Background:

Minor head trauma is defined as a head injury that is associated with a Glasgow Coma Score (GCS) of 14-15. In 2009, PECARN investigators published validated clinical prediction rules for children with minor head injury at low risk of a clinically-important traumatic brain injury (TBI) for whom CT scans should be avoided.

Concussion leads to a functional disturbance rather than a structural injury (ie: normal CT head/MR brain), may