

# Supporting Resources

Use the links below to jump to a specific resource.

## Brain Injury and Co-Occurring Conditions Infographic:

This Infographic reveals how brain injury overlaps with 9 critical service systems and 5 social determinants of health (aging, disability, rural health, veteran health, and minority health). It will help you

- Understand how brain injuries often go unrecognized
- See the link between brain injury and ALL systems of support
- Learn what front-line staff can do: screen, accommodate, educate and refer

## CDC Guideline: Center for Disease Control and Prevention Guideline on the Diagnosis and Management of Mild Traumatic Brain Injury in Children

Jama Pediatrics online September 2018 and CDC's 5 Key Recommendations from the Guideline

## CDC mTBI Pediatric Guideline Supplemental Documents

- **CDC Diagnosis Recommendations at a Glance:** an overview of all the diagnostic recommendations from the pediatric guideline
- **CDC Prognostic Recommendations at a Glance:** an overview of all the prognostic recommendations from the pediatric guideline
- **CDC Management and Treatment at a Glance:** an overview of the management and treatment recommendations from the pediatric guideline

**CDC Pediatric mTBI Guideline Checklist:** Checklist of best mTBI practice in pediatrics

**Updated Mild Traumatic Brain Injury Guideline for Adults - American College of Emergency Physicians:** To help improve, diagnosis, treatment, and outcomes for adults with mild TBI

**CDC Brain Injury & Concussion Discharge Instructions for the care of adult patients with Mild Traumatic Brain Injury.**

## American Congress of Rehabilitation Medicine (ACRM) Tip Card

When Your Patient is Living with Brain Injury

## 5 Types of Concussion and Two Modifying Factors Infographic and Fact Sheet



## **Brain Links' Tennessee Brighter Futures Collaborative**

To aid with referrals and additional resources for each of 10 major systems of support (Adverse childhood experiences, mental health, brain injury, substance use disorder, domestic violence, juvenile justice, criminal justice, homelessness, chronic pain, child abuse) and 5 social determinants of health areas (rural health, minority health, disability health, aging health and veterans)

## **Sample 504 / IEP Accommodations and Modifications in the Classroom for a Student with a Traumatic Brain Injury**

From cbirt.org. See also tncstep.org for TN Special education assistance for families

## **Job Accommodations Network Flyer**

Flyer for information on help for work accommodations. Also here is a link to a document for brain injury-specific accommodations

## **CDC Online Training for Healthcare Providers - Earn Free CME, CNE, and CEU credits**

## **Research Summary and References**



**No two brain injuries are alike. Brain injury often does not occur alone.**

It can lead to other problems and it can come from another problem. These common co-morbidities must be recognized and understood so that we can more effectively treat people from all systems of support and potentially prevent downstream consequences.

**In the Quick View below, a fact is given about 9 systems of support (purple boxes) and 5 social determinants of health (green boxes), showing their connection to brain injury.**

## Quick View

### **Adverse Childhood Experiences:**

Toxic stress from ACEs exposure can alter brain development and lead to risky behaviors increasing risk of TBI.

### **Mental Health (MH):** 50% in treatment have a brain injury.

80% in MH & SUD treatment have a history of brain injury.

### **Substance Use Disorder (SUD):**

About 50% in treatment have a brain injury. 80% in MH & SUD treatment have a history of brain injury.

### **Criminal Legal System:**

50-87% have had a traumatic brain injury (TBI).

### **Racial Minorities:**

More likely to sustain a TBI and have worse outcomes.

### **Domestic Violence (DV):**

As high as 20 million women each year could have a TBI caused by DV.

### **Disability:**

Over 5 million in U.S. have brain injury-related disability.

### **Homelessness:**

Over 50% who are homeless or in an insecure living situation have a TBI.

### **Aging:**

Over 1 in 50 Americans 75+ experience a TBI-related ED visits, hospitalizations or death.

### **Child Abuse:**

Abusive Head Trauma is a leading cause of physical abuse deaths in children under 5 in the U.S.

### **Juvenile Justice:**

As high as 67% of detained youth have a history of brain injury.

### **Rural Health:**

Those in rural areas are at higher risk of sustaining a brain injury.

### **Pain:**

About 60% of people with TBI develop chronic pain.

### **Veterans:**

Veterans with TBI have higher rates of PTSD, depression, SUD and anxiety disorder.

**BRAIN  
INJURY**

## NEW BRAIN INJURIES IN THE U.S. EACH YEAR



Traumatic Brain Injury – Pediatric (TBI)

➡ **5.2 million\***  
Emergency department (ED), inpatient and outpatient



Traumatic Brain Injury – Adult

➡ **12.6 million\***  
Emergency department, inpatient and outpatient



Traumatic Brain Injury – Military

➡ **19,167**



Stroke

➡ **795,000**



Brain Tumors

➡ **90,000**



Dementias

➡ **514,000\*\***

### Prevalence

The total number of people **living with traumatic brain injury** in the United States:

★ **64,000,000**  
or **18.7% of U.S. population**

The number of **all causes of** brain injuries is even higher.

**Total:**

➡ **19,218,167 new brain injuries/year**  
★ or **5.6% of the U.S. population**

**Drug Overdose with Anoxia:** In 2023, 105,007 people died from overdose. Many more survived and many survived multiple overdoses. Studies suggest there are between **15-50 survivors for every death**. A New Hampshire task force found that 90% of survivors had an anoxic injury. Until there is improved data, there is a wide range (between 1.6 and 4.84 million) of new anoxic brain injuries each year.

### Brain injury can also include these nontraumatic causes:

- Brain infection
- Metabolic disorders
- Epilepsy/Seizure disorder
- Neurotoxic poisoning
- Congenital injuries
- Near drownings and others



We do not have accurate numbers for these types of injuries. There are also brain injuries that occur before birth that are not considered “acquired brain injuries,” but they are still brain injuries and may benefit from accommodations.

\***An unknown number will not seek care but may still have an injury that produces lasting or prolonged changes.** The CDC says: “Current data sources may capture only 1 out of every 9 concussions across the nation.”

\*\***Dementia is different from other brain injuries in that it is a progressive disease.** It will still impact community providers’ treatment. They need to screen for neurocognitive impairment.

### Adverse Childhood Experiences (ACEs) Produce Brain Changes



ACEs are not brain “injuries”, but they can produce developmental brain changes. Similar to brain injury, changes may include: emotional, behavioral, cognitive and mental health challenges. Also, like brain injury, accommodations, or strategies, may be helpful in supporting people with ACEs.



## EACH SYSTEM AND ITS CONNECTION TO BRAIN INJURY

Where we see many of the people living with **brain injuries** throughout our communities

### Adverse Childhood Experiences (ACEs)

- **61% of adults** have experienced at least 1 ACE. 16% of adults have experienced **4 or more ACEs**. ACEs occur across all demographic groups.
- Toxic stress from ACEs exposure **can alter brain development** and look like impulsivity, poor judgment, and quick to anger.
- **Brain changes** from ACEs can lead to risk-taking behaviors, **increasing the risk of TBI** as an adult. ACEs can also lead to **neurologic decline** later in life.



### Mental Health

- **6 months to 1 year** following an injury: **one third** will experience a mental health problem – **that number will grow over time**.
- People with **brain injury** have a **2-4 times** increased risk of attempting or having death by suicide.
- As high as **80%** of people seeking mental health **and** substance use treatment also have a **brain injury**.



### Substance Use Disorder

- **About 50% of the people in Substance Use (SU) treatment have a brain injury.**
- About 80% of people who need **both Mental Health and SU treatment** also have a brain injury.
- 72% of people in inpatient treatment for brain injury are **given an Rx for opioids**.
- Within one year after injury, **10-20% will develop a SU problem** & that number will grow over time.
- **For every overdose death**, there are approximately **fifty overdose survivors**, **90% of whom become impaired** because of insufficient oxygen to the brain.



### Domestic Violence

- **It is estimated that millions of women each year may sustain a brain injury caused by domestic violence.**
- In 1 study of women who experienced DV, **85% experienced blows to the head**; for **50% of them**, it was **too many times to count**.
- In the same study, **83% were strangled** (which can lead to a **brain injury** from lack of oxygen), **88% were strangled multiple times**.
- **Men are victims of domestic violence, too.** 26% of men report domestic abuse in their lifetime.



### Juvenile Justice

- **As high as 67% of detained youth have a history of brain injury.** For most, the brain injury occurred **before the criminal offense**.
- Youth with a TBI have a **69% higher chance of re-offending**.
- Juvenile offenders are almost **3.4 times more likely to have a TBI** than non-justice-involved youth.



