



# Concussions: -On and off the job- It's more than just a headache

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# Objectives

- How to recognize risk factors/prevention
- How to recognize when a head injury has occurred
- What to do in the short-term
- What to do in the long-term
- Goals of long-term
- Recognize ongoing effects and symptoms
- New treatment options/latest trends
- Community resources

# Disclosures

- No disclosures

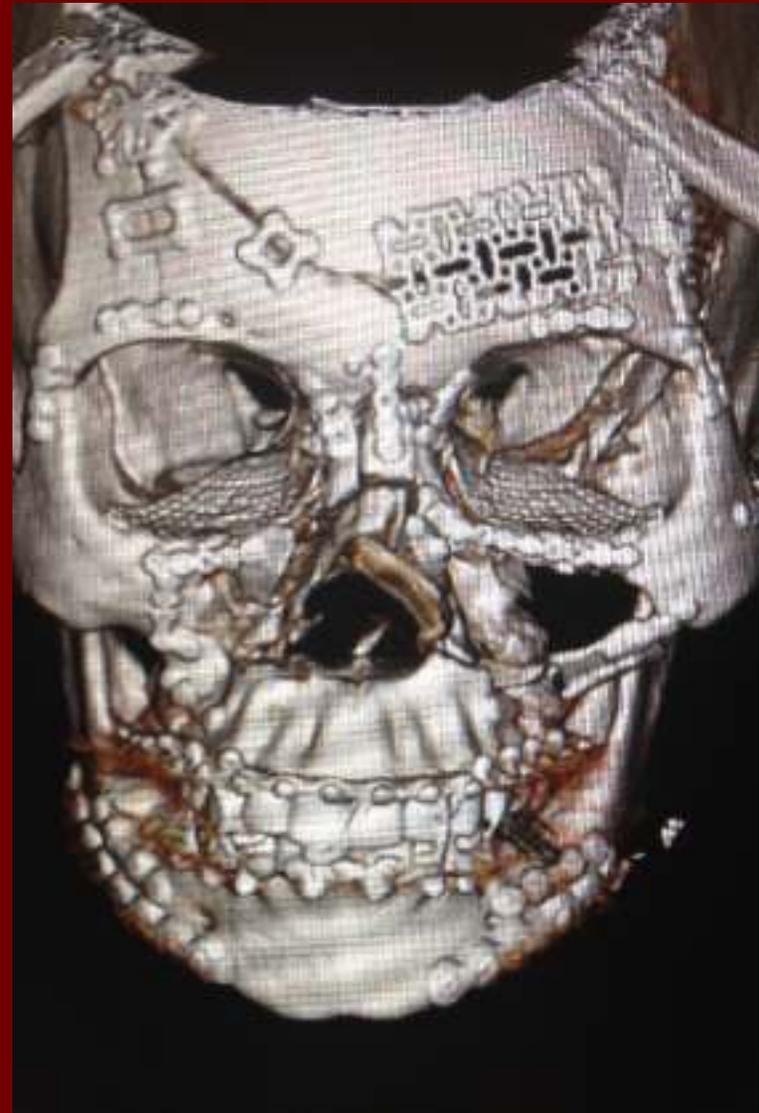
# Concussions: Things to Know



# A day in the life...working with TBI



# Direct blow/impact

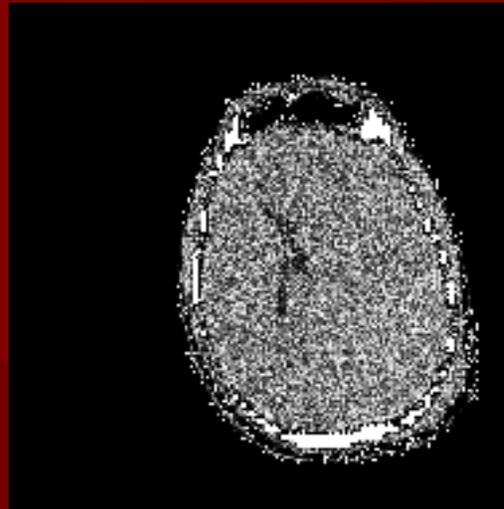


# Explosion/blast



# What is a concussion?





## TRAUMATIC BRAIN INJURY

- A concussion is a form of mild TBI
- Vast majority of TBIs are mild or concussions

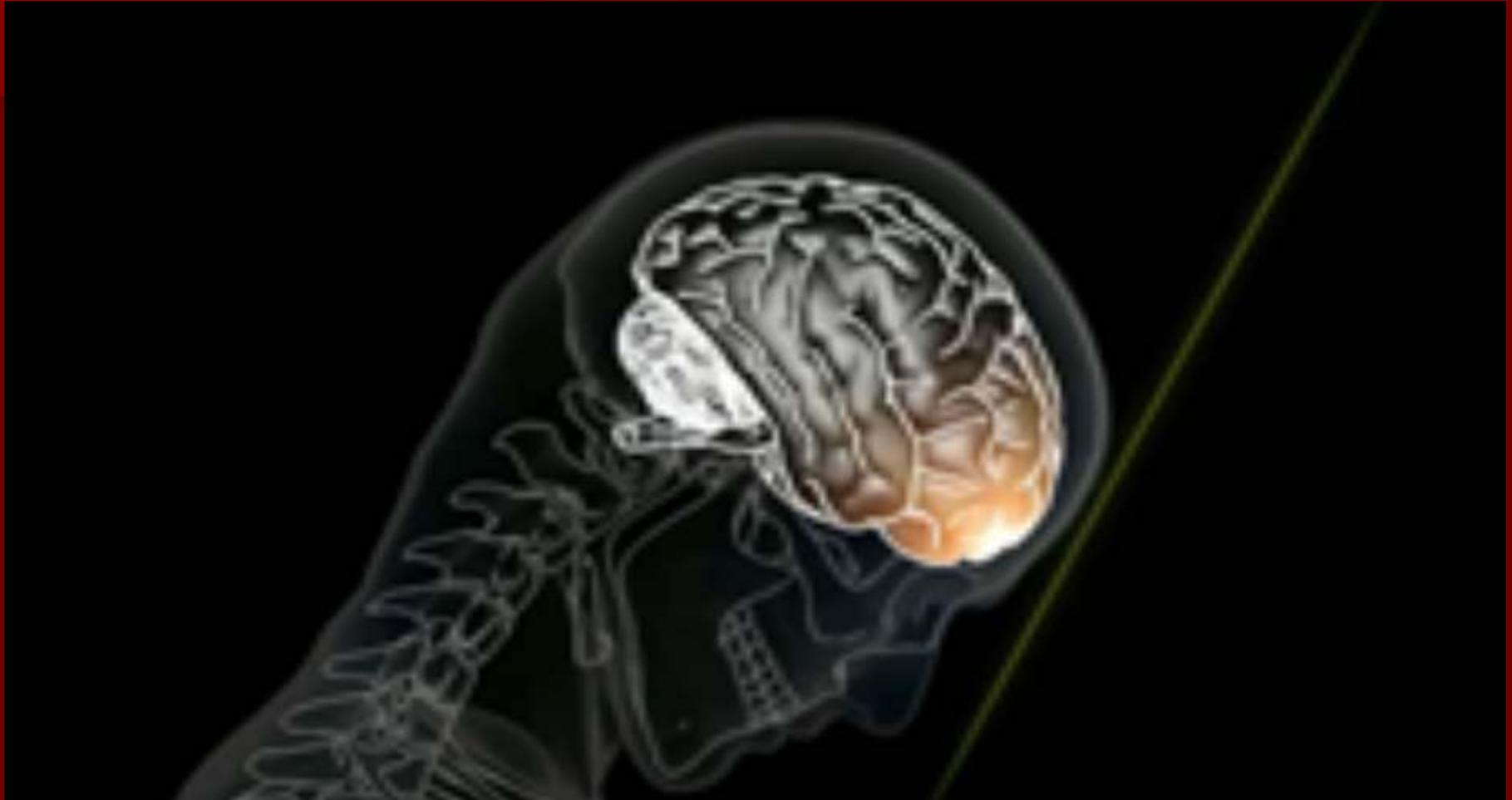
CDC: 64,000 TBI-related deaths in the United States in 2020.<sup>3</sup> That's about 176 TBI-related deaths every day

60,000 High School students suffer from concussion each year (under reported)

Centers for Disease Control and Prevention. National Center for Health Statistics: Mortality data on CDC WONDER. Available

at: <https://wonder.cdc.gov/mcd.html> ■

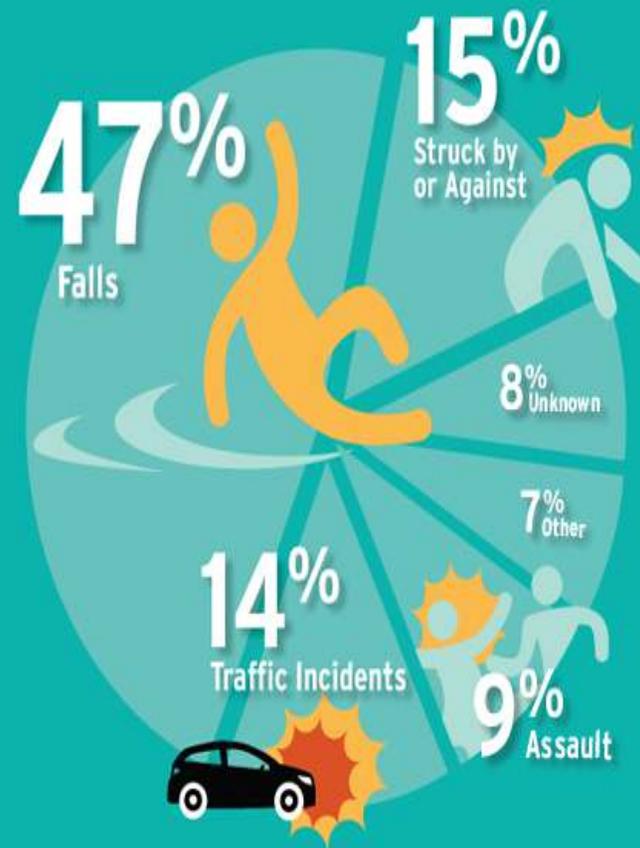
# Mechanism of injury



[https://www.cdc.gov/headsup/basics/concussion\\_what.html](https://www.cdc.gov/headsup/basics/concussion_what.html)

