

ACUTE CONCUSSION EVALUATION (ACE)

Physician/Clinician Office Version

Gerard Gioia, PhD
Children's National Hospital

| |
|--------------------------|
| Patient Name _____ |
| DOB: _____ Age: _____ |
| Date: _____ ID/MR# _____ |

A. Injury Characteristics Date/Time of Injury _____ Reporter: Patient Parent Spouse Other _____

- 1. Injury Description** _____
- 1a. Is there evidence of a forcible blow to the head (direct or indirect)? Yes No Unknown
 1b. Is there evidence of intracranial injury or skull fracture? Yes No Unknown
 1c. Location of Impact: Frontal Lft Temporal Rt Temporal Lft Parietal Rt Parietal Occipital Neck Indirect Force
 2. **Cause:** MVC Pedestrian-MVC Fall Assault Sports (specify) _____ Other _____
 3. **Amnesia Before (Retrograde)** Are there any events just BEFORE the injury that you/ person has no memory of (even brief)? Yes No Duration _____
 4. **Amnesia After (Anterograde)** Are there any events just AFTER the injury that you/ person has no memory of (even brief)? Yes No Duration _____
 5. **Loss of Consciousness:** Did you/ person lose consciousness? Yes No Duration _____
 6. **EARLY SIGNS:** Appears dazed or stunned Is confused about events Answers questions slowly Repeats Questions Forgetful (recent info)
 7. **Seizures:** Were seizures observed? No Yes Detail _____

B. Symptom Check List* Since the injury, has the person experienced any of these symptoms any **more than usual** today or in the past day?
 Indicate presence of each symptom (0=No, 1=Yes). *Lovell & Collins, 1998 JHTR

| PHYSICAL (9) | | | COGNITIVE (4) | | | SLEEP/ FATIGUE (5) |
|---|---|---|------------------------------|---|--------------------------|---|
| Headache | 0 | 1 | Feeling mentally foggy | 0 | 1 | Fatigue |
| Nausea | 0 | 1 | Feeling slowed down | 0 | 1 | Drowsiness |
| Sensitivity to light | 0 | 1 | Difficulty concentrating | 0 | 1 | Sleeping less than usual |
| Sensitivity to noise | 0 | 1 | Difficulty remembering | 0 | 1 | Sleeping more than usual |
| Dizziness | 0 | 1 | COGNITIVE Total (0-4) | | | Trouble falling asleep |
| Balance problems | 0 | 1 | | | | 0 1 N/A |
| Visual problems (blurry, double) | 0 | 1 | EMOTIONAL (4) | | SLEEP Total (0-5) | |
| Vomiting | 0 | 1 | Irritability | 0 | 1 | Exertion: Do these symptoms <u>worsen</u> with: Physical Activity <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Cognitive Activity <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Overall Rating: How <u>different</u> is the person acting compared to his/her usual self? (circle) Normal 0 1 2 3 4 5 6 Very Different |
| Numbness/Tingling | 0 | 1 | Sadness | 0 | 1 | |
| PHYSICAL Total (0-9) | | | More emotional | 0 | 1 | |
| | | | Nervousness | 0 | 1 | |
| (Add Phys, Cog, Emotion, Sleep totals) TOTAL ACE Sx Score (0-22) | | | EMOTIONAL Total (0-4) | | | |

C. Risk Factors/ Modifiers of Recovery (check all that apply)

| Concussion History? Y ___ N ___ | | Headache History? Y ___ N ___ | | Developmental History | | Psychiatric History |
|--|-------------------------------------|--|-------------------------------------|--|-------------------------------------|-------------------------------------|
| Previous # 1 2 3 4 5 | <input checked="" type="checkbox"/> | Prior treatment for headache | <input checked="" type="checkbox"/> | Learning disabilities | <input checked="" type="checkbox"/> | Anxiety |
| Longest symptom duration Days ___ Weeks ___ Months ___ Years ___ | | History of migraine headache ___ Personal ___ Family _____ | | Attention-Deficit/ Hyperactivity Disorder | | Depression |
| If multiple concussions, less force caused reinjury? Yes ___ No ___ | | | | Other developmental disorder _____ | | Other psychiatric disorder _____ |

List other comorbid medical disorders or medication usage (e.g., hypothyroid, seizures) _____