### Criminal Legal System

- **50-87% of people in the Criminal Legal System (CLS) have had a traumatic brain injury.** (Compared with **8.5% in the general population**)
- People with TBI are **12 times less likely** to achieve a discretionary release.
- Nearly **100% of women** in the Criminal Legal System have a history of TBI. (Many from DV)



## Chronic Pain

- **About 60% of people with TBI develop chronic pain.**
- People with TBI are **at 11 times greater risk** of accidental overdose.
- Common problems following **brain injury**, like **poor judgment, memory and increased impulsivity** make it harder to self-regulate substance use and **make overdose more likely.**



## Homelessness

- **Over 50% of people who are homeless or in an insecure living situation have a TBI. (25% were moderate to severe) This is 10 times higher than the general population.**
- Most will experience their 1st TBI **before** becoming homeless.
- TBI in people who are homeless is associated with **poorer physical and mental health, higher suicidality and suicide risk, memory issues, more health service use and higher criminal legal system involvement.** People with **cognitive impairment** are likely to **spend more time unhoused** than those without cognitive impairment.



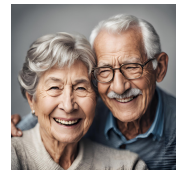
## Child Abuse

- **30-60% of perpetrators of Domestic Violence also abuse children in the household.**
- "Abusive Head Trauma (AHT) is a leading cause of physical **child abuse deaths in children under 5** in the United States." (**One-third of all child maltreatment deaths.**)
- Consider that the **parent/caregiver** of a child involved with the Child Welfare System **may have had a brain injury.** The best practice ideas to follow should be applied to both children and parents/caregivers.



## Aging Health

- Nationally, people age 75 years and older have the **highest numbers and rates of traumatic brain injury-related hospitalizations.**
- **Over 1 in 50 Americans aged 75 or older experience a TBI-related ED visit, hospitalization or death.**
- Each year, there are about **3 million emergency department visits** because of falls in older adults. **More than half** will not tell their doctor.



## Veterans

- **19,547 military members** diagnosed with TBI in 2023.
- **Service members with TBIs have higher rates of PTSD, depression, substance use disorder, and anxiety disorder than those without TBI.**
- **Veterans with mTBI** (mild) had greater combat exposure; less social support; and more comorbidities, including asthma, PTSD, sleeping problems, worse pain scores and slower processing speed.



## Disability Health

- **1 in 4 Adults** in the US reported having a disability in 2022. (cdc.org)
- **Over 5 million people in the United States have a disability related to brain injury. This is 1 in 60 people.** (biausa.org)
- Just over 47% of people 40 or older with a history of brain injury live with a **disability in at least one area of functioning.** (Schneider, Wang, et al., 2021).
- Disabilities following brain injury often cannot be seen. For this reason, brain injury has been **called the "silent epidemic" for decades.**



## Rural Health

- **60 million (1 out of 5) people live in rural America, making the problems with TBI management and resources a major public health concern.**
- **Contributing factors to higher rates of brain injury:** Environmental issues (poorer road conditions, unpredictable weather and livestock and wildlife), drinking and driving, and substance use.
- **Poorer outcomes result from:** Longer travel times to emergency care, lack of access to level 1 trauma centers, lack of specialized brain injury care and high cost of healthcare in rural areas.



## Minority Health

- **People in racial and ethnic minorities are more likely to sustain a traumatic brain injury, & more likely to have worse outcomes.** Reasons for higher rates of TBI include: Motor vehicle accidents, substance use, suicide and domestic violence.
- In Tennessee, Hispanics have the highest proportion of **work-related TBIs**.
- People who are Hispanic or Black are more likely to drop out of long-term studies and are **less likely to receive follow-up care and rehabilitation** for a variety of reasons.
- **Native American & Alaskan Natives** have the highest rate of TBI & fatality from TBI.



## RECOMMENDATIONS FOR BEST PRACTICE ACROSS ALL SYSTEMS

### BEST PRACTICE

Frontline Providers should:

- **SCREEN** for prior history of brain injury
- **ASSESS** neurocognitive and functional impairment
- **EDUCATE** staff on brain injury
- **EDUCATE** the person about their brain injury
- **PROVIDE** and **TEACH** accommodations
- **CONNECT** person served with community resources

### COMMON PROBLEMS

After Brain Injury, we often see problems with:

- Attention, memory and new learning
- Slowed speed of processing
- Organization, problem solving and impulsivity
- Irritability, frustration and agitation
- Balance, dizziness and headaches
- Poor awareness of deficits & difficulties
- Difficulty being flexible, poor self-monitoring

### WHAT TO LOOK FOR

Frontline Providers may see:

- Looking uninterested because they cannot pay attention
- Appearance of defiance because they cannot remember the rules
- Slow to follow directions because they cannot process quickly
- Getting into fights because of irritability, anger and impulsivity
- Falling into things, often getting hurt
- Difficulty re-entering community because of cognitive changes
- Getting stuck on an idea or a way of doing something, not recognizing mistakes

# COMMON ACCOMMODATIONS FOR BRAIN INJURY CHALLENGES

Here are some common and simple accommodations:

## For the person:

- Working for shorter periods of time
- Getting rid of distractions around you, like noise or movement
- Taking notes (on paper, in a notebook, on a phone or computer)
- Using a phone to set timers to remember appointments



## For the care provider:

- Repeating information to the person
- Slowing down when talking; giving them more time to respond
- Giving the person a list of house rules, written directions, or pictures to help them understand and remember
- Coaching the person with the injury to "Stop, think and plan" then act
- Coaching the person to take deep breaths when feeling angry or anxious

## TOOLS FOR BEST PRACTICE

### Brain Injury Screening Resources:

- ★ **NASHIA's Online Brain Injury Screening and Support System (OBISSS):** <https://www.nashia.org/obisssprogram>  
The OBISSS is highly recommended. It is made up of the OSU screening tool, a Symptoms Questionnaire and Strategies. It can be used electronically, on a computer, phone or iPad. It can be self-administered.
- **OSU TBI Identification Method - Modified:** Modified to include brain injury from all causes.  
<https://www.tndisability.org/primary-emergency-care-providers>

**Brain Links' Strategies & Accommodations Tool:** <https://www.tndisability.org/rehabilitation>

### Symptom Questionnaire and Cognitive Strategies:

- Adults: [bit.ly/3FLkz0V](https://bit.ly/3FLkz0V)
- Juvenile: [bit.ly/4iS2bSC](https://bit.ly/4iS2bSC)



## TENNESSEE RESOURCES

**Brain Links' Website** with many resources  
<https://www.tndisability.org/brain>

**Brain Links' Toolkits** (for Service Professionals and Survivors) <https://www.tndisability.org/brain-toolkits>

**TN Department of Health TBI Program**  
<https://tinyurl.com/3v5jrdt3>



**Tennessee Brighter Futures' Resource Pages & Training for Brain Injury**  
<https://www.tndisability.org/tbf-brain-injury>

**Tennessee Brighter Futures**  
More information on the collaborative & resources for all systems of support  
<https://www.tndisability.org/tennessee-brighter-futures>

**TN Brighter Futures is organized and facilitated by Brain Links through a contract from the TN Department of Health TBI Program.**



For a list of selected references, visit Brain Links:  
<https://www.tndisability.org/tbf-brain-injury>



<https://www.tndisability.org/brain>  
@BrainLinksTN



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# CENTERS FOR DISEASE CONTROL AND PREVENTION GUIDELINE ON THE DIAGNOSIS AND MANAGEMENT OF MILD TRAUMATIC BRAIN INJURY AMONG CHILDREN

## FULL REPORT

★ <https://jamanetwork.com/journals/jamapediatrics/article-abstract/2698456>

Offering 19 sets of clinical recommendations that cover diagnosis, prognosis, and management and treatment, the CDC Pediatric mTBI Guideline is applicable to healthcare providers in all practice settings. The CDC Pediatric mTBI Guideline outlines specific actions healthcare providers can take to help young patients and their parents/caregivers, including five key practice-changing recommendations.

## 5 KEY RECOMMENDATIONS

1. Do not routinely image pediatric patients to diagnose mTBI.
2. Use validated, age-appropriate symptom scales to diagnose mTBI.
3. Assess for risk factors for prolonged recovery, including history of mTBI or other brain injury, severe symptom presentation immediately after the injury, and personal characteristics and family history (such as learning difficulties and family and social stressors.)
4. Provide patients and their parents/caregivers with instructions on returning to activity customized to their symptoms.
5. Counsel patients and their parents/caregivers to return gradually to non-sports activities after no more than a 2–3 days of rest.







## Mild Traumatic Brain Injury and Concussion: Information for Adults

### Discharge Instructions

You were seen today for a mild traumatic brain injury (mild TBI) or concussion.



**Use this handout to help you watch for changes in how you are feeling or acting and to help you feel better.**



**Be sure to let a family member or friend know about your injury and the types of symptoms to look out for. They may notice symptoms before you do and can help you.**



**Schedule a follow-up appointment with your regular doctor.**

Due to your injury, you may need to take some time off from things like work or school. If so, ask your doctor for written instructions about when you can safely return to work, school, sports, or other activities such as driving a car, riding a bike, or operating heavy equipment.