# Mechanism of Injury

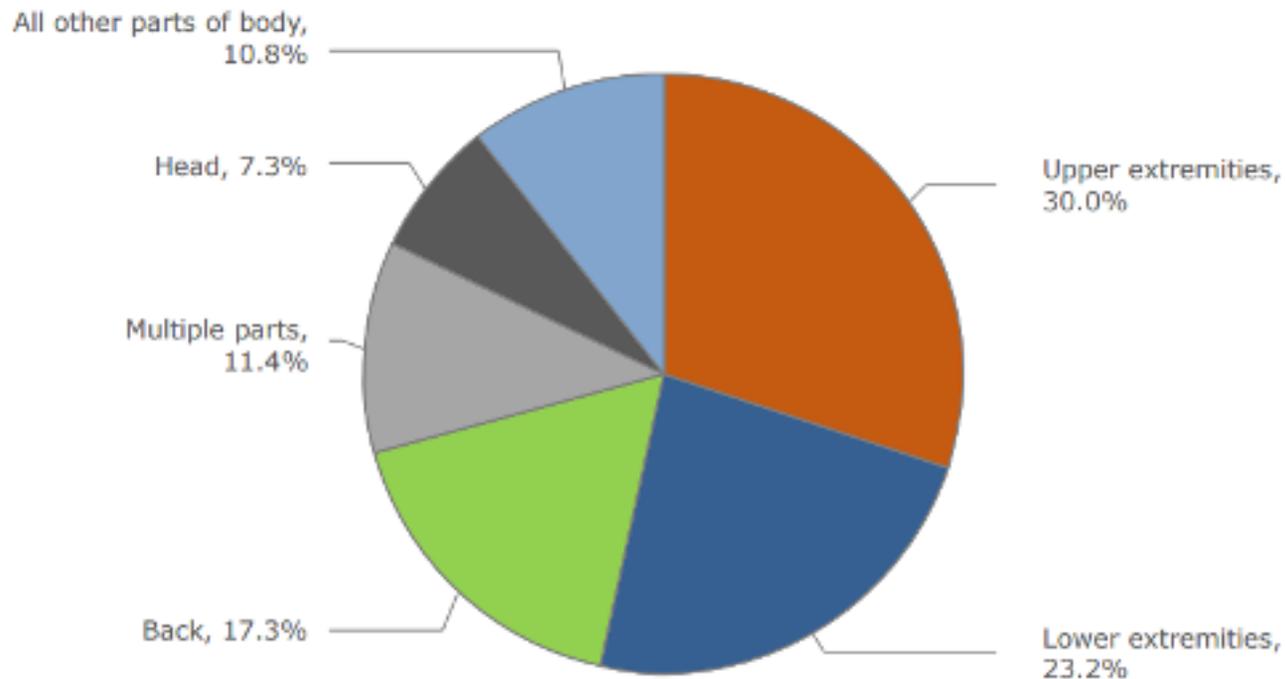
## Leading Causes of Traumatic Brain Injury in the United States (2013)



[https://www.brainline.org/sites/default/files/slides/TBICauses\\_2017update\\_full.jpg](https://www.brainline.org/sites/default/files/slides/TBICauses_2017update_full.jpg)

# OSHA/Bureau of Labor Statistics

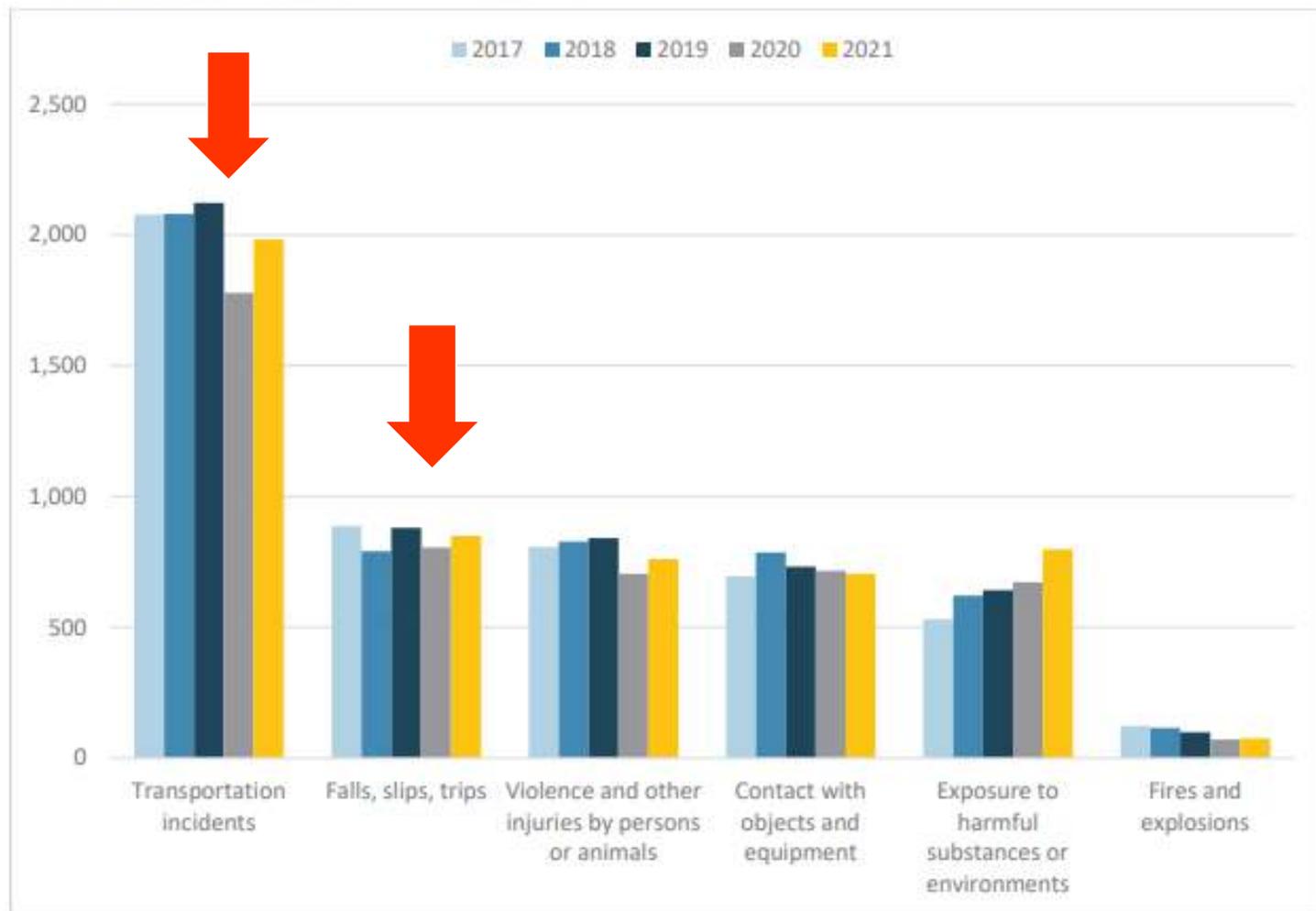
Distribution of injuries and illnesses by part of body,  
all ownerships, 2014



Upper extremities were the most frequently injured part of the body with 346,170 cases.  
There were 268,860 injuries to lower extremities and 200,250 injuries to the back.

# US Bureau of Labor and Statistics

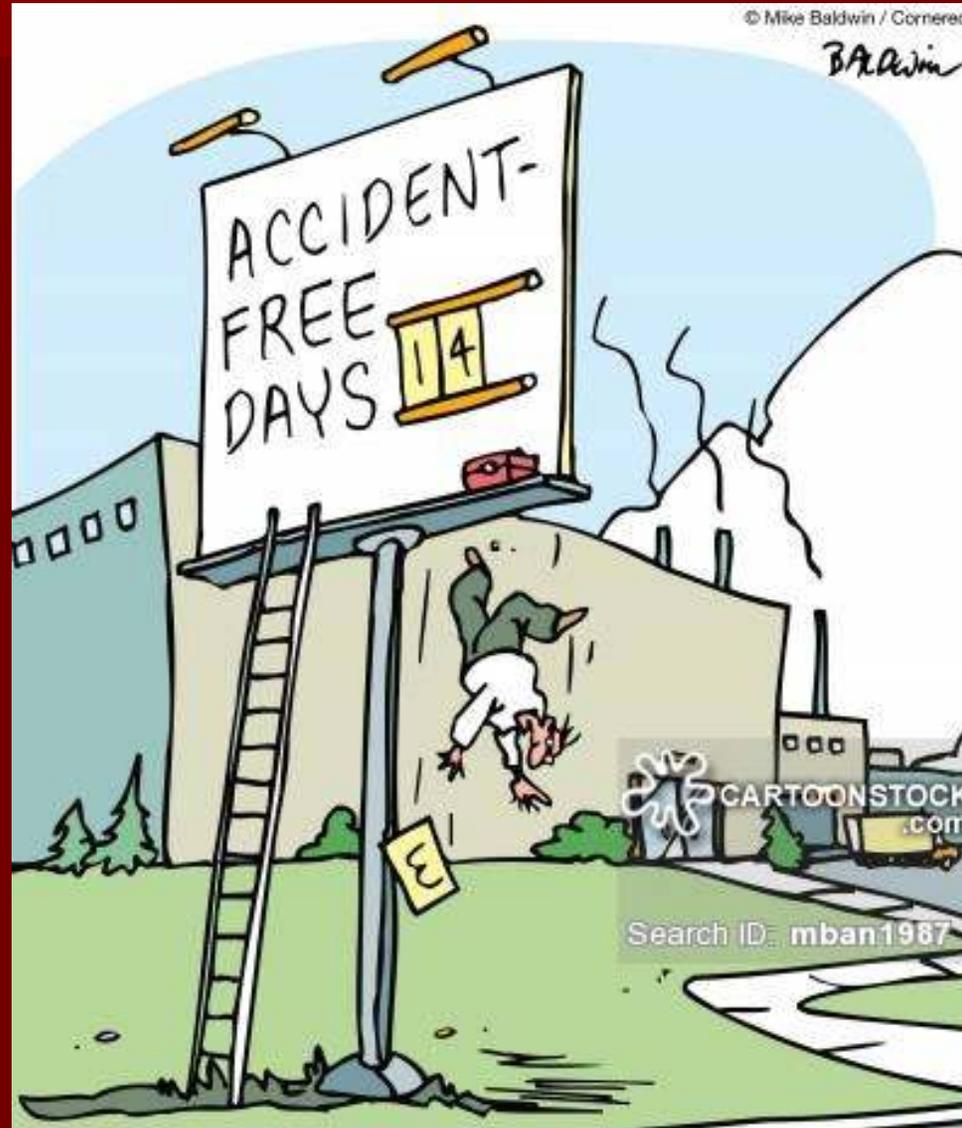
Chart 3. Fatal work injuries by major event or exposure, 2017-21