D. RED FLAGS for acute emergency management: Refer to the emergency department with sudden onset of any of the following:

- | | | | |
|--------------------------|---------------------------------------|--|------------------------------------|
| * Headaches that worsen | * Looks very drowsy/can't be awakened | * Can't recognize people or places | * Neck pain |
| * Seizures | * Repeated vomiting | * Increasing confusion or irritability | * Unusual behavioral change |
| * Focal neurologic signs | * Slurred speech | * Weakness or numbness in arms/legs | * Change in state of consciousness |

E. Diagnosis (ICD-10): S06.0X0A Concussion w/o LOC S06.0X1A Concussion w/ LOC <30 min S06.0X9A Concussion w LOC, duration unknown
 No diagnosis S06.890A (Intracranial injury) Other _____

F. Follow-Up Action Plan Complete ACE Care Plan and provide copy to patient/family.
 No Follow-Up Needed
 Physician/ Clinician Office Monitoring: Date of next follow-up _____
 Referral:
 Neuropsychologist Neurology Neurosurgery Sports Medicine Psychiatrist Psychologist Multi-Discipl. Concussion Clinic
 Emergency Department

A concussion (or mild traumatic brain injury (MTBI)) is a complex pathophysiologic process affecting the brain, induced by traumatic biomechanical forces secondary to direct or indirect forces to the head. Disturbance of brain function is typically related to neurometabolic dysfunction, rather than structural injury, and is typically associated with normal structural neuroimaging findings (i.e., CT scan, MRI). Concussion may or may not involve a loss of consciousness (LOC). Concussion results in a constellation of physical, cognitive, emotional and sleep-related symptoms. Symptoms may last from several minutes to days, weeks, months or even longer in some cases.

ACE Instructions

The ACE is intended to provide an evidence-based clinical protocol to conduct an initial evaluation and diagnosis of patients (both children and adults) with known or suspected MTBI.

A. Injury Characteristics:

1. Obtain **description of the injury** - how injury occurred, type of force, location on the head or body if force transmitted to head. Different biomechanics of injury may result in differential symptom patterns (e.g., occipital blow may result in visual changes, balance difficulties).
2. Indicate the **cause of injury**. Greater forces associated with the trauma are likely to result in more severe presentation of symptoms.
- 3/ 4. **Amnesia:** Amnesia is defined as the failure to form new memories. Determine whether amnesia has occurred and attempt to determine length of time of memory dysfunction – **before** (retrograde) and **after** (anterograde) injury. Even seconds to minutes of memory loss can be predictive of outcome. Recent research has indicated that amnesia may be up to 4-10 times more predictive of symptoms and cognitive deficits following concussion than is LOC (less than 1 minute).¹
5. **Loss of consciousness (LOC)** - If occurs, determine length of LOC, if possible.
6. **Early signs.** If present, ask the individuals who know the patient (parent, spouse, friend, etc) about specific signs of the concussion/ MTBI that may have been observed. These signs are typically observed early after the injury.
7. Inquire whether **seizures** were observed or not.

B. Symptom Checklist:²

1. Ask patient (and/ or parent, if child) to report presence of the four categories of symptoms since injury. It is important to assess all listed symptoms as different parts of the brain control different functions. One or all symptoms may be present depending upon mechanisms of injury.³ Record 1 for Yes or 0 for No for their presence or absence, respectively.
2. For all symptoms, indicate presence of symptoms as experienced within the past 24 hours. Since symptoms can be present pre-morbidly/at baseline (e.g., inattention, headaches, sleep, sadness), it is important to assess **change** from their typical presentation. Physical symptoms can be clustered into headache-related (headache, nausea, sensitivity to light/noise), vestibular (balance, dizziness), ocular-motor (Visual problems- blurry, double)
3. **Scoring:** Sum total **number** of symptoms present per area, and sum all four areas into Total Symptom Score (score range 0-22). (Note: most sleep symptoms are only applicable after a night has passed since the injury. Drowsiness may be present on the day of injury.) If symptoms are new and present, there is no lower limit symptom score. Any **score > 0** indicates **positive symptom** history.
4. **Exertion:** Inquire whether any symptoms worsen with physical (e.g., running, climbing stairs, bike riding) and/or cognitive (e.g., academic studies, multi-tasking at work, reading or other tasks requiring focused concentration) exertion. Clinicians should be aware that symptoms will typically worsen or re-emerge with exertion, indicating incomplete recovery. Over-exertion may protract recovery.
5. **Overall Rating:** Determine how different the person is acting from their usual self. Circle 0 (Normal) to 6 (Very Different).