### Watch for Danger Signs

In rare cases, a dangerous blood clot that crowds the brain against the skull can develop after a TBI. The people checking on you should call 911 or take you to an emergency department right away if you have:

- A headache that gets worse and does not go away
- Significant nausea or repeated vomiting
- Unusual behavior, increased confusion, restlessness, or agitation
- Drowsiness or inability to wake up
- Slurred speech, weakness, numbness, or decreased coordination
- Convulsions or seizures (shaking or twitching)
- Loss of consciousness (passing out)

More information on mild TBI and concussion, as well as tips to help you feel better, can be found at [www.cdc.gov/TraumaticBrainInjury](http://www.cdc.gov/TraumaticBrainInjury).



## Learn About Your Injury

Mild TBI and concussions are brain injuries. A mild TBI or concussion is caused by a bump, blow, or jolt to the head or body that causes:



The head and brain to move quickly back and forth.



The brain to bounce or twist in the skull from this sudden movement.



Chemical changes in the brain and sometimes stretching and damage to the brain cells.

**Doctors may describe these injuries as “mild” brain injuries because they are usually not life-threatening. Even so, their effects can be serious.**

### Mild TBI and concussion signs and symptoms are part of the normal healing process.

Some mild TBI and concussion symptoms (listed at right) may appear right away, while other symptoms may not appear for hours or days after the injury. Symptoms generally improve over time, and most people will feel better within a couple of weeks. If you have symptoms that concern you or are getting worse, be sure to talk with your doctor.

### Symptoms of mild TBI and concussion may affect how you feel, think, act, or sleep.

Symptoms of mild TBI and concussion are different for each person. Most people will have one or more symptoms that affect how they feel, think, act, or sleep. Symptoms may change during recovery. For example, you may have headaches and feel sick to your stomach right after the injury. A week or two after your injury you may notice other symptoms, like feeling more emotional than usual or having trouble sleeping.

### Symptoms of Mild TBI and Concussion



#### Physical

- Bothered by light or noise
- Dizziness or balance problems
- Feeling tired, no energy
- Headaches
- Nausea or vomiting (early on)
- Vision problems



#### Thinking and Remembering

- Attention or concentration problems
- Feeling slowed down
- Feeling foggy or groggy
- Problems with short-term memory
- Problems with long-term memory
- Trouble thinking clearly



#### Emotional

- Anxiety or nervousness
- Irritability or easily angered
- Feeling more emotional
- Sadness



#### Sleep

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

## Understand Your Recovery

**Start your recovery by resting. As symptoms improve, you may gradually return to regular activities.**

Recovery from a mild TBI or concussion means you can do your regular activities without experiencing symptoms from the injury. Recovery may be slower among older adults. People who have had a brain injury in the past may also find that it takes longer to recover.

### **The First Few Days**

- Start your recovery by resting. Symptoms are generally more severe the first few days after the injury.
- You may need to take a short time off from work or school, although usually no more than 2 to 3 days.
- Ask your doctor for written instructions about when you can safely return to work, school, or other activities, such as driving a car.



### **As You Start to Feel Better**

- As you start to feel better after the first few days of your injury, you can gradually return to regular (non-strenuous) activities, such as taking a short walk.
- Avoid activities that make your symptoms come back or get worse.
- For a short time, you may need extra help or support, such as rest breaks or fewer hours at work or school.



### **When Symptoms Are Nearly Gone**

- When your symptoms are mild and nearly gone, return to most regular activities.
- If your symptoms do not get worse during an activity, then that activity is OK for you.
- If your symptoms get worse, you should cut back on that activity.

### **Taking these steps may help speed your recovery:**

- Avoid activities that can put you at risk for another injury to your head and brain.
- Stay connected to friends and family and talk with them about how you are feeling.
- Ask your doctor about medications that are safe to take during recovery to help with symptoms (for example, ibuprofen or acetaminophen for headaches).
- Limit screen time and loud music before bed, sleep in a dark room, and keep to a fixed bedtime and wake-up schedule.

**Do not return to sports and recreational activities on the same day of your injury; wait until you get the OK from a doctor.**

A repeat brain injury that occurs before the brain has fully healed may slow your recovery or increase the chance for long-term problems. This risk is especially a concern for teens and young adults. Returning to sports and recreational activities is a gradual process and should be carefully managed and monitored by your doctor.

**If you do not think you are getting better or your symptoms are getting worse, tell your doctor.**

Keep track of your mild TBI or concussion symptoms and share this information with your doctor. This information may help them identify the best treatments for your symptoms. You may also need to see a specialist who has experience treating brain injuries. Your doctor can help link you to brain injury specialists and services in your area.

If the injury is affecting your ability to work or go to school, talk with your employer or school about support services that may be available to you. If your injury was work-related, make sure you report it right away to your employer and your workers' compensation office.

**More information on mild TBI and concussion, as well as tips to help you feel better, can be found at [www.cdc.gov/TraumaticBrainInjury](http://www.cdc.gov/TraumaticBrainInjury).**

Additional Notes:

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*The information provided in this handout or through links to other sites is not a substitute for medical or professional care. Questions about diagnosis and treatment for concussion should be directed to your doctor or other healthcare provider.*



# Diagnostic Recommendations



**CDC HEADS UP**  
SAFE BRAIN. STRONGER FUTURE.

This handout for healthcare providers describes diagnosis-related recommendations contained in the CDC Pediatric mTBI Guideline.



## GOAL OF THE CDC mTBI GUIDELINE

The goal of the CDC Pediatric Mild Traumatic Brain Injury (mTBI) Guideline is to help healthcare providers take action to improve the health of their pediatric patients with mTBI. To do this, the Guideline consists of 19 clinical recommendations that cover diagnosis, prognosis, and management and treatment. These recommendations are applicable to healthcare providers working in: inpatient, emergency, primary, and outpatient care settings.

The Guideline was developed through a rigorous process guided by the American Academy of Neurology methodology and 2010 National Academy of Sciences methodology for the development of evidence-based guidelines. An extensive review of scientific literature, spanning 25 years of research, formed the basis of the Guideline.

### mTBI in children

Childrens' developing brains are more vulnerable to mTBI because:



Their axons are not as well-myelinated.



They are more susceptible to chemical and metabolic changes.

## RECOMMENDATIONS FOR THE DIAGNOSIS OF mTBI

Six sets of diagnostic recommendations are included in the Guideline. These recommendations focus on:



Neuroimaging



Neuropsychological tools



Serum Biomarkers



# Diagnostic Recommendations

## NEUROIMAGING

### Computed Tomography (CT)

Clinical evaluation of a child with possible mTBI includes balancing the likelihood of potentially devastating complications of a more severe injury against the risks associated with a head CT.

- Healthcare providers **should not** routinely obtain a head CT for diagnostic purposes in children with mTBI.
- Healthcare providers **should** use validated clinical decision rules to identify children with mTBI at low risk for intracranial injury (ICI), in whom a head CT is not indicated, as well as children who may be at higher risk for clinically important ICI, and therefore may warrant a head CT. Existing decision rules combine a variety of factors that, when assessed together, may increase the risk for more serious injury. Such risk factors include the following:
  - Age < 2 years old
  - Loss of consciousness
  - Severe mechanism of injury
  - Vomiting
  - Amnesia
  - Clinical suspicion for skull fracture
  - Severe or worsening headache
  - Nonfrontal scalp hematoma
  - Glasgow Coma Score < 15
- For children diagnosed with mTBI, healthcare providers **should** discuss the risk of a pediatric head CT in the context of risk factors for ICI with the patient and his/her family.



### USE VALIDATED CLINICAL DECISION RULES TO IDENTIFY ICI

It is critical to rule out ICI while avoiding unnecessary risks related to exposure from a head CT. Strong clinical evidence indicates that use of clinical decision rules are effective in identifying children at low risk for ICI.

### Magnetic Resonance Imaging (MRI)

There is currently insufficient evidence to recommend the use of brain MRI in the diagnosis of mTBI in children.

- Healthcare providers **should not** routinely use MRI in the acute evaluation of cases of suspected or diagnosed mTBI.

### Single Photon Emission Computed Tomography (SPECT)

Insufficient evidence currently exists to recommend the use of SPECT in the diagnosis of mTBI in children.

- Healthcare providers **should not** use SPECT in the acute evaluation of cases of suspected or diagnosed mTBI.

### Skull X-rays

CT is better at detecting intracranial injuries, and in the instances where CT is not available, validated clinical decision rules are better than skull X-rays when screening patients with increased risk for ICI.

- Skull X-rays **should not** be used in the diagnosis of pediatric mTBI.
- Skull X-rays **should not** be used in the screening for ICI.

# Diagnostic Recommendations



## EXAMPLES OF VALIDATED SCALES INCLUDE, BUT AREN'T LIMITED TO:

- Post-Concussion Symptom Scale
- Health and Behavior Inventory
- Post-Concussion Symptom Inventory
- Acute Concussion Evaluation

## NEUROPSYCHOLOGICAL TOOLS

### Symptom Scales

There are several validated tools that can be applied quickly and inexpensively.