# On The Job Risks

- Blunt/axial load: object falls from height
  - Blast mechanism: tire pressure/machinery
  - Object strike: Debris, construction
  - Slip/trip and fall
  - Fall from height
  - Whiplash
- OSHA:  
6.5 million workers on over 250,000 construction sites on any given day

# What to do on the job?



# Immediately following injury

- If you are alone when injured:
  - Did you lose consciousness?
  - Do you remember the event?
  - Stay laying/sitting until you are sure your balance is stable
  - Self reporting the injury
  - Acknowledge and be truthful about symptoms
  - Notify supervisor and remove yourself from site with any symptoms for evaluation

# Immediately following injury

- You witness a co-worker's injury:
  - Did you see the mechanism of injury during fall/or event?
  - Did they lose consciousness?
  - Do they remember talking to you immediately after or were they "foggy" or unconscious?
  - Were they stumbling or showing signs of imbalance in any way?
  - Did their vocabulary make sense or did they have "word salad" or "jumbled speech"
  - Remove them from the area/stabilize same as when alone

# Know when professional medical attention is needed !!

-Unconscious/Amnestic-

-Open wound large enough to require sutures or open to bone-

-Hard blow to the head +/- loss of consciousness with blood thinners (Coumadin/ASA)

-Decline-confusion/HA/nausea/vomiting/weirdness/word salad/unsteady gait

-Any seizure-like behavior-including staring off, deviated gaze- NOT ALL SEIZURES ARE LIKE TV!!

# What happens next?

- Please report!!
- OSHA 300 reporting requirements:
  - How does OSHA define a recordable injury or illness?
  - Any work-related fatality.
  - Any work-related injury or illness that results in loss of consciousness, days away from work, restricted work, or transfer to another job.
  - Any work-related injury or illness requiring medical treatment beyond first aid.
  - Any work-related diagnosed case of cancer, chronic irreversible diseases, fractured or cracked bones or teeth, and punctured eardrums.
  - There are also special recording criteria for work-related cases involving: needlesticks and sharps injuries; medical removal; hearing loss; and tuberculosis.

# Pocket CONCUSSION RECOGNITION TOOL

To help identify concussion in children, youth and adults



FIFA®



## RECOGNIZE & REMOVE

Concussion should be suspected **if one or more** of the following visible clues, signs, symptoms or errors in memory questions are present.

### 1. Visible clues of suspected concussion

Any one or more of the following visual clues can indicate a possible concussion:

- Loss of consciousness or responsiveness
- Lying motionless on ground/Slow to get up
- Unsteady on feet / Balance problems or falling over/Incoordination
- Grabbing/Clutching of head
- Dazed, blank or vacant look
- Confused/Not aware of plays or events

### 2. Signs and symptoms of suspected concussion

Presence of any one or more of the following signs & symptoms may suggest a concussion:

- Loss of consciousness
- Seizure or convulsion
- Balance problems
- Nausea or vomiting
- Drowsiness
- More emotional
- Irritability
- Sadness
- Fatigue or low energy
- Nervous or anxious
- "Don't feel right"
- Difficulty remembering
- Headache
- Dizziness
- Confusion
- Feeling slowed down
- "Pressure in head"
- Blurred vision
- Sensitivity to light
- Amnesia
- Feeling like "in a fog"
- Neck Pain
- Sensitivity to noise
- Difficulty concentrating

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### 3. Memory function

Failure to answer any of these questions correctly may suggest a concussion.

- "At what venue are we at today?"
- "Which half is it now?"
- "Who scored last in this game?"
- "What team did you play last week / game?"
- "Did your team win the last game?"

**Any athlete with a suspected concussion should be IMMEDIATELY REMOVED FROM PLAY, and should not be returned to activity until they are assessed medically. Athletes with a suspected concussion should not be left alone and should not drive a motor vehicle.**

It is recommended that, in all cases of suspected concussion, the player is referred to a medical professional for diagnosis and guidance as well as return to play decisions, even if the symptoms resolve.

### RED FLAGS

**If ANY of the following are reported then the player should be safely and immediately removed from the field. If no qualified medical professional is available, consider transporting by ambulance for urgent medical assessment:**

- Athlete complains of neck pain
- Increasing confusion or irritability
- Repeated vomiting
- Seizure or convulsion
- Weakness or tingling/burning in arms or legs
- Deteriorating conscious state
- Severe or increasing headache
- Unusual behaviour change
- Double vision

### Remember:

- In all cases, the basic principles of first aid (danger, response, airway, breathing, circulation) should be followed.
- Do not attempt to move the player (other than required for airway support) unless trained to do so
- Do not remove helmet (if present) unless trained to do so.

from McCrory et al, Consensus Statement on Concussion in Sport. Br J Sports Med 47 (5), 2013

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# Sport Concussion Assessment Tool

- Used by medical professionals
- Utilized as baseline for athletes
- More comprehensive than concussion recognition tool
- Used by professional sports organizations



## SCAT3™

Sport Concussion Assessment Tool – 3rd edition  
For use by medical professionals only

Name: \_\_\_\_\_

Date / Time of Injury  
Date of Assessment: \_\_\_\_\_

Examiner: \_\_\_\_\_

### What is the SCAT3?

The SCAT3 is a standardized tool for evaluating injured athletes for concussion and can be used in athletes aged from 12 years and older. It supersedes the original SCAT and the SCAT2 published in 2005 and 2008, respectively. For younger persons, ages 12 and under, please use the Child SCAT3. The SCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool. Pre-season baseline testing with the SCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the SCAT3 are provided on page 3. If you are not familiar with the SCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organisations. Any revision or any reproduction in a digital form requires approval by the Concussion in Sport Group.

**NOTE:** The diagnosis of a concussion is a clinical judgement, ideally made by a medical professional. The SCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their SCAT3 is "normal".

### What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms. Some examples listed below and most often do not involve loss of consciousness. Concussion should be suspected in the presence of any one or more of the following:

- Symptoms (e.g., headaches, or
- Physical signs (e.g., unsteadiness, or
- Impaired brain function (e.g., confusion) or
- Abnormal behaviour (e.g., change in personality).

### SIDELINE ASSESSMENT

#### Indications for Emergency Management

**NOTE:** A hit to the head can sometimes be associated with a more serious brain injury. Any of the following warrants consideration of activating emergency procedures and urgent transportation to the nearest hospital:

- Glasgow Coma score less than 15
- Deteriorating mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurologic signs

#### Potential signs of concussion?

If any of the following signs are observed after a direct or indirect blow to the head, the athlete should stop participation, be evaluated by a medical professional and should not be permitted to return to sport the same day if a concussion is suspected.

Any loss of consciousness?	Y	N
"If so, how long?"	Y	N
Balance or motor incoordination (troubles with blood pressure, etc.)	Y	N
Disorientation or confusion (unable to respond appropriately to questions)	Y	N
Loss of memory	Y	N
"If so, how long?"	Y	N
"Before or after the injury?"	Y	N
Blank or vacant look	Y	N
Visible facial injury in combination with any of the above	Y	N

### 1 Glasgow Coma Scale (GCS)

<b>Best eye response (E)</b>	1
No eye opening	2
Eye opening in response to pain	3
Eye opening to speech	4
Eyes opening spontaneously	5
<hr/>	
<b>Best verbal response (V)</b>	1
No verbal response	2
Incomprehensible sounds	3
Inappropriate words	4
Confused	5
Oriented	6
<hr/>	
<b>Best motor response (M)</b>	1
No motor response	2
Extension to pain	3
Abnormal flexion to pain	4
Flexion/Withdrawal to pain	5
Localizes to pain	6
Obeys commands	7

**Glasgow Coma Score (E + V + M)** / 15

GCS-E could be recorded for all athletes in case of subsequent deterioration.

### 2 Maddocks Score<sup>2</sup>

"I am going to ask you a few questions, please listen carefully and give your best effort."

Modified Maddocks questions (1 point for each correct answer)

What venue are we at today?	Y	N
Which half is it now?	Y	N
Who scored last in this match?	Y	N
What team did you play last week's game?	Y	N
Did your team win the last game?	Y	N

**Maddocks Score** / 5

Maddocks score is validated for sideline diagnosis of concussion only, and is not used for final testing.

