neuropsychological evaluation
  - Help identify cognitive deficits/strengths, possible changes 2/2 TBI
  - Provide specific recommendations regarding accommodations for school and/or work to support vocational aspirations
  - Recommendations regarding additional therapies (e.g., speech therapy, occupational therapy, etc.)

Vocational Assessment/ Counseling

- Testing for vocational interests, work values, and skills
- Job site evaluations
- Job task review and practice
- Work readiness assessment
- Job counseling
- Interview coaching

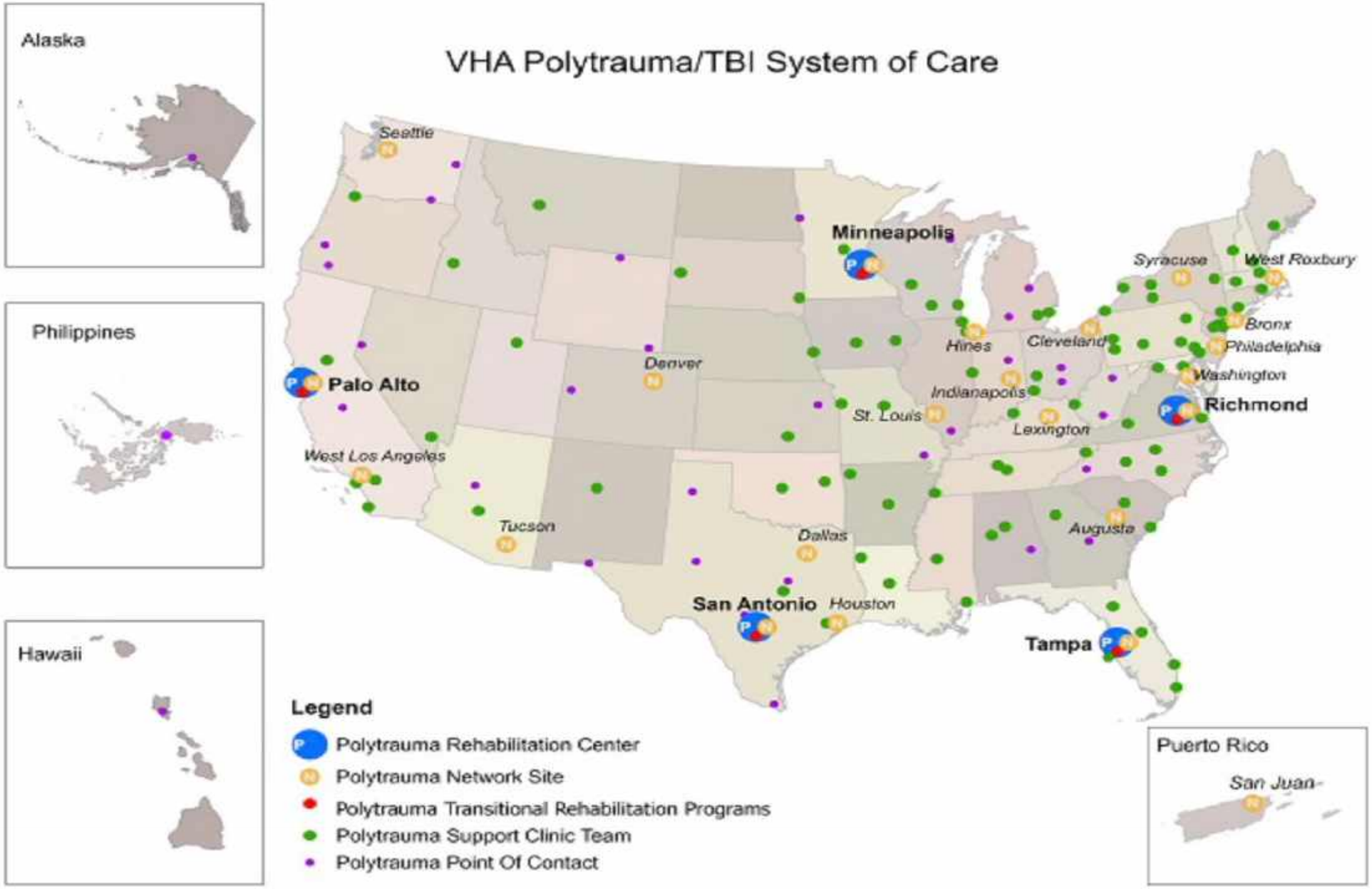
VA POLYTRAUMA/TBI SYSTEM OF CARE



VA has a Polytrauma/TBI national system of care composed of four components:

- Polytrauma Rehabilitation Centers (PRCs) are regional referral centers for acute inpatient medical and rehabilitation care
- Polytrauma Network Sites (PNS) provide post-acute rehabilitation and coordinate polytrauma services within the Veterans Integrated Service Networks (VISNs)
- Polytrauma Support Clinic Teams (PSCT) provide outpatient interdisciplinary rehabilitation evaluation and treatment services within their catchment areas
- Polytrauma Point of Contact (PPOC) at each VA facility deliver a more limited range of rehabilitation services and facilitate referrals to other PSC programs, as necessary

Polytrauma System of Care Locations



Practical considerations

- 6th to 8th grade reading level (word has option to check readability – grade level language is)
- Whenever possible, provide option to have importance information in writing
- Slower processing speed
  - Be patient and maintain a calm attitude at all times
  - Recognize that slowed thinking does not equate lower intelligence
  - Speak more slowly, with slightly longer pauses than usual
  - Allow more time for Veterans to respond