- Healthcare providers **should** use an age-appropriate, validated symptom rating scale as a component of the diagnostic evaluation in children presenting with acute mTBI.

### Computerized Cognitive Testing

There is insufficient evidence to determine whether baseline testing in children better identifies mTBI as compared to post-injury scores alone.

- Healthcare providers **may** use validated, age-appropriate computerized cognitive testing in the acute period of injury as a component of the diagnosis of mTBI.

### Standardized Assessment of Concussion (SAC)

There is insufficient evidence to support the use of the SAC in the diagnosis of children with mTBI.

## SERUM BIOMARKERS

### Serum Biomarkers

There is insufficient evidence to currently recommend any of the studied biomarkers for the diagnosis of mTBI in children.

- Healthcare providers **should not** perform these tests outside of a research setting at this time for the diagnosis of children with mTBI.



## ► Take action to improve the health of your young patients with mTBI.

To view all 19 sets of recommendations, including those that cover prognosis and management/treatment, and to learn more about the CDC Pediatric mTBI Guideline, visit [www.cdc.gov/HEADSUP](http://www.cdc.gov/HEADSUP).

# Prognostic Recommendations

This handout for healthcare providers describes prognosis-related recommendations contained in the CDC Pediatric mTBI Guideline.



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### mTBI in children

Symptoms of mTBI generally fall into four categories:

- Somatic
- Cognitive
- Mood/Affective
- Sleep

Symptom resolution:

**30%**

Experience symptoms  
one month post-injury

**10%**

Experience symptoms  
three months post-injury

**5%**

Experience symptoms  
one year post-injury

## RECOMMENDATIONS FOR THE PROGNOSIS OF mTBI

Five sets of prognostic recommendations are included in the Guideline. These recommendations focus on:



Counseling patients  
on prognosis



Evaluating for  
premorbid conditions



Assessing for  
risk factors



Use of tools for  
predicting prognosis



Interventions for  
poor prognosis



# Prognostic Recommendations

## GENERAL HEALTHCARE PROVIDER COUNSELING OF PROGNOSIS

Evidence suggests education and clear communication from healthcare providers can optimize outcomes.

- Healthcare providers **should** counsel patients and families that the large majority (70-80%) of children with mTBI do not show significant difficulties that last more than 1-3 months post-injury.
- Healthcare providers **should** counsel patients and families that although some factors predict an increased or decreased risk for prolonged symptoms, each child's recovery from mTBI is unique and will follow its own trajectory.



## PROGNOSIS RELATED TO PREMORBID CONDITIONS

There is an increased risk of delayed recovery or prolonged symptoms associated with certain premorbid conditions in children with mTBI.

- Healthcare providers **should** assess the premorbid history of children either prior to an injury, as a part of pre-participation athletic examinations, or as soon as possible post-injury in children with mTBI, to assist in determining prognosis.
- Healthcare providers **should** counsel children and families completing pre-participation athletic examinations, and children with mTBI and their families, that recovery from mTBI might be delayed in those with:
  - Premorbid histories of mTBI
  - Learning difficulties
  - Lower cognitive ability (for children with an intracranial lesion)
  - Increased pre-injury symptoms (such as headache disorders)
  - Neurological or psychiatric disorder
  - Family and social stressors

## ASSESSMENT OF CUMULATIVE RISK FACTORS AND PROGNOSIS

Evidence indicates that a variety of demographic and injury-related factors predict outcomes in pediatric mTBI.

- Healthcare providers **should** screen for a variety of known risk factors for persistent symptoms in children with mTBI.
- Healthcare providers **may** use validated prediction rules, which combine information about multiple risk factors for persistent symptoms, to provide prognostic counseling to children with mTBI evaluated in emergency department settings.

### FACTORS ASSOCIATED WITH POOR PROGNOSIS:

- Older children or adolescents
- Children of Hispanic ethnicity
- Children from a lower socioeconomic status
- Children with more severe presentations of mTBI (including those associated with an intracranial injury)
- Children who report a higher level of acute postconcussion symptoms
- Children with a neurological or psychiatric disorder
- Children with learning difficulties
- Children with family and social stressors

# Prognostic Recommendations



## EXAMPLES OF VALIDATED SCALES INCLUDE, BUT AREN'T LIMITED TO:

- Post-Concussion Symptom Scale
- Health and Behavior Inventory
- Post-Concussion Symptom Inventory
- Accute concussion Evaluation

## ASSESSMENT TOOLS AND PROGNOSIS

Healthcare providers can more effectively counsel patients with mTBI when they have assessed risk factors for outcomes and recovery. However, there is no single assessment tool to predict outcomes.

- Healthcare providers **should** use a combination of tools to assess recovery in children with mTBI.
- Healthcare providers **should** use validated symptom scales to assess recovery in children with mTBI.
- Healthcare providers **may** use validated cognitive testing (including measures of reaction time) to assess recovery in children with mTBI.
- Healthcare providers **may** use balance testing to assess recovery in adolescent athletes with mTBI.



## INTERVENTIONS FOR mTBI WITH POOR PROGNOSIS

While most symptoms of mTBI resolve within 1-3 months, some children are at risk for persistent symptoms or delayed recovery. Children who are at higher risk for delayed recovery are more likely to need further intervention.

- Healthcare providers **should** monitor children with mTBI who are determined to be at high risk for persistent symptoms based on premorbid history, demographics, or injury characteristics.
- For children with mTBI whose symptoms do not resolve as expected with standard care (i.e., after 4-6 weeks), healthcare providers **should** provide or refer for appropriate assessments or interventions.

## ► Take action to improve the health of your young patients with mTBI.

To view all 19 sets of recommendations, including those that cover diagnosis and management and treatment, and to learn more about the CDC Pediatric mTBI Guideline, visit [www.cdc.gov/HEADSUP](http://www.cdc.gov/HEADSUP).



# Management and Treatment Recommendations



**CDC HEADS UP**  
SAFE BRAIN. STRONGER FUTURE.

This handout for healthcare providers provides an overview of the management and treatment-related recommendations contained in the CDC Pediatric mTBI Guideline.



## GOAL OF THE CDC mTBI GUIDELINE

The goal of the CDC Pediatric Mild Traumatic Brain Injury (mTBI) Guideline is to help healthcare providers take action to improve the health of their pediatric patients with mTBI. To do this, the Guideline consists of 19 clinical recommendations that cover diagnosis, prognosis, and management and treatment. These recommendations are applicable to healthcare providers working in: inpatient, emergency, primary, and outpatient care settings.

The Guideline was developed through a rigorous process guided by the American Academy of Neurology methodology and 2010 National Academy of Sciences methodology for the development of evidence-based guidelines. An extensive review of scientific literature, spanning 25 years of research, formed the basis of the Guideline.

### mTBI in children

While most have a good recovery, some children experience both acute and long-term problems that affect them:



**Physically**



**Cognitively**



**Psychologically**

## RECOMMENDATIONS FOR TREATMENT AND MANAGEMENT OF mTBI

Eight sets of management and treatment recommendations are included in the Guideline. These recommendations focus on:



General areas of treatment for patients and families



Symptom and problem-specific treatments

# Management and Treatment Recommendations



Counsel patients to return gradually to non-sports activities after no more than 2-3 days of rest.

## GENERAL AREAS OF TREATMENT FOR PATIENTS AND FAMILIES

Health outcomes can generally be optimized through patient education and behavior modification. In addition, evidence suggests that rest, or reduction in cognitive and physical activity, is beneficial immediately following mTBI. This should be followed shortly after the injury with a gradual return to activity.

### Patient and Family Education and Reassurance

- In providing education and reassurance to the family, the healthcare provider **should** include the following information:
  - Warning signs indicating a more serious injury
  - Expected course of symptoms and recovery
  - Instructions on monitoring post-concussive symptoms
  - Prevention of further injury
  - Management of cognitive and physical activity, or rest
  - Instructions regarding return to school and return to play or recreation
  - Clear healthcare provider follow-up instructions from a healthcare provider

### Cognitive and Physical Rest and Aerobic Treatment

Collaboration among healthcare providers, schools, and families should be coordinated to gradually adjust interventions and return the child to full participation without worsening symptoms.

- Healthcare providers **should** counsel patients to observe more restrictive physical and cognitive activity during the first several days following mTBI in children.
- Following these first several days, healthcare providers **should** counsel patients and families to resume a gradual schedule of activity that does not exacerbate symptoms, with close monitoring of symptom expression (number, severity).
- Following the successful resumption of a gradually increased schedule of activity, healthcare providers **should** offer an active rehabilitation program of progressive reintroduction of noncontact aerobic activity that does not exacerbate symptoms, with close monitoring of symptom expression (number, severity).
- Healthcare providers **should** counsel patients to return to full activity when they return to premorbid performance if they have remained symptom-free at rest, and with increasing levels of physical exertion.

Return to school and play plans can be found at [www.cdc.gov/HEADSUP](https://www.cdc.gov/HEADSUP).