C. Risk Factors/ Modifiers of Recovery:

 Assess the following risk factors as possible complicating or modifying factors in the recovery process.

1. **Concussion history:** Assess the number and date(s) of prior concussions, the duration of symptoms for each injury, and whether less biomechanical force resulted in re-injury. Recent research indicates that cognitive and symptom effects of concussion may be cumulative, especially if there is minimal duration of time between injuries and less biomechanical force results in subsequent concussion (which may indicate incomplete recovery from initial trauma).⁴⁻⁸
2. **Headache history:** Assess personal and/or family history of diagnosis/treatment for headaches. Recent research indicates headache (migraine in particular) can result in protracted recovery from concussion.⁸⁻¹¹
3. **Developmental history:** Assess history of learning disabilities, Attention-Deficit/Hyperactivity Disorder or other developmental disorders. Symptoms of these disorders can mimic concussion symptoms and should be taken into account.
4. **Psychiatric history:** Assess for history of depression/mood disorder, anxiety, and/or sleep disorder.¹³⁻¹⁶

D. Red Flags:

 The patient should be carefully observed over the first 24-48 hours for these serious signs. Red flags are to be assessed as **possible signs of deteriorating neurological functioning**. Any positive report should prompt strong consideration of referral for emergency medical evaluation (e.g. CT scan to rule out intracranial bleed or other structural pathology).¹⁷

E. Diagnosis:

 The following ICD-10 diagnostic codes may be applicable.

S06.0X0A Concussion, with no loss of consciousness – Positive injury description with evidence of forcible direct/ indirect blow to the head (A1a); plus evidence of active symptoms (B) of any type and number related to the trauma (Total Symptom Score >0); no evidence of LOC (A5), skull fracture or intracranial injury (A1b).

S06.0X1A Concussion with loss of consciousness of 30 minutes or less - Positive injury description with evidence of forcible direct/ indirect blow to the head (A1a); plus evidence of active symptoms (B) of any type and number related to the trauma (Total Symptom Score >0); positive evidence of LOC (A5), skull fracture or intracranial injury (A1b).

S06.0X9A Concussion with loss of consciousness of unspecified duration- Positive injury description with evidence of forcible direct/ indirect blow to the head (A1a); plus evidence of active symptoms (B) of any type and number related to the trauma (Total Symptom Score >0); unclear/unknown injury details; unclear evidence of LOC (A5), no skull fracture or intracranial injury.

Other Diagnoses – If the patient presents with a positive injury description and associated symptoms, but additional evidence of intracranial injury (A 1b) such as from neuroimaging, a moderate TBI and the diagnostic category of **S06.890A (Intracranial injury)** should be considered.

F. Follow-Up Action Plan:

 Develop a follow-up plan of action for symptomatic patients. The physician/clinician may decide to (1) monitor the patient in the office or (2) refer them to a specialist. Serial evaluation of the concussion is critical as symptoms may resolve, worsen, or ebb and flow depending upon many factors (e.g., cognitive/ physical exertion, comorbidities). Referral to a specialist can be particularly valuable to help manage certain aspects of the patient's condition. (Physician/clinician should also complete the ACE Care Plan included in this tool kit.)

1. **Physician/clinician office serial monitoring-** Particularly appropriate if number and severity of symptoms are steadily decreasing over time and/or fully resolve within 1-3 weeks. If steady reduction is not evident, referral to a specialist is warranted.
2. **Referral to a specialist** – Appropriate if symptom reduction is not evident in 1-3 weeks, or sooner if symptom profile is concerning in type/severity.
 - **Evaluation** by a specialist is particularly relevant for evaluating and managing persisting symptoms, focal neurologic, sensory, vestibular, and motor concerns. It may be useful for active, targeted rehabilitation, medication management (e.g., headaches, sleep disturbance, depression) if post-concussive problems persist. Cognitive, social-emotional or school-related concerns should be referred to a neuropsychologist. Multi-disciplinary clinics are especially useful when multiple symptom types (e.g., physical, cognitive, emotional) are persisting and require further definition for active treatment.