**Notes:** Mechanism of Injury ("tell me what happened"):

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**Any athlete, with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle until cleared to do so by a medical professional. No athlete diagnosed with concussion should be returned to sports participation on the day of injury.**

SCAT3 SPORT CONCUSSION ASSESSMENT TOOL 3 | PAGE 9
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# Mild TBI POCKET GUIDE

## Guideline for Adult Patients

A part of CDC's "Heads Up" Series

### Inclusion Criteria

- Non-penetrating trauma to the head.
- Presenting to ED within 24 hours of injury.
- GCS score 14–15 on initial ED evaluation.
- Age  $\geq$  16.

### Exclusion Criteria

- Penetrating or multisystem trauma.
- GCS score  $<$  14 on initial ED evaluation.
- Age  $<$  16.

GCS = Glasgow Coma Scale

## Four Critical Questions

### 1. Which patients with mild TBI should have a noncontrast head CT scan in the ED?

*Level A: Loss of consciousness or posttraumatic amnesia and one or more of the following:*

- Headache
- Vomiting
- Age  $>$  60 years old
- Drug or alcohol intoxication
- Deficits in short-term memory
- Physical evidence of trauma above the clavicle
- Posttraumatic seizure
- GCS score  $<$  15
- Focal neurologic deficit
- Coagulopathy

*Level B: Head trauma patients with no loss of consciousness or posttraumatic amnesia and one or more of the following:*

- Focal neurologic deficit
- Vomiting
- Severe headache
- Age  $\geq$  65 years old
- Physical signs of a basilar skull fracture
- GCS score  $<$  15.
- Coagulopathy
- Dangerous mechanism of injury.\*

*\*Dangerous mechanism of injury includes ejection from a motor vehicle, a pedestrian struck, and a fall from a height of  $>$  3 feet or 6 steps.*

*Level C: None specified*

### 2. Is there a role for head MRI over noncontrast CT in the ED evaluation of a patient with acute mild TBI?

*Levels A, B, and C: None specified*

### 3. In patients with mild TBI, are brain-specific serum biomarkers predictive of an acute traumatic intracranial injury?

*Levels A and B: None specified*

*Level C: In mild TBI patients without significant extracranial injuries and a serum S-100B level  $<$  0.1  $\mu\text{g/L}$  measured within 4 hours of injury, consideration can be given to not performing a CT.\*\**

*\*\*This test has not yet received FDA approval for clinical use in the United States.*

### 4. Can a patient with an isolated mild TBI and a normal neurologic evaluation be safely discharged from the ED if a noncontrast head CT scan shows no evidence of intracranial injury?

*Level A: None specified*

*Level B: Such patients are at minimal risk for developing an intracranial lesion and therefore may be safely discharged from the ED.\*\*\**

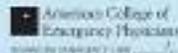
*\*\*\*There are inadequate data to include patients with a bleeding disorder, who are receiving anticoagulation therapy or antiplatelet therapy, or who have had a previous neurosurgical procedure.*

*Level C: Patients with mild TBI discharged from the ED should be informed about postconcussive symptoms.*

## Talking Points for Use With Patients

- A concussion is a brain injury caused by a bump, blow, or jolt to the head or body that causes the head and brain to move quickly back and forth. Although usually not life-threatening, a concussion may change the way the brain works, and can sometimes be serious.
- You may experience a range of symptoms over the next few days, such as difficulty concentrating, dizziness, or trouble falling asleep. These symptoms can be part of the normal healing process, and most go away over time without any treatment.
- Return immediately to the emergency department if you have worsening or severe headache, lose consciousness, increased vomiting, increasing confusion, seizures, numbness, or any symptom that concerns you, your family, or friends.
- Tell a family member or friend about your head injury and ask them to help monitor you for more serious symptoms. Get plenty of rest and sleep, and return gradually and slowly to your usual routines. Don't drink alcohol. Avoid activities that are physically demanding or require a lot of concentration.
- If you don't feel better after a week, see a doctor who has experience treating brain injuries.
- Don't return to sports before talking to your doctor. A repeat blow to your head—before your brain has time to heal—can be very dangerous and may slow recovery or increase the chance for long-term problems.

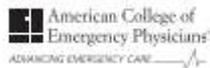
To view the full clinical policy or for more information about brain injury and concussion, visit: [www.cdc.gov/TraumaticBrainInjury](http://www.cdc.gov/TraumaticBrainInjury) ■ [www.acep.org/TraumaticBrainInjury](http://www.acep.org/TraumaticBrainInjury)





# What to expect after a concussion

A part of CDC's "Heads Up" Series



For more information about concussion, please visit:  
[www.cdc.gov/Concussion](http://www.cdc.gov/Concussion).

## PATIENT INSTRUCTIONS

You have been examined at \_\_\_\_\_  
(name of hospital emergency department)  
for a head injury and possible concussion. Be sure to let a family member or friend know about your injury. They may notice symptoms before you do and can help you.

Take time off from work or school for \_\_\_\_\_ days or until you and your doctor think you are able to return to your usual routine.

Your next appointment with \_\_\_\_\_  
(Doctor's name)  
is \_\_\_\_\_  
(date and time)

## What to Expect Once You're Home from the Hospital

Most people with a concussion recover quickly and fully. During recovery, you may have a range of symptoms that appear right away, while others may not be noticed for hours or even days after the injury. You may not realize you have problems until you try to do your usual activities again. Most symptoms go away over time without any treatment. Below is a list of some of the symptoms you may have:



### Thinking/Remembering

- Difficulty thinking clearly
- Feeling slowed down
- Trouble concentrating
- Difficulty remembering new information



### Physical

- Headache
- Balance problems
- Blurred vision
- Dizziness
- Nausea or vomiting
- Lack of energy
- Sensitivity to noise or light



### Emotional/Mood

- Irritability
- Nervousness
- Sadness
- More emotional



### Sleep

- Sleeping more than usual
- Sleeping less than usual
- Trouble falling asleep

## How to Feel Better

- Get plenty of rest and sleep.
- Avoid activities that are physically demanding or require a lot of thinking.
- Do not drink alcohol.
- Return slowly and gradually to your routine.
- Ask a doctor when it is safe to drive, ride a bike, or operate heavy equipment.

## WHEN TO RETURN TO THE HOSPITAL

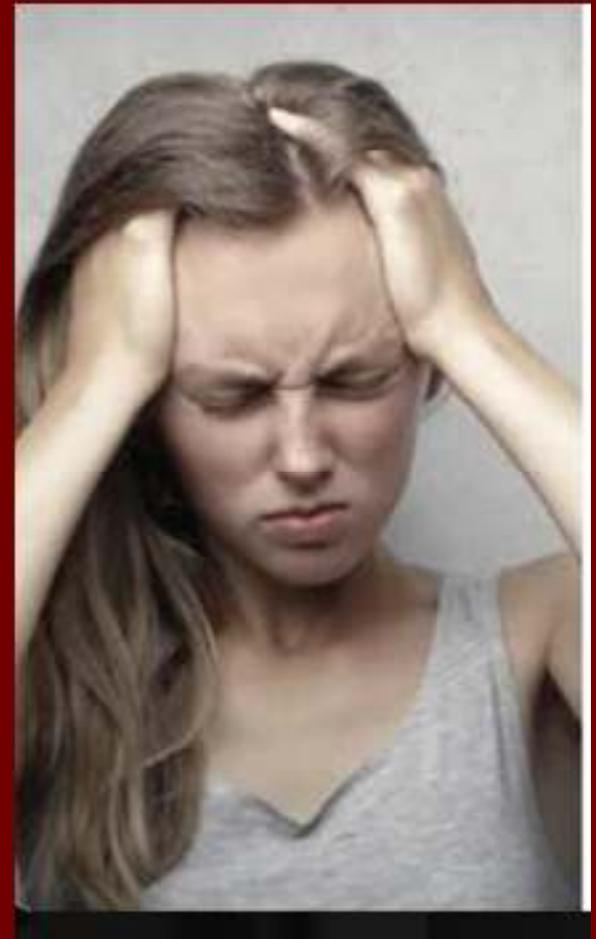
Sometimes serious problems develop after a head injury. Return to the emergency department right away if you have any of these symptoms:

- Repeated vomiting
- Worsening or severe headache
- Unable to stay awake during times you would normally be awake
- More confused and restless
- Seizures
- Difficulty walking or difficulty with balance
- Difficulty with your vision
- Any symptom that concerns you, your family members, or friends

# Message is clear and consistent

## But...

- How are we doing relaying this to patients? To employers?
- The invisible injury



# What happens next?

- Post concussive disorder: **Post-concussion syndrome** is a complex disorder in which various symptoms — such as headaches and dizziness — last for weeks and sometimes months after the injury that caused the **concussion**.

- [Post-concussion syndrome - Mayo Clinic](#)

[www.mayoclinic.org/diseases.../post-concussion-syndrome/](http://www.mayoclinic.org/diseases.../post-concussion-syndrome/)



**National Library of Medicine**  
*National Center for Biotechnology Information*

## **Postconcussive Syndrome**

Cara M. Permenter; Ricardo J. Fernández-de Thomas; Andrew I. Sherman.

► [Author Information and Affiliations](#)

Last Update: August 29, 2022.