# Management and Treatment Recommendations

## Psychosocial and Emotional Support

Evidence suggests that social support (both tangible help and emotional involvement) contributes to healthy behaviors, and improved overall quality of life.

- Healthcare providers **may** assess the extent and types of social support (e.g., emotional, informational, instrumental, appraisal) available for children with mTBI, and emphasize social support as a key element in the education of caregivers and educators.

## Return to School

- To assist children returning to school following mTBI, medical and school-based teams **should** counsel the student and family regarding the process of gradually increasing the duration and intensity of academic activities as tolerated, with the goal of increasing participation without significantly exacerbating symptoms.
- Return to school protocols **should** be customized based on the severity of postconcussion symptoms in children with mTBI as determined jointly by medical and school-based teams.
- For any student with prolonged symptoms that interfere with academic performance, school-based teams **should** assess the educational needs of that student and determine the student's need for additional educational supports, including those described under pertinent federal statutes.
- Postconcussion symptoms and academic progress in school **should** be monitored collaboratively by the student, family, healthcare provider, and school teams, who jointly determine which modifications or accommodations are needed to maintain an academic workload without significantly exacerbating symptoms.
- The provision of educational supports **should** be monitored and adjusted on an ongoing basis by the school-based team until the student's academic performance has returned to pre-injury levels.
- For students who demonstrate prolonged symptoms and academic difficulties despite an active treatment approach, healthcare providers **should** refer the child for a formal evaluation by a specialist in pediatric mTBI.

# 70 - 80%

of children with mTBI will demonstrate functional recovery by 1-3 months.





# Management and Treatment Recommendations



## SYMPTOM OR PROBLEM-SPECIFIC TREATMENT AND MANAGEMENT

### Post-traumatic Headache Treatment and Management

Painful headaches are one of the most common symptoms in children after mTBI and may require intervention.

- Healthcare providers in the emergency department **should** clinically observe and consider obtaining a head CT in children presenting with a severe and worsening headache, along with other symptoms or risk factors, following mTBI to evaluate for ICI requiring further management in accordance with validated clinical decision making rules.
- Children undergoing observation periods for headache with acutely-worsening symptoms **should** undergo emergent neuroimaging.
- Healthcare providers and caregivers **should** offer non-narcotic analgesia to children with a painful headache following acute mTBI, but also provide counseling to the family regarding the risks of analgesic overuse, including a rebound headache.
- There is insufficient evidence to recommend the administration of 3% hypertonic saline as a treatment for an acute headache following mTBI in children. Healthcare providers **should not** administer this medication to children with mTBI for treatment of symptoms outside of a research setting at this time.
- Chronic headache following mTBI is likely to be multifactorial; therefore, healthcare providers **should** refer children with chronic headache after mTBI for multidisciplinary evaluation and treatment, with consideration of analgesic overuse as a contributory factor.

### Healthcare providers should identify and tailor treatment plans/referrals to address:

- **Acutely worsening headache:** consider neuroimaging
- **Worsening sleep problems:** sleep hygiene, sleep specialist
- **Chronic headache:** nonopioid analgesia (monitor for overuse), multidisciplinary evaluation
- **Cognitive impairment:** treatment directed at etiology, neuropsychological evaluation
- **Vestibulo-ocular dysfunction:** vestibular rehabilitation
- **Emotional dysfunction:** psychotherapeutic evaluation and treatment

### Vestibulo-ocular Motor Dysfunction

Dizziness is another potentially debilitating symptom of mTBI, and limited evidence suggests that early vestibular physical therapy may benefit patients experiencing dizziness.

- Healthcare providers **may** refer children with subjective or objective evidence of persistent vestibulo-ocular motor dysfunction following mTBI to a program of vestibular rehabilitation.



# Management and Treatment Recommendations

## Sleep Treatment and Management

Sleep disturbances after mTBI are common and may exacerbate ongoing problems. Adequate sleep has been shown to improve overall health and should be an important part of treatment for children with mTBI.

- Healthcare providers **should** provide guidance on proper sleep hygiene methods to facilitate recovery from pediatric mTBI.
- If sleep problems emerge or continue, despite appropriate sleep hygiene measures, healthcare providers **may** refer children with mTBI to a sleep disorder specialist for further assessment.



## Cognitive Impairment Treatment and Management

Problems with attention, memory and learning, response speed, and other cognitive impairment can occur following mTBI. These disturbances can result in significant problems with learning in school, or social interactions.

- Healthcare providers **should** attempt to determine the etiology of cognitive dysfunction within the context of other mTBI symptoms.
- Healthcare providers **should** recommend treatment for cognitive dysfunction that reflects its presumed etiology.
- Healthcare providers **may** refer children with persisting complaints related to cognitive function for a formal neuropsychological evaluation to help determine etiology, and to recommend targeted treatment.



## ► Take action to improve the health of your young patients with mTBI.

To view all 19 sets of recommendations, including those that cover diagnosis and prognosis, and to learn more about the CDC Pediatric mTBI Guideline, visit [www.cdc.gov/HEADSUP](http://www.cdc.gov/HEADSUP).

For healthcare providers treating children 18 years of age and younger

## HEALTHCARE PROVIDERS SHOULD:

### ASSESS.

Conduct a physical examination to identify findings that:

- Suggest more severe TBI (e.g., hemotympanum, pupillary asymmetry).
- May impact management of mTBI (e.g., concurrent injuries or baseline deficits, oculomotor dysfunction).
- Suggest other contributions to symptoms (e.g., dehydration, cervical tenderness, scalp hematoma).

Do not image routinely (including CT & MRI).

- Use validated clinical decision rules predicting risk for more severe injury to determine need.

Assess symptoms using validated scales. Consider cognitive and balance testing.

Conduct a history to identify risk factors for poor prognosis using validated prediction rules.

### COUNSEL.

Provide information about:

- Warning signs that injury may be more serious.
- Typical recovery course.
- How to prevent further injury.
- Gradual re-introduction of activity that does not worsen symptoms.
- The need for social and emotional support.

Offer clear instructions (preferably verbal and written) on return to activity, including school and sports, customized to the patient's symptoms.

- After a few days of rest (2-3 days), begin light activity & then gradually re-introduce regular activities (not inclusive of sports) that do not significantly worsen symptoms.
- Assess school-related needs & monitor progress in collaboration with parents and school professionals.
- Once back to regular non-sports activities (including school), patient can begin return to sports using a standard progression with gradually increasing levels of physical exertion.
- No return to contact sports activity until symptom-free with exertion (including without the use of pain medication).

### REFER.

Identify and tailor treatment plans/referrals to address:

- Acutely worsening symptoms → consider neuroimaging.
- Chronic headache → non-opioid analgesia (monitor for overuse), multi-disciplinary evaluation.
- Vestibulo-ocular dysfunction → vestibular rehabilitation.
- Worsening sleep problem → sleep hygiene, sleep specialist.
- Cognitive impairment → treatment directed at etiology, neuropsychological evaluation.
- Emotional dysfunction → psychotherapeutic evaluation and treatment.

**A combination of risk factors that may indicate need for neuroimaging include:**

- Age < 2 years old
- Recurrent vomiting
- Loss of consciousness
- Severe mechanism of injury
- Severe or worsening headache
- Amnesia
- Non-frontal scalp hematoma
- Glasgow Coma Score < 15
- Clinical suspicion for skull fracture

**Examples of validated scales include, but aren't limited to:**

- Post-Concussion Symptom Scale
- Health and Behavior Inventory
- Post-Concussion Symptom Inventory
- Acute Concussion Evaluation

**Factors associated with poor prognosis:**

- Older age (older children/adolescents) or Hispanic ethnicity
- Lower socio-economic status
- History of intracranial injury
- Premorbid histories of mTBI or increased pre-injury symptoms
- Neurological or psychiatric disorder
- Learning difficulties or lower cognitive ability
- Family and social stressors

**Parents should watch for warning signs:**

- A headache that gets worse & does not go away
- Significant nausea or repeated vomiting
- Increased confusion, restlessness, or agitation
- Slurred speech, drowsiness, or inability to wake up
- Weakness, numbness, or decreased coordination
- Loss of consciousness, convulsions, or seizures

**Steps in a return to play progression generally include:**

- Step 1: Return to regular non-sports activities
- Step 2: Light aerobic exercise
- Step 3: Sport-specific exercise
- Step 4: Non-contact training drills
- Step 5: Full contact practice
- Step 6: Return to sport

**Refer patients whose symptoms do not resolve as expected with standard care after 4-6 weeks.**





# WHEN YOUR PATIENT IS LIVING WITH BRAIN INJURY

*A tip card for physicians treating individuals living with chronic brain injury sequelae*

## Key points about brain injury (BI):

- BI can affect every aspect of an individual's functioning, leaving some with lifelong challenges.
- BI can be traumatic (TBI) or non-traumatic.
- Injury severity (mild, moderate, severe) does not necessarily predict long-term outcome.
- Many sequelae are difficult to see and therefore may be easy to misinterpret (e.g. lack of initiation, cognitive overload, difficulty recognizing social cues).
- Each injury is unique, like a thumbprint.
- Improvements can occur after initial recovery; re-engagement in therapeutic activities may be beneficial even years post-injury.