Resources

- Brain Injury Association (https://www.biausa.org)
- Brainline (https://www.brainline.org) - Brain Injury and PTSD, especially helpful for caregivers
- https://www.polytrauma.va.gov
- https://www.stroke.org - National Stroke Association
- https://msktc.org/tbi TBI Model Systems Knowledge Translation Center
- https://www.polytrauma.va.gov/concussioncoach.asp (concussion coach app)

Resources (TBI Screening for Veteran)

- TBI Screening: DVBIC (3 questions)
- https://www.mirecc.va.gov/docs/visn6/5_TBI_3_Question_Screening_Tool.pdf
- Brief ABI Screen
- The Ohio State University Traumatic Brain Injury(TBI) Identification Method
- https://wexnermedical.osu.edu/neurological-institute/neuroscience-research-institute/research-centers/ohio-valley-center-for-brain-injury-prevention-and-rehabilitation/osu-tbi-id

Ask the Expert

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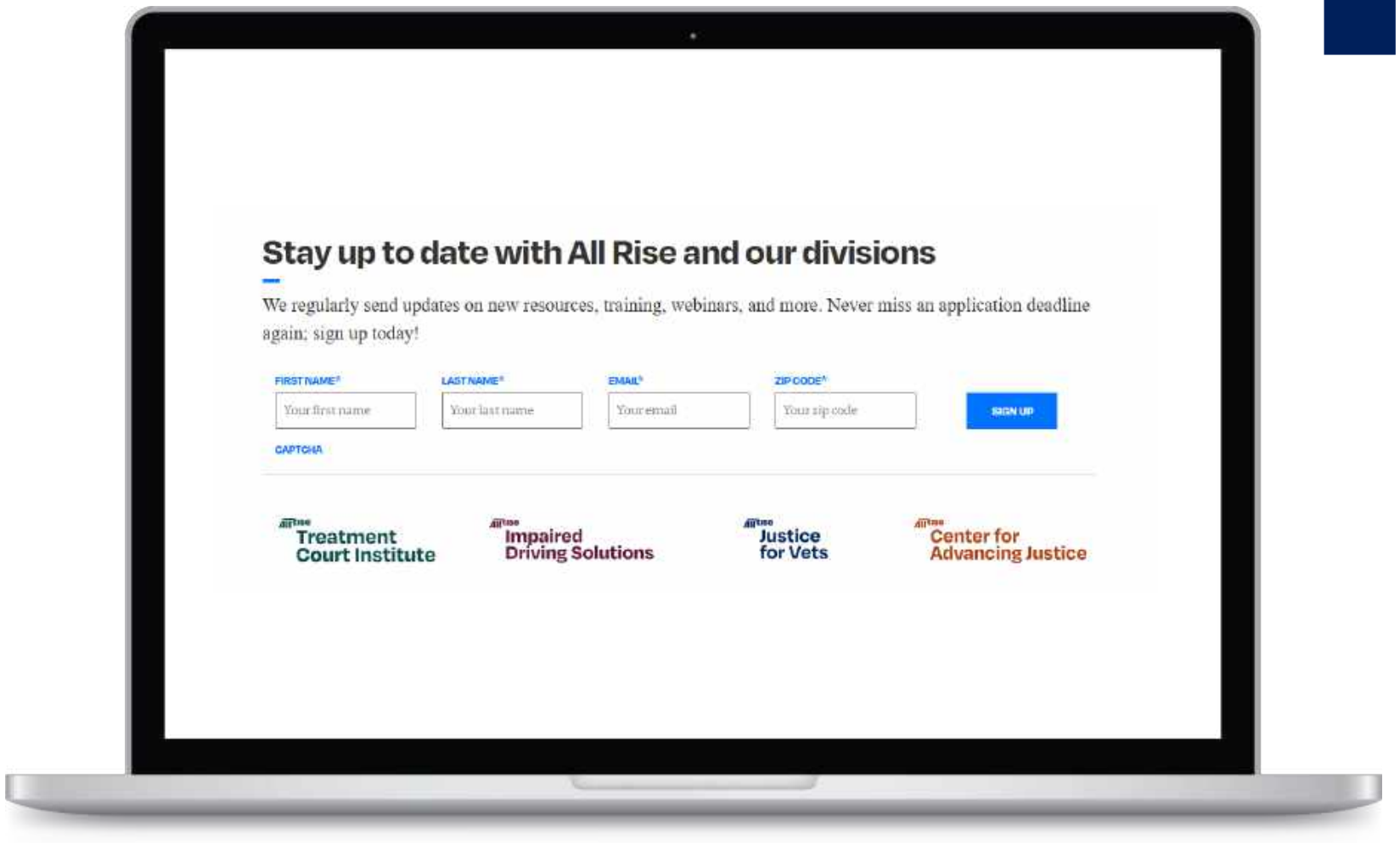

Evaluations

1. On your compatible phone or tablet, open the built-in camera app.
2. Point the camera at the QR code.
3. Tap the banner that appears on your phone or tablet.
4. Follow the instructions on the screen to complete the evaluation.
5. After completion, you will be provided with a certificate that can be saved and printed.

Justice for Vets

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