Previous reports in the literature have attempted to associate the severity of the brain injury with PCS in patients who have suffered mild TBI, however, these have failed to consistently report that the severity of injury correlates with the risk of PCS. Variables and measures utilized in order to

# Post concussive disorder:

- Anywhere from 29-90% of patients experience some combination of symptoms following concussion or traumatic insult
- No universally accepted definition:  
(headache, dizziness, fatigue, irritability, impaired memory and concentration, insomnia, and lowered tolerance for noise and light)
- There is no specific duration that has been agreed upon by researchers- some define it as sx's longer than 3 months, others say following the first week. At Shock Trauma we use 6 weeks

# Persistent post-concussive disorder

- Usually requires referrals to specialty services: cognitive therapy, vestibular training, neurology, neuropsychology

Symptoms of concussion usually fall into four categories:

# Prolonged signs and symptoms

Thinking/ Remembering	Physical	Emotional/ Mood	Sleep
Difficulty thinking clearly	Headache  Fuzzy or blurry vision	Irritability	Sleeping more than usual
Feeling slowed down	Nausea or vomiting (early on)  Dizziness	Sadness	Sleep less than usual
Difficulty concentrating	Sensitivity to noise or light  Balance problems	More emotional	Trouble falling asleep
Difficulty remembering new information	Feeling tired, having no energy	Nervousness or anxiety	

# Prolonged signs and symptoms

- **Headaches**- most common complaint. Specifics of pain can vary, times of day and severity can vary
- **Cranial nerves**- blurry vision, loss of taste or smell, dizziness, ringing in the ears, hearing loss, light or sound sensitivity, vertigo, nausea
- **Psychological**- Anxiety, irritability, short-temper, impulsive, sleep disturbance, personality changes
- **Cognitive**- Memory loss, difficulty multi-tasking, difficulty with higher executive functioning, delayed processing, delayed word finding

# Acknowledging the symptoms

## ICD-10

- An ICD-10 diagnostic criteria as well as an investigatory *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*, in appendix form are available. The ICD-10 criteria include a history of traumatic brain injury (TBI) and the presence of 3 or more of the following 8 symptoms: (1) headache, (2) dizziness, (3) fatigue, (4) irritability, (5) insomnia, (6) concentration or (7) memory difficulty, and (8) intolerance of stress, emotion, or alcohol.

## DSM-IV

- The *DSM-IV* criteria are (A) history of TBI causing "significant cerebral concussion;" (B) cognitive deficit in attention and/or memory; (C) presence of at least 3 of 8 symptoms (eg, fatigue, sleep disturbance, headache, dizziness, irritability, affective disturbance, personality change, apathy) that appear after injury and persist for 3 months; (D) symptoms that begin or worsen after injury; (E) interference with social role functioning; and (F) exclusion of dementia due to head trauma and other disorders that better account for the symptoms. Criteria C and D require symptom onset or worsening to be contiguous to the head injury, distinguishable from preexisting symptoms, and have a minimum duration of 3 months.

# Post Traumatic Headache

## Subtypes

- Tension
- Migraine-like
- Cervico-occ junction
- Facial neuralgias

## Incidence/Prevalence

- >70% incidence
- 44% present at 1 year

(Hoffman 2020)

# Why?

Unclear pathology:

Alterations in cerebral blood flow and metabolism

Hemodynamics?

Genetic predisposition?

Axonal injury

Psychopathology

# Acute Treatment



UAMS: University of Arkansas- Institute for Digital Health and Innovations

# TRAUMATIC BRAIN INJURY GUIDELINES 2022

Department of Physical Medicine and Rehabilitation/Trauma Rehabilitation Resources Program

## TELE-REHABILITATION INTERVENTIONS GUIDELINE

### Management of Headaches in the Patient with Traumatic Brain Injury

Author(s):	Rani Lindberg	Peer Reviewed:		Finalized:	
Drafted:	February 2022	Date:		Published:	

(2) Pharmacologic treatment (Zasler, 2021; Silberstein, 2012; Tfelt, 2013)

a) Abortive: Includes Nonsteroidal Anti-inflammatory Drugs (NSAIDs), ergot derivatives, triptans, and opioid medications.

(i) Acetaminophen and NSAIDs:

1. Acetaminophen dosing should not exceed 3 grams per day
2. NSAIDs such as ibuprofen, aspirin, and naproxen be used and have been shown to be more effective than placebo for acute migraines, but caution should be observed in those with or at risk for bleeding issues, gastritis/ulcers, and renal dysfunction.
3. NSAIDs have not been shown to be more effective than a combination of aspirin, acetaminophen, and caffeine. (Matchar, 2000)

(ii) Triptans

1. Examples include: Sumatriptan, rizatriptan, zolmitriptan
2. Triptans bind and activate serotonin 1b/1d receptors thereby inhibiting the release of vasoactive peptides and promoting constriction of blood vessels as well as inhibiting dural nociception and pain (Hansen, 2000).
3. Because of their vasoconstrictive properties, triptans should NOT be used in patients with cardiovascular disease and/or cerebrovascular disease or hemiplegic migraines.

(iii) Calcitonin gene-related peptide (CGRP)

1. Examples: Gepants, ubrogepant, rimegepant
2. This class of medications is reserved for those who cannot tolerate triptans due to side effects or cardiac/cerebrovascular disease.

(iv) Opioids and combination analgesics containing opioids.

1. Routine use not recommended, but short-term use of opioids may be necessary when other medications are contraindicated or ineffective (ICHHD-3, 2018).





- Non pharmacological: rest, relaxation, diet, integrative/alternative medicine (harpist/acupuncture in house)
- Multi-modal first line: NSAID, Beta blocker, Tylenol Antidepressant (Elavil)
- Multi-modal second line: Triptans, muscle relaxers, reglan
- Rarely: Occ nerve block, pain referrals

Time!

# How do I know when I'm ready to return to work?



# Returning to the Workplace

## Symptom free

- Decreased hours, advance as tolerated if possible
- Functional Capacity Evaluation (FCE)
- Formal cognitive therapy evaluation
- Re-evaluation and monitoring

## Active Symptoms

- Most recommendations are to remain out of work until symptom free

# CDC Heads up initiative- returning to activity

- Returning to daily activities: Increased rest and limited exertion are important to facilitate the patient's recovery. Physicians should be cautious about allowing patients to return to driving, especially if the patient has problems with attention, processing speed, or reaction time. Patients should also be advised to get adequate sleep at night and to take daytime naps or rest breaks when significant fatigue is experienced. Symptoms typically worsen or re-emerge with exertion. Let any return of a patient's symptoms be the guide to the level of exertion or activity that is safe.

\*State of Maryland MVA- TBI driver training courses- self report state

# Return to sports

CDC Heads up initiative updates [https://www.cdc.gov/headsup/providers/return\\_to\\_activities.htm](https://www.cdc.gov/headsup/providers/return_to_activities.htm)

## **Step 1: Back to regular activities (such as school)**

Athlete is back to their regular activities (such as school).

## **Step 2: Light aerobic activity**

Begin with light aerobic exercise only to increase an athlete's heart rate. This means about 5 to 10 minutes on an exercise bike, walking, or light jogging. No weight lifting at this point.

## **Step 3: Moderate activity**

Continue with activities to increase an athlete's heart rate with body or head movement. This includes moderate jogging, brief running, moderate-intensity stationary biking, moderate-intensity weightlifting (less time and/or less weight from their typical routine).

## **Step 4: Heavy, non-contact activity**

Add heavy non-contact physical activity, such as sprinting/running, high-intensity stationary biking, regular weightlifting routine, non-contact sport-specific drills (in 3 planes of movement).

## **Step 5: Practice & full contact**

Young athlete may return to practice and full contact (if appropriate for the sport) in controlled practice.

## **Step 6: Competition**

Young athlete may return to competition.

# Community Resources

- **National Institute for Occupational Safety and Health**  
200 Independence Avenue SW  
Hubert H. Humphrey Building  
Room 715H  
Washington, DC 20201  
Toll Free: (800)356-4674  
Fax: (202)260-1898  
MRL1@cdc.gov  
<http://www.cdc.gov/niosh/homepage.html>
- **Occupational Safety & Health Administration**  
200 Constitution Avenue, NW  
Washington, DC 20210  
Toll Free: (800)321-6742  
TTY: (877)889-5627  
<http://www.osha.gov>
- For information on state workers' compensation programs, visit:  
<http://www.dol.gov/esa/regs/compliance/owcp/wc.htm>
- For information on federal workers' compensation programs, visit:  
<http://www.dol.gov/esa/owcp/dfec/>
- For information on state labor laws, visit:  
<http://www.dol.gov/esa/programs/whd/state/state.htm>

# Community Resources

<https://www.braintrauma.org/>

<https://www.cdc.gov/headsup>



1-855-SIT IT OUT (748-4868)



**HeadFirst**  
SPORTS INJURY AND CONCUSSION CARE

PATIENTS & PARENTS

TRAINERS & COACHES

PROFESSIONALS

NEWS, EVENTS, & RESOURCES

LOCATIONS

YOUR VISIT

CONTACT

In collaboration with Righttime Medical Care at 10 convenient Maryland locations, HeadFirst provides a community model concussion clinic for the diagnosis, management, and treatment of Traumatic Brain Injuries (TBI) caused by a bump, blow, or jolt to the head.



**EDUCATION** ▶

**EVALUATION** ▶

**TREATMENT** ▶

See how HeadFirst became one of the largest concussion clinics in the country, and its journey to care for people of all ages and from all walks of life.

# Johns Hopkins



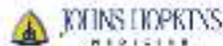
Johns Hopkins Bayview Medical Center

## Head Injury Outpatient Psychiatric Enhanced Services (HOPES)

Multidisciplinary psychiatric services for adults with acquired brain injury



Head Injury Outpatient Psychiatric Enhanced Services (HOPES)  
Consultative/Outpatient Program  
Johns Hopkins Bayview Medical Center  
370 Bayview Drive  
Baltimore, MD 21224  
Phone: 410-955-1100 • Fax: 410-955-1104



The Johns Hopkins Bayview Head Injury Outpatient Psychiatric Enhanced Services (HOPES) provides comprehensive and multidisciplinary services to adult survivors of acquired brain injury who have behavioral, emotional or cognitive difficulties.