## Common Sequelae and Subsequent Life Challenges

Areas of Functioning	Specific Sequelae	Subsequent Life Challenges
Motor	Motor planning; coordination; balance; spasticity	Driving/ transportation
Sensory	Changes in vision, hearing, taste, smell or tactile sensation; visual field loss; unilateral neglect; temperature regulation	Following health/wellness recommendations
Cognitive	Attention; concentration; organization; new learning; initiation; memory; problem-solving; judgement; self-awareness; cognitive overload	Communicating needs
Communication	Expressive and receptive communication; dysarthria; tangential speech; following social rules; understanding social cues	Relationships, sexuality
Emotional	Regulating emotions; flat affect; easily overstimulated/overwhelmed; increased risk for depression, anxiety and suicidal ideation	Making friends
Fatigue and Sleep	Physical and emotional fatigue; sleep patterns	Employment
		Return to school
		Having a sense of meaning in life
		Behavioral health
		Substance use/ misuse



## WHEN YOUR PATIENT IS LIVING WITH BRAIN INJURY

*A tip card for physicians treating individuals living with chronic brain injury sequelae*

**[CONTINUED]**

### Interacting with Patients Living with Brain Injury

- Encourage the patient to bring a written list of questions and concerns to the appointment.
- Plan extra time for the appointment to allow for cognitive or communication challenges.
- Encourage the patient to bring a friend/family member to the appointment as a historian/note-taker if needed.
- Encourage compensatory strategies, including –
  - Writing notes in a smartphone or notebook/day-planner organizer;
  - Using a med-minder; setting alarms on smartphone.
- Find ways to repeat information during the appointment; summarize at the end.
- Have the patient repeat instructions back to you – repeat, rehearse, review.
- Provide reminders by email.
- Provide a written summary of the appointment; email a copy of the summary.
- If the patient becomes overwhelmed, model calmness (sit back, take a breath, relax); slow down the information flow; ask how he/she is doing and if they have questions; switch to a lighter topic.
- Encourage an organized approach to wellness (a handout on wellness after BI can be found at [https://www.archives-pmr.org/article/S0003-9993\(18\)30177-1/pdf](https://www.archives-pmr.org/article/S0003-9993(18)30177-1/pdf)).
- Encourage socialization and productive activity (support groups, community classes, volunteering).
- Provide resources for support, education and advocacy.

### Community Resources – Support, Education, Advocacy

- Brain Injury Association of America – [www.biausa.org](http://www.biausa.org)
- United States Brain Injury Alliance – [www.usbia.org](http://www.usbia.org)  
*Most states have either a state brain injury association or alliance, offering support groups, resources, education and advocacy. Links to these websites can be found at the two resources above.*
- Model Systems Knowledge Translation Center for TBI – <https://msktc.org/tbi>
- Center for Disease Control – <https://www.cdc.gov/traumaticbraininjury>
- Brainline – <https://www.brainline.org/>
- American Stroke Association – [www.stroke.org](http://www.stroke.org)
- National Association of State Head Injury Administrators – [www.nashia.org](http://www.nashia.org)

***This tip card was prepared with support from the American Congress of Rehabilitation Medicine (ACRM), by members of the ACRM Chronic Brain Injury Task Force:***

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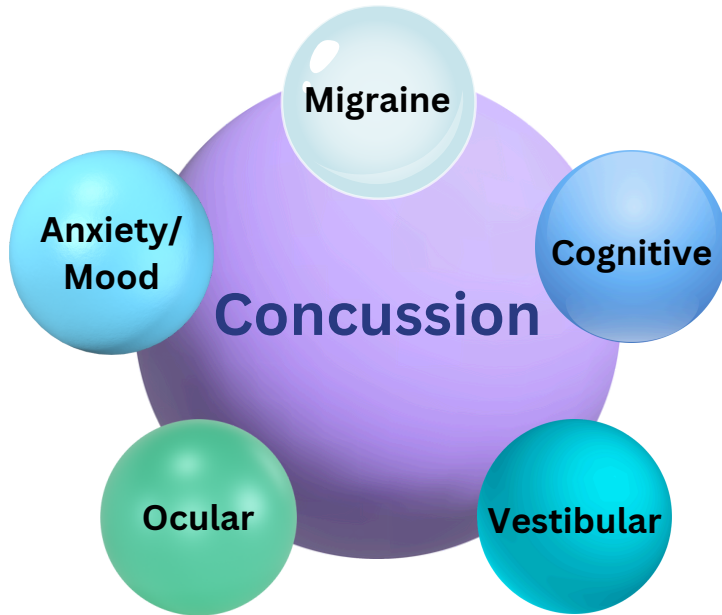
# 5 TYPES OF CONCUSSION

with 2 Modifying Factors

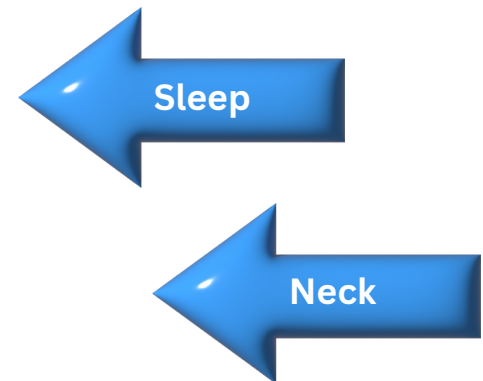


“Concussions are characterized by diverse symptoms and impairments in function resulting in different clinical profiles and recovery trajectories.”

## 5 Concussion Types



## 2 Modifying Factors



## CONCUSSION FACTS

- Symptoms will be broad and generalized during the first week following a concussion and will generally include symptoms like headache and fatigue.
- After the first week, if symptoms persist, they will tend to fall into one of the 5 clinical trajectories.
- There could be more than one trajectory type present.
- Specific trajectory and outcome depends on several factors:
  - Direction of force (linear vs. rotational)
  - Location of impact
  - Amount of force involved
  - Pre-injury risk factors

## ACTIVE TREATMENT

Research is showing that active, specialized treatment - focused on specific symptoms - helps the brain recover from injury. These treatments include:

- |  |  |
|--|--|
| ▪ Neuropsychology                      | ▪ Neurosurgery                                 |
| ▪ Vestibular Physical Therapy          | ▪ Neuroradiology                               |
| ▪ Exertional Physical Therapy          | ▪ Chiropractic                                 |
| ▪ Physical Medicine and Rehabilitation | ▪ Cognitive Therapy/ Speech Language Pathology |
| ▪ Neuro-optometry/ Neuro-ophthalmology |  |
| ▪ Orthopedist                          |  |

## RISK FACTORS (which may delay recovery)

- |                                |   |
|--------------------------------|---|
| • History of prior concussions | • Migraine history                                      |
| • Motion sickness              | • Gender (female)                                       |
| • Visual problems              | • Age (younger children tend to take longer to recover) |
| • Learning or attention issues |   |

# CONCUSSION CLINICAL TRAJECTORIES

A model for understanding assessment, treatment and rehabilitation.

## COGNITIVE

“Cognitive difficulties include decreased concentration, increased distractibility, difficulty learning/retaining new information or decreased multitasking abilities. Sometimes accompanied by increased fatigue as the day progresses.”



## VESTIBULAR

“Impairments of the vestibular system - the balance center of the brain - affects one’s ability to interpret motion, coordinate head and eye movements, or stabilize vision upon head movement.”



## OCULAR

“Ocular dysfunction occurs when the movement of the eyes in tandem, or binocular movement, is affected. This may result in difficulties bringing the eyes together, or moving one’s eyes to track motion.”



## POST-TRAUMATIC MIGRAINE

“Post-traumatic migraine symptoms include headaches, nausea, and/or sensitivity to light or noise.”



## ANXIETY/MOOD

“This occurs when someone has a hard time turning his or her thoughts off, being particularly ruminative, or suffering from excessive worry or concern.”



**TWO MODIFYING FACTORS:** The presence of modifiers impacts the concussion symptoms.

### SLEEP

The sleep modifier involves sleeping more or less than usual and having difficulty falling or staying asleep.

### NECK

The neck modifier includes neck pain, stiffness or difficulty moving the neck.

The information on this infographic is from the University of Pittsburgh Medical Center’s *TREAT Sport-related Concussion Conference* on April 20-21, 2024. It was based on research from: Collins, Kontos, Reynolds, Murawski, et al. KSSTA; 2014. Kontos & Collins, APA Books; 2018. Kontos et al. *Curr Sports Med Rep*; 2019. This *5 Types of Concussion and 2 Modifying Factors* information reflects an update from the original *6 Types of Concussion*.



[@BrainLinksTN](https://www.tndisability.org/brain)



Brain Links is supported by the Administration for Community Living (ACL) of the U.S. Department of Health and Human Services under Grant No. 90TBSG0051-01-00 and in part by the TN Department of Health, Traumatic Brain Injury Program.

July 2024

## 504/IEP Accommodations &amp; Modifications in the Classroom for a Student with a Traumatic Brain Injury

Student: \_\_\_\_\_ Teacher: \_\_\_\_\_ Grade: \_\_\_\_\_ Date: \_\_\_\_\_ Birth Date: \_\_\_\_\_

Presenting Concerns: \_\_\_\_\_

Persons Responsible for Providing Selected Items: \_\_\_\_\_

Directions: Circle the challenges that affect your child or student. Check the accommodations that may be helpful.

**Environment**

- ☐ Post class rules
- ☐ Post daily schedule
- ☐ Give preferential seating
- ☐ Change to another class
- ☐ Change schedule (most difficult in morning)
- ☐ Eliminate distractions (visual, auditory & olfactory)
- ☐ Modify length of school day
- ☐ Provide frequent breaks
- ☐ Provide a quiet work place
- ☐ Maintain consistent schedule
- ☐ Provide system for transition

**Transitions**

- ☐ Specified person to oversee transition between classes or end of day
- ☐ Advanced planning for transition between grades/schools
- ☐ Modified graduation requirements
- ☐ Assistance with identifying post-secondary supports
- ☐ Identification of community resources for persons with brain injury

**Method of Instruction**

- ☐ Repeat directions
- ☐ Circulate teacher around room
- ☐ Provide visual prompts
- ☐ Provide immediate feedback
- ☐ Point out similarities to previous learning & work
- ☐ Use manipulative materials
- ☐ Teach to current level of ability (use easier materials)
- ☐ Speak clearly
- ☐ Pre-teach or reteach
- ☐ Use peer tutor or partner
- ☐ Use small group instruction
- ☐ Use simple sentences
- ☐ Use individualized instruction
- ☐ Pause frequently
- ☐ Use cooperative learning
- ☐ Encourage requests for clarification, repetition, etc.
- ☐ Use examples relevant to student's life
- ☐ Demonstrate & encourage use of technology

**Behavioral Needs**

- ☐ Early interventions for situations that may escalate
- ☐ Teach expected behavior
- ☐ Increase student academic success rate
- ☐ Learn to recognize signs of stress
- ☐ Give non-verbal cues to discontinue behavior
- ☐ Reinforce positive behavior
- ☐ Set goals with student
- ☐ Use social opportunities as rewards
- ☐ Teach student to use advance organizers at beginning of lesson
- ☐ Role play opportunities
- ☐ Use proactive behavior management strategies
- ☐ Daily/weekly communication with parents
- ☐ Modification of non-academic tasks (e.g., lunch or recess)
- ☐ Time & place to regroup when upset
- ☐ Additional structure in daily routine
- ☐ Frequent specific feedback about behavior

**Assistive Technology**

- ☐ Multimedia software
- ☐ Electronic organizers
- ☐ Shortcuts on computers
- ☐ Concept mapping software
- ☐ Accessibility options on computer
- ☐ Proofreading programs
- ☐ Alternative keyboards
- ☐ Voice output communication devices and reminders
- ☐ Enlarged text or magnifiers
- ☐ Recorded text & books
- ☐ Specialized calculators
- ☐ Picture & symbol supported software
- ☐ Talking spell checker & dictionary
- ☐ Computer for responding & homework
- ☐ Use of communication devices
- ☐ Word predicting programs
- ☐ iPad/tablet
- ☐ Smart Phone

## 504/IEP Accommodations & Modifications in the Classroom for a Student with a Traumatic Brain Injury

### Memory Deficits

- Monitoring planner (check-off system)
- Written & verbal directions for tasks
- Posted directions
- Frequent review of information
- Strategy for note taking during long reading assignment
- Provide a copy of notes
- Open book or note tests
- Reminders for completing & turning in work
- Repetition of instructions by student to check for comprehension

### Visual Spatial Deficits

- Large print materials
- Distraction free work area
- Modified materials (e.g., limit amount of material presented on single page, extraneous picture)
- Graphs & tables provided to student
- Use of math & reading template or guide

### Gross Motor/Mobility Difficulties

- Priority in movement (e.g., going first or last)
- Adaptive physical education
- Modified activity level for recess
- Special transportation
- Use of ramps or elevators
- Restroom adaptations
- Early release from class
- Assistance with carrying lunch tray, books, etc.
- Escort between classes
- Alternative evacuation plan
- Simple route finding maps & cues

### Attention

- Visual prompts
- Positive reinforcement
- Higher rate of task change
- Verbal prompts to check work

### Organizational Skills

- Study guide or timeline
- Daily calendar for assignments & tasks (digital or written)
- Instructions in using a planner or app
- Provide color-coded materials
- High-lighted materials to emphasize important or urgent information

### Academic Progress

- Assigned person to monitor student's progress
- Contact person (home & school)
- Weekly progress report (home & school)

### Fine Motor Difficulties

- Copy of notes provided
- Oral examinations
- Note-taker for lectures
- Scribe for test taking
- Recorded lectures

### Curriculum

- Reduce length of assignments
- Change skill or task
- Modify testing type or setting
- Allow extra time
- Teach study skills
- Teach sequencing skills
- Teach memory strategies
- Write assignments in daily log
- Teach peers how to be helpful

### Fatigue

- Reduced schedule
- Planned rest breaks
- Schedule arranged for high cognitive demand tasks to be followed by less stressful coursework

### Processing Delays

- Complex direction broken into steps
- Repetition of pertinent information
- Cueing student to question prior to asking
- Use of precise language

### Other Considerations

#### *Home/School Relations*

- School counseling
  - Scripts about the injury & hospitalization
  - Schedule regular meetings for all staff to review progress & maintain consistency
  - Schedule parent conferences every
- 
- Parent visits/contact
  - Home visits

#### *Disability Awareness*

- Explain disabilities to other students
- Teach peers how to be helpful
- Training for school staff

**This checklist serves as a starting point for identifying student needs and developing appropriate accommodations. Because rapid changes take place after a brain injury, the plan must be frequently reviewed and updated to meet the changing needs of the student. Be sure to review and change the plan as frequently as needed.**



# JAN

## Job Accommodation Network

Practical Solutions • Workplace Success

Have questions about  
workplace accommodations  
or the Americans with  
Disabilities Act (ADA)?

**Ask JAN. We can help!**

**Office of Disability  
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# CDC'S ONLINE TRAINING FOR HEALTHCARE PROVIDERS

## HEADS UP

HEADS UP to Healthcare Providers is a free online training developed by CDC and the American Academy of Pediatrics. The goal of the training is to provide an overview of the evidence-based recommendations outlined in the [CDC Pediatric mTBI Guideline](#) and to equip healthcare providers with practical strategies to integrate these recommendations into clinical practice.

## LEARNING OBJECTIVES

This **training** will enable healthcare providers to:

- ★ Learn practical strategies to integrate the latest clinical recommendations into practice. Understand
- ★ the current diagnostic criteria for mTBI and use validated, symptom-based assessment tools to identify them.
- ★ Recognize the key components of a return-to-school process.
- ★ Identify common mental health conditions following mTBI.
- ★ Advise patients and their caregivers on mTBI-related prevention strategies.

With this training, health care providers will get the tools to improve mTBI care and patient outcomes to help children thrive. CMEs are available for AAP members.

## FOLLOW THE URL TO BEGIN

<https://www.cdc.gov/heads-up/hcp/training/index.html>

## CDC Resources for Healthcare Providers

<https://www.cdc.gov/traumatic-brain-injury/hcp/communication-resources/index.html>



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# Research Summary and References

## Support for the Toolkit

### TOOLKIT

This toolkit, and specifically the *Concussion Management Protocol*, were developed based on the research summarized below. The research supports educating practitioners (rationale for the [Reference](#) section), properly evaluating, monitoring and referring patients (rationale for the [In-Office](#) section) and properly educating those with mTBI/ TBI (rational for the [Send-Home](#) sections).

### CHILDREN:

#### Healthcare providers outside hospitals are on the front lines:

Most (82%) of those 0 to 17 years will seek initial care with their primary care physician (Arbogast, et al., 2016). Since most of our incidence data comes from Emergency Department's (ED's), we are significantly underestimating the extent of the TBI issue (Study included over 8,000 patients).

#### The very young are frequently not diagnosed or treated:

The newest pediatric mTBI guidelines recommend using an age-appropriate validated concussion scale (Lumba-Brown, et al., 2018), but one does not exist yet that focuses on children five and under. We must look for additional signs in children five years and under. For this age range, parents endorse the typical symptoms from the ACE, but in answer to an open-ended question, 82% also reported additional symptoms (Suskauer, et al., 2018), including:

- ✱ Appetite changes
- ✱ Behavioral dysregulation
- ✱ Decreased engagement
- ✱ Disrupted sleep
- ✱ Bladder incontinence (Enuresis)
- ✱ Increased dependence
- ✱ Stomachaches

The study also concluded that it is important to monitor behavior dysregulation over time. At first, parents saw disengagement, and then behavior dysregulation emerged and persisted. Behavioral dysregulation was among most commonly reported symptoms and was still present at the time of the evaluation (over one month post).