### What is Acquired Brain Injury?

Acquired brain injury (ABI) is an injury to the brain that occurs after birth. Well-known causes of ABI include:

- Traumatic brain injury (TBI)
- Tumors
- Stroke
- Seizures
- Toxic exposures
- Infections
- Metabolic disorders, such as multi shock
- Lack of oxygen to the brain

### Symptoms

Common long-term symptoms of ABI can be divided into three categories.

**Emotional:** depression, anxiety, loss of interest, poor motivation

**Behavioral:** inappropriate expression of anger, irritability, impulsivity, disinhibition

**Cognitive:** forgetfulness, inattention, difficulty multitasking

**Physical:** headache, dizziness

### Mission and Values of HOPES

The mission of this unique program is to assist people who have acquired brain injury as they learn to accept all aspects of their illness, advance their wellness, and attain their maximum potential so that they can have a better quality of life. The program aims to provide the highest quality of care to persons with brain injury experiencing behavioral, emotional or cognitive difficulties.

The work of HOPES is based on:

- Optimism, commitment and progress
- Multidisciplinary teamwork to provide holistic care
- Learning and research

### Services

The multidisciplinary team provides many services, including:



- Diagnostic assessments
- Medication management
- Individual and group therapy
- Family counseling
- Consultation
- Occupational Therapy
- Anger management
- Enhancing interpersonal skills



HOPES provides support to prevent inpatient hospitalization by connecting an individual with a psychotherapist and neuropsychologist. In addition, participants will engage in a variety of group therapies three days a week.

### Who is eligible?

Adults 18 years of age and older who have a history of an acquired brain injury and emotional or behavioral disturbances may be able to participate in the program.

We accept Medicaid, Medicare, and some private insurances. Please contact your health insurance company to check your coverage.

For more information or to schedule an appointment, call 410-955-0104.

800.221.6443



**BRAIN INJURY  
ASSOCIATION**  
**OF MARYLAND**

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# Brain Injury Association of Maryland

We bring health, hope, and healing to thousands of Marylanders living with brain injury, their families, and the professionals who serve them.

**1.800.221.6443**



All about brain injury and PTSD

TBI Basics ▾ Topics ▾ Personal Stories & Blogs ▾ Expert Q&A ▾ Resource Directory

People with TBI ▾ Caregivers ▾ Professionals ▾ Military & Veterans ▾ Children with TBI ▾

## TBI Basics

What you need to know about brain injury

[Start here](#)



### Find What You Need

Get targeted resources quickly!

POWERED BY



**WOUNDED WARRIOR PROJECT**

### Personal Stories & Blogs

Brain Injury Recovery – An Evolving Definition

Getting Back on the

### Expert Q&A

How Can Educating Families About Common Impacts of Brain Injuries Help Them Heal?

### Headlines

January 12, 2023

More than one third of military health care beneficiaries have limited access to psychiatrists: study

## Legal & Finances

Previous Topic: Treatment & Recovery

Next Topic: Community & Support



### Legal Issues

- [Selecting an Attorney After a TBI](#)
- [How Do I Know if I Need an Attorney?](#)
- [What Are an Attorney's Obligations When a Client Has Had a Brain Injury?](#)
- [Proving in Court That a Brain Injury Merits Workers Compensation](#)
- [How Attorneys Can Help People with Brain Injury Dispute "Pre-Existing Conditions"](#)



### Managing finances

- [Ten Ways to Stay Financially Afloat After TBI](#)
- [Coping with Mild TBI: Finances](#)
- [Paying the Bills: Health Insurance, Disability Pay, and Attorneys](#)

Previous Topic: Treatment & Recovery

Next Topic: Community & Support

## Treatment & Recovery

Previous Topic: Managing Symptoms

Next Topic: Legal & Finances

There are many paths to recovering from a brain injury. Here is a look at the most common types of rehabilitation, along with some alternative treatments that some people with TBI have found to be helpful.



### Rehabilitation

- [TBI 101: Rehabilitation](#)
- [Selecting the Right Rehabilitation Facility After Brain Injury](#)
- [Who Are the Rehab Specialists?](#)
- [So Introduction to Rehabilitation: The Healing Brain](#)
- [What Does a Neuropsychologist Do, Exactly?](#)
- [When Do You Begin the Rehab Process?](#)
- [What Is TBI Rehabilitation Really Like?](#)
- [What Kinds of Rehabilitation Should a TBI Patient Receive?](#)



### Traditional Treatment

- [What About Cognitive Rehabilitation Therapy?](#)
- [Speech & Language Therapy](#)
- [Physical Therapy](#)
- [Occupational Therapy](#)
- [Vocational Rehabilitation Services: Can They Help You?](#)
- [A Guide to Neuropsychological Testing](#)



### Alternative Treatment

- [What Is Complementary, Alternative, and Integrative Health?](#)
- [Selecting a Complementary Health Practitioner](#)
- [Meditation and Body-Based Practices: An Overview](#)



## Brain Injury Movin' Ahead Virtual Support Group

- 1st Monday of the month, 6:30 pm
- RSVP to Candace Rebeck, **410-448-6303**

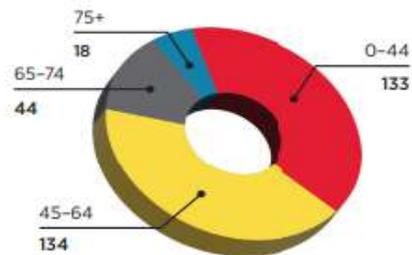
This peer-counseling group holds monthly sessions for survivors of Traumatic Brain Injury (TBI) and their families and friends

Minimum 3 hours per day 5-6 days per week of therapies.  
Gym, hydro pool, sports, grounds

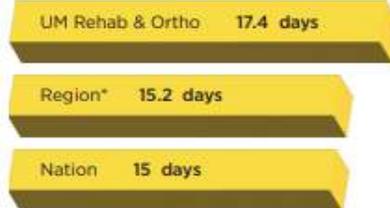
## Traumatic Brain Injury Rehabilitation Program | 2021

**NUMBER SERVED: 329**

**AVERAGE AGE: 48.8**



**AVERAGE LENGTH OF STAY**

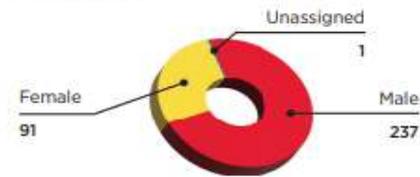


\*Region: MD, WV, PA, DE & DC

**FUNCTIONAL OUTCOMES**

<b>Change in Self-Care</b>	UM Rehab & Ortho	12.5
	Expected Ave	12.9
<b>Change in Mobility</b>	UM Rehab & Ortho	27.7
	Expected Ave	30.5
<b>Functional Efficiency</b> <i>(higher number is better)</i>	UM Rehab & Ortho	3.53
	Expected Ave	2.81

**GENDER**

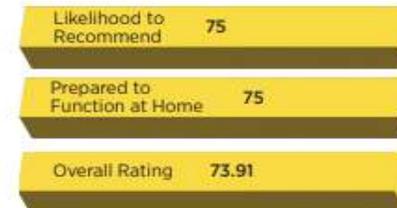


**INJURY**

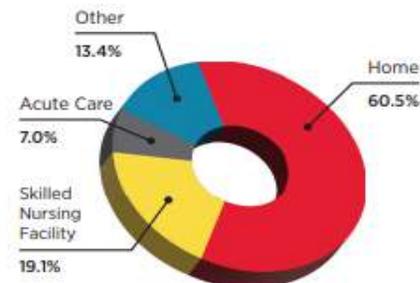


**QUALITY & SATISFACTION**

*(mean score)*



**DISCHARGE SETTING**





UNIVERSITY of MARYLAND  
REHABILITATION &  
ORTHOPAEDIC INSTITUTE

- **Neuro Recovery Clinic:**
- Began seeing patients in 2021
- Run by Neurosurgeons Dr. Badjatia, Parikh and Schwartzbauer with neurologists, neuropsychologists, speech therapists
- See patients last Friday of the month
- Includes comprehensive neuro assessments, MIDAS and other questionnaires, multimodal imaging, referrals to headache or other specialists as needed



**We aim to:**

- 1) Improve transition from Acute to Post-Acute Care following traumatic brain injury.
- 2) Identify evolving clinical problems and initiate targeted referral and treatment.
- 3) Utilize multidisciplinary care to help our patients recover to their fullest potential.

**Our Mission** is to achieve the maximum possible quality of life for Shock Trauma patients who have suffered a traumatic brain injury, their families and communities by facilitating informed healthcare decisions after hospital discharge with evidence-based information and by promoting improvements in healthcare delivery during transitions in care.

**Our Vision** is that Shock Trauma TBI patients and their families have information they can use during transitions in care to make decisions that reflect their desired health outcomes.

# Latest Research

Biomarkers

EEG

fMRI

TCDs

PET

SPECT

Genetics

Biofluid

## **A Framework to Advance Biomarker Development in the Diagnosis, Outcome Prediction, and Treatment of Traumatic Brain Injury**

Elisabeth A Wilde, Ina-Beate Wanner, Kimbra Kenney, Jessica Gill, James R Stone, Seth Disner, Caroline Schnakers, Retsina Meyer, Eric M. Prager, Magali Haas, and Andreas Jeromin 

Published Online: 23 Mar 2022 | <https://doi.org/10.1089/neu.2021.0099>

[> Biomed Rep.](#) 2022 May 19;17(1):58. doi: 10.3892/br.2022.1541. eCollection 2022 Jul.

**Prognostic properties of the association between the S-100B protein levels and the mean cerebral blood flow velocity in patients diagnosed with severe traumatic brain injury**

Sebastian Dzierżęcki <sup>1, 2</sup>, Mirosław Ząbek <sup>1, 2</sup>, Artur Zaczęński <sup>3</sup>, Ryszard Tomasiuk <sup>4</sup>



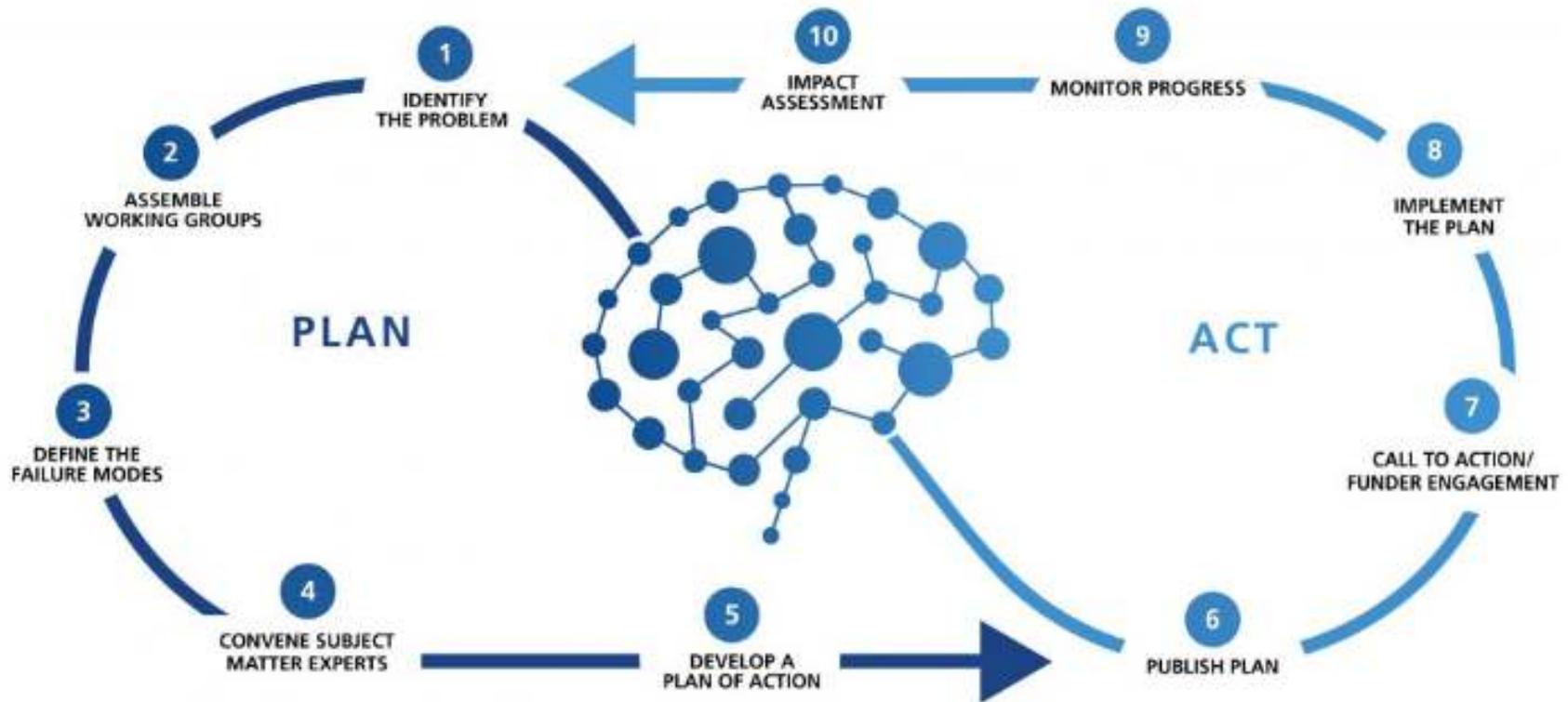
BrainTraumaBlueprint

[Braintraumablueprint.org](http://Braintraumablueprint.org)

## TBI ACTION COALITION

A new community coordination model to accelerate  
a first generation of diagnostics and treatments  
for traumatic brain injury

[LEARN MORE & BECOME A MEMBER](#)



<http://braintraumablueprint.org>

# Traumatic Brain Injury (TBI): Adopting Discovery to Clinical Practice

*Dr. Angela Lumba-Brown, Dr. Eric M Prager, Dr. Nicole Harmon, Dr. Michael McCrea, Dr. Michael J. Bell, Dr. Jamshid Ghajar, Dr. Scott Pyne, and Dr. David Cifu*

*David Cifu, MD*

 Open Access

## **A Review of Implementation Concepts and Strategies Surrounding Traumatic Brain Injury Clinical Care Guidelines**

Angela Lumba-Brown , Eric M. Prager, Nicole Harmon, Michael A. McCrea, Michael J. Bell, Jamshid Ghajar, Scott Pyne, and David X. Cifu

**Published Online:** 23 Nov 2021 | <https://doi.org/10.1089/neu.2021.0067>

# Prevention!!!

© 2010 Kevin Spear kevin@kevinspear.com www.kevinspear.com



K.Spear

"Since pride comes before a fall, I'm wearing a helmet."



# Plan. Provide. Train.

*Three simple steps to preventing falls.*

[Home](#) [Educational Materials and Resources](#) [Training](#) [Media Resources](#)

## Social Media Graphics



If you're working at 6 feet or higher, you need fall protection.

[osha.gov/stopfalls](https://www.osha.gov/stopfalls)

[Share on Facebook](#) [Share on Twitter](#) [Download the Image](#)



3 parts of an effective fall arrest system:

- 1 Anchorage point
- 2 Harness
- 3 Lanyard or lifeline

[osha.gov/stopfalls](https://www.osha.gov/stopfalls)

[Share on Facebook](#) [Share on Twitter](#) [Download the Image](#)



- ▶ Use fall protection when 6 feet up and higher.
- ▶ Inspect your harness, lanyard, and anchorage point.
- ▶ Always wear your gear and stay connected.

[osha.gov/stopfalls](https://www.osha.gov/stopfalls)



Falls can be prevented:

- PLAN** ahead to get the job done safely.
- PROVIDE** the right equipment.
- TRAIN** everyone to use the equipment safely.

[osha.gov/stopfalls](https://www.osha.gov/stopfalls)

# Prevention



- Fall protection
- Wear your fall gear!!!!
- Wear helmets!!!
- Follow all safety guidelines on the job

# ThinkFirst

National Injury Prevention Foundation

ThinkFirst's Mission is to prevent brain, spinal cord and other traumatic injuries through education, research and advocacy.

Maryland:

ThinkFirst! University of Maryland Rehab

ThinkFirst! Maryland Shock Trauma

[Thinkfirst.org](http://Thinkfirst.org)

[ThinkfirstMD@gmail.com](mailto:ThinkfirstMD@gmail.com)

# What's new with trends?

## Konrad Walek-research

- 2012-2022
- University of Maryland  
Department of Neurosurgery

## Shock Trauma Center

- Predicting outcomes of severe TBI



UNIVERSITY of MARYLAND  
MEDICAL CENTER

# Patient Cohort Overview

- 1 July 2012 to 1 March 2022
- **1674** patients admitted to STC with severe blunt head trauma (GCS <8)
  - Age 18-88
  - GCS on admission  $\leq 8$
  - Underwent CT brain on admission

# Goals of Investigation

## Introduction

- **Identify trends over time in:**
  - Severity of presentation
  - Anatomic areas affected by TBI and DAI
  - Effectiveness of treatment strategies
  - Outcomes
- **Secondary objectives:**
  - Changes in treatment strategies from 2012-2022
  - Comparison of TBI outcomes at STC vs. outside institutions

# Functional Recovery after TBI and DAI

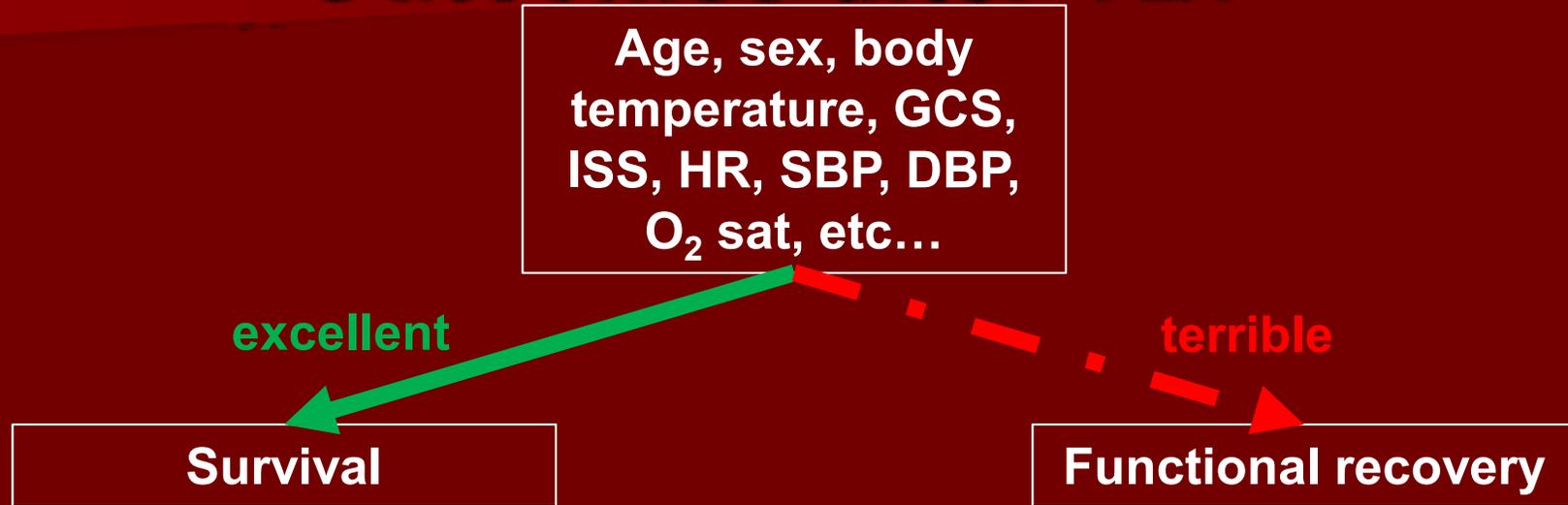


# Functional Recovery Outcomes after TBI

- **708 patients** underwent MRI within 30 days of TBI
- **462 patients** underwent MRI within 30 days and had long-term clinical follow-up
- **146 (31.6%) died after TBI**
  - **16 (11.0%)** in first 24 hours
  - **76 (52.1%)** in first 7 days
  - **100 (68.5%)** in first 14 days
  - **127 (87.0%)** in first 30 days
- Of surviving **316**:



# Functional Recovery Outcomes after TBI



# Functional Recovery – Glasgow Outcome Scale

## Outcomes after TBI

GOS	GOSE	Interpretation
1 = Dead	1 = Dead	Dead
2 = Vegetative state	2 = Vegetative state	Absence of awareness of self and environment
3 = Severe disability	3 = Lower severe disability	Needs full assistance in ADL
	4 = Upper severe disability	Needs partial assistance in ADL
4 = Moderate disability	5 = Lower moderate disability	Independent, but cannot resume work/school or all previous social activities
	6 = Upper moderate disability	Some disability exists, but can partly resume work or previous activities
5 = Good recovery	7 = Lower good recovery	Minor physical or mental deficits that affects daily life
	8 = Upper good recovery	Full recovery or minor symptoms that do not affect daily life

ADL = activities of daily living.

# Functional recovery data analysis

- TOD of admission
- Age, sex
- Body temp at admission
- Year
- Length of stay
- Length of ICU
- Time to hospital
- Ventilator days
- ISS
- SPB on admission
- HR on admission
- SpO2 on admission

# Functional Recovery Outcomes after TBI

Age, sex, body  
temperature, GCS,  
ISS, HR, SBP, DBP,  
O<sub>2</sub> sat, etc...

terrible

**Functional recovery**

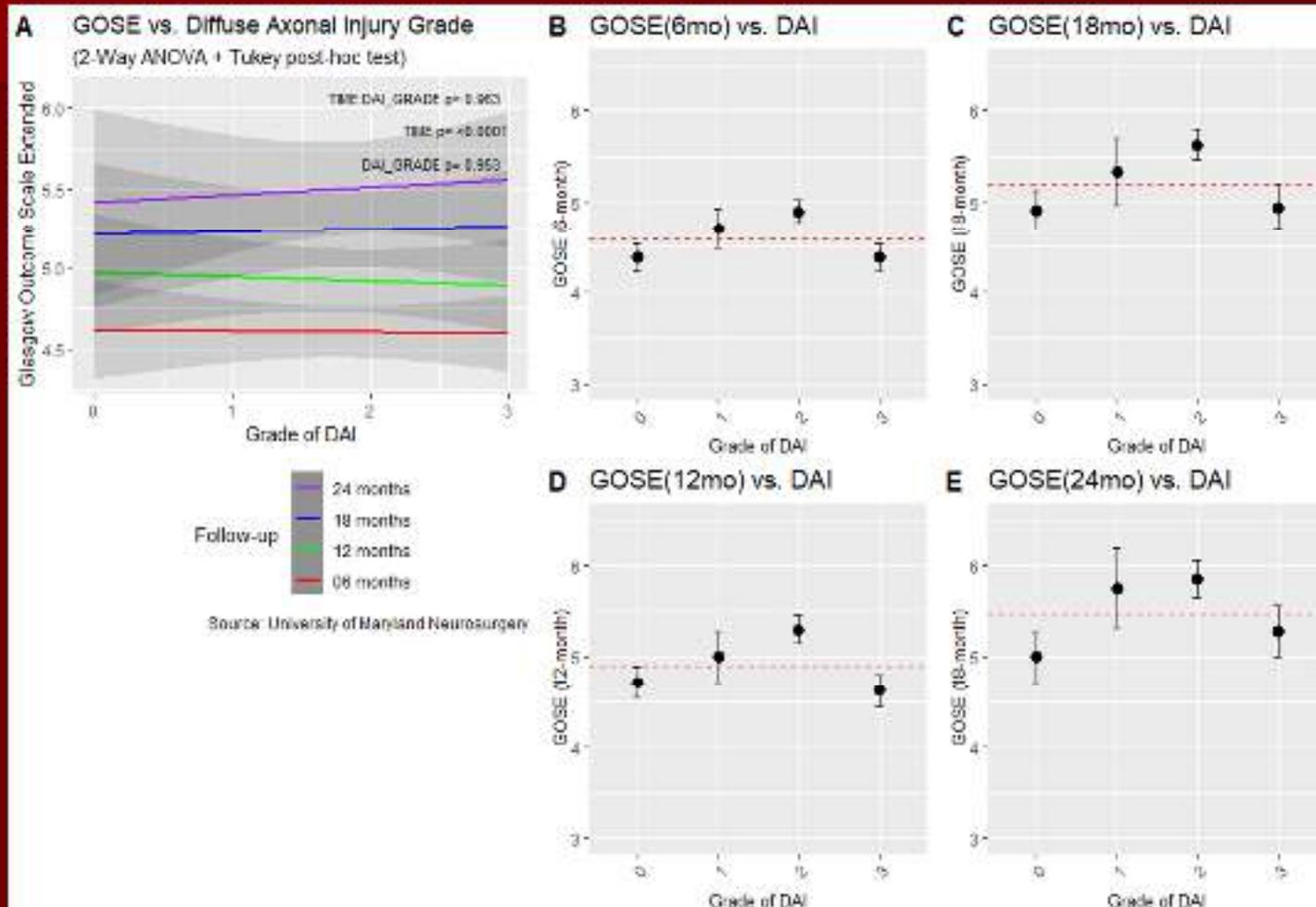
Early: age, ICU LOS  
Long-term: hospital LOS

# MRI

- Grade of DAI I,II or III
- Traditional grading system for outcome
- Location of injury
- Pons, corpus callosum, brainstem, internal/external capsule
- White matter

# Functional Recovery – DAI Grade → No Correlation

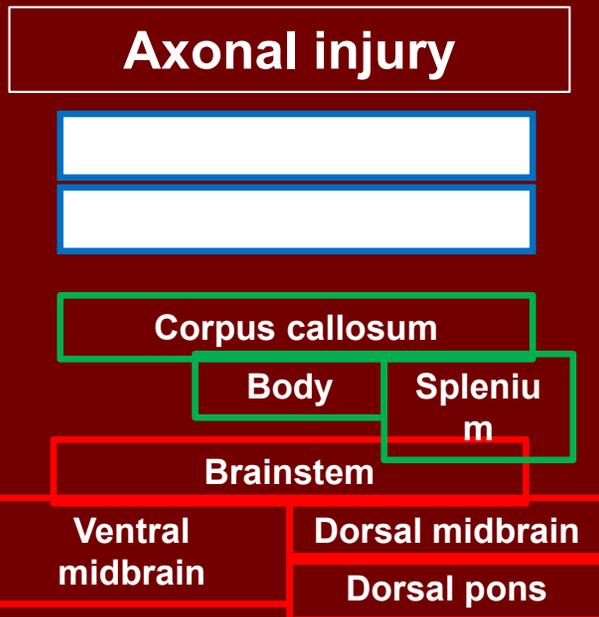
## Outcomes after TBI



# Functional Recovery – Stratifying the DAI Grade by Location

## Outcomes after TBI

First Proposed Revision to DAI Grading System



Grade	Location of Lesions	Functional prognosis
1A	SWM only	Favorable*
1B	SWM and IC	~
<b>Corpus Callosum</b>		
2A	Body of CC	Favorable**
2B	Genu of CC	~
2C	Splenium of CC	<b>TBD at 12 months</b>
<b>Brainstem</b>		
3A	Ventral pons only	~
3B	Ventral midbrain	<b>TBD at 24 months</b>
3C	Dorsal midbrain/pons	Very poor
3D	Medullary lesions	Survival unlikely

\*vs. overall Grade 1

\*\*vs. overall Grade 2

# Combinations of DAI Lesions (2)

## Functional Recovery after TBI

	SWM								
SWM	NS	IC							
IC	NS	<b>-4.52</b> <b>(0.0275)</b>	CC genu						
CC genu	NS	NS	NS	CC body					
CC body	NS	<b>-0.699</b> <b>(0.00188)</b>	<b>-0.327</b> <b>(0.00205)</b>	<b>+0.64</b> <b>(0.0004)</b>	CC splenium				
CC splenium	NS	NS	NS	<b>-0.693</b> <b>(0.0034)</b>	NS	Dorsal midbrain			
Dorsal midbrain	NS	NS	NS	NS	NS	<b>-1.42</b> <b>(0.0014)</b>	Ventral midbrain		
Ventral midbrain	NS	<b>-0.155</b> <b>(0.0295)</b>	NS	NS	NS	<b>-0.286</b> <b>(0.0001)</b>	NS	Dorsal pons	
Dorsal pons	NS	NS	NS	<b>-0.452</b> <b>(0.0275)</b>	NS	<b>-0.143</b> <b>(0.0001)</b>	<b>-0.257</b> <b>(0.0001)</b>	<b>-3.211</b> <b>(0.0001)</b>	Ventral pons
Ventral pons	NS	NS	NS	NS	<b>-0.182</b> <b>(0.0491)</b>	NS	NS	NS	NS

IC internal capsule  
 SWM subcortical white matter  
 CC corpus callosum

# Lessons Learned

Clinical characteristics predictive of survival are poor predictors of functional outcome.

6-month functional outcome is not a sufficient long-term endpoint.

Impact of corpus callosum lesions is highly variable → must consider combination of lesions.

Not all brainstem DAI lesions are created equal.

**Dorsal midbrain** is the single strongest predictor of poor functional outcome.

# Questions ????