#### Children with TBI may develop or have ongoing concerns and should be monitored (for years):

They are more likely to have a variety of health/academic issues compared to those with no TBI (Haarbauer-Krupa, Lee, et al., 2018). The highest prevalence are:

- ✱ Learning disorders
- ✱ ADD/ADHD
- ✱ Speech Language problems
- ✱ Developmental delay
- ✱ Anxiety
- ✱ Bone, joint or muscle problems

Children with mild (Taylor, 2015) and moderate and severe (Schwartz, 2003) injuries are more at risk for persistent behavior problems. The risk rises with severity of the mTBI and younger age at injury. Even in children whose injuries were significant enough to show skull or brain tissue damage on imaging, only one-fourth received any rehabilitations services afterward and only one-fourth received a neuropsychological assessment. None of the children received early intervention or special education preschool services after their TBI (Haarbauer-Krupa, Lundine, et al., 2018). This study concludes:

- ✱ Healthcare providers should provide information to parents on what to watch for and long term implications.



- ✳ Healthcare providers should make appropriate referrals at the time of diagnosis.
- ✳ Referral to rehabilitation can help with transition to preschool.

Another study (Niedzwecki, et al., 2018) concluded that even though children did not receive inpatient care, some will still benefit from rehabilitation for subsequent problems, including memory and learning issues (that were not pre-existing).

This study also found that medical issues at the time of injury, like elevations or depressions of Intra-cranial pressure (ICP), unstable blood pressure, unstable oxygenation, delayed nutrition or seizures, can impact the child's IQ at 12 months.

- ✳ The study's recommendation for trauma treatment is that rehab services be included early in the continuum – this would include consultation early in the ICU or acute care settings and referrals to an outpatient concussion clinic.

In the first year after injury, a substantial portion of children with moderate or severe TBI have unmet or unrecognized healthcare needs, with cognitive services being most frequent among these. Because of this finding, the authors recommended that cognition be screened in the primary care setting (Slomine, et al., 2006).

#### *Reason for unmet needs:*

- ✳ Lack of a physician's recommendation or referral
- ✳ Failure of parent follow-up
- ✳ Not provided in the school settings
- ✳ Cost

Children with all levels of impairment had educational needs, while those with less severe injuries were at greater risk of being underserved (Kingery, et al., 2017).

Earlier age at time of injury produces more functional impairment (Taylor, et al., 2015). The more severe the injury and the younger age at injury, the greater the need for monitoring and follow up (Anderson, Catroppa, Dudgeon, 2006; Anderson, Catroppa, Haritou, 2006).

### **On the first visit, provide educational materials, accommodations for return to school and recommend a follow up visit (at which time appropriate referrals can be made):**

- ✳ Many children did not even visit a healthcare provider in the year following their injury (Slomine, et al., 2006).

### **Ongoing family support is important:**

Family support is important because those with family dysfunction/poor coping, the child had greater dysfunction (Schwartz, 2003; Anderson, Catroppa, Dudgeon, et al., 2006; Taylor, 2008).

Families also reported needing information, emotional support and access to community-based services (Jones, 2017).

### **Schools need the support/recommendations of healthcare providers:**

Teachers are not adequately trained to identify brain injuries and issues related to them (Davies, et al., 2013).

On specialized testing, children with TBI tend to show specific patterns of deficit that will not be revealed through standard special education testing. A neuropsychological evaluation will pick up these patterns. In a study of mild complicated TBI (with orthopedic controls), children who were injured before age 6 and were about 5 years post injury were tested. Both groups were within normal limits on most cognitive, language and reading measures; but they had some differences in verbal IQ, receptive

language and reading comprehension. The biggest differences were in pragmatic language (which leads to social issues), story retell, and word fluency (Haarbauer-Krupa, King, et al., 2019).

Schools will not provide all of what a child needs (Niedzwecki, 2018). Schools are only required to provide those services that directly relate to academics.

The gap in academic achievement widens over time (compared with non-injured classmates) (Ewing-Cobbs, 2006; Farmer, 1997; Taylor & Yeates, 2002; Todis & Glang, 2008; Todis, Glang, Bullis, et al., 2011; Wagner, et al., 2006). So, if children with TBI do not qualify for services at first, they should be referred again if they continue to have difficulties.

“Children who receive systematic transition services a part of their medical care are more likely to be identified for specialized support services at school, such as speech therapy (Haarbauer-Krupa, Ciccia, et al., 2017).

Use of the ACE tools (screening tool and Care Plan) “increased patient follow-up and improved recall of and adherence to ED discharge recommendations (Zuckerbraun, 2014).”

### **Pediatric Guideline:**

*Also see the CDC Pediatric Guideline (Lumba-Brown, et al., 2018) on mTBI in this toolkit for 19 sets of recommendations, with these [5 key take away points](#):*

1. Do not routinely image pediatric patients to diagnose mTBI.
2. Use validated, age-appropriate symptom scales to diagnose mTBI.
3. Assess risk factors for prolonged recovery, including history of mTBI or other brain injury, severe symptom presentation immediately after the injury, and personal characteristics and family history (such as learning difficulties and family and social stressors).
4. Provide patients and their parents with instructions on returning to activity customized to their symptoms.
5. Counsel patients and their parents/caregivers to return gradually to non-sports activities after no more than 2-3 days of rest.

### **Consequences of brain injury for all ages:**

Once a person has one brain injury, the risk for another increases, and the risk increases with each subsequent injury. A person with a brain injury is also more likely to be incarcerated (or involved with the criminal justice system) (Farrer & Hedges, 2011; Shiroma, et al., 2012; Williams, et al., 2010; Im, et al., 2014), to have psychiatric issues ((McCarthy, et al., 2006; Kaponen, et al., 2002; Zgaljardic, et al., 2015), to be involved with substance abuse (Kreutzer, et al., 1996), and to be socially isolated (Morton & Wehman, 1995; Hawthorne, et al., 2009). Long-term psychiatric disorders are associated with greater risk for substance abuse (Zgaljardic, et al., 2015). Prior TBI has been identified as a potential contributing factor to domestic violence (Romero-Martinez & Moya-Albiol, 2013). Not surprisingly, TBI is found in female victims of domestic violence (Corrigan, et al., 2001).

## **ADULTS**

### **Follow up and education are important:**

Findings from a study (Seabury, et al., 2018) of follow-up care that was provided to people at 11 Level 1 trauma centers across the country:

- ✱ Less than half received TBI educational material at discharge or saw a health care practitioner within 3 months after injury.
- ✱ Only 27% were called by 2 weeks.
- ✱ Follow-up care varied by site, from 19% to 72%.

- ✳ For those with a positive CT scan, over one-third had not seen a medical practitioner for follow-up.
- ✳ Even among those with 3 or more moderate to severe post-concussive symptoms, only about half saw a medical practitioner within 3 months.
  - Of those that did, 80% reported that it was helpful. The majority saw a general practitioner and 38% saw a neurologist. Only 15% reported visiting a clinic specializing in TBI care.

### A few conclusions from the paper:

- ✳ “Failure to follow-up with patients could have adverse consequences, as simply providing educational materials to patients with mTBI is associated with improved outcomes.”<sup>35</sup>
- ✳ “Our findings reveal the consequences that may result from the absence of systems of follow-up care for patients with mTBI and concussion. They also highlight an apparent lack of appreciation by many clinicians of the substantial symptom and life burdens experienced by a significant proportion of patients with injuries labeled mild.”

Use of the ACE tools (screening tool and Care Plan) “increased patient follow-up and improved recall of and adherence to ED discharge recommendations (5-21 year olds) (Zuckerbraun, 2014).”

### Unmet Needs:

Poor psychosocial health was reported by a substantial portion in a study at one year post injury TBI may cause decades lasting vulnerability to psychiatric illness in some individuals. They were most susceptible to depression, delusional disorders and personality disturbances. This study highlights the importance of psychiatric follow up even decades (30 years) later (Kaponen, et al., 2002). Heinemann found unmet needs at 7 years. The most prevalent were improving memory and problem solving, increasing income and improving job skills (Heinemann, et al., 2002).

[Also see the Updated Mild Traumatic Brain Injury Guideline for Adults in this toolkit.](#)

### Model of 6 types of concussion and active treatments (pediatric and adult):

There is now a great body of evidence supporting the 6 types of concussion and the active treatments for each type. A good resource to start with is *Concussion: A Clinical Profile Approach to Assessment and Treatment* by Kontos and Collins (2018) and *A comprehensive, targeted approach to the clinical care of athletes following sport-related concussion* (Collins, et al., 2013).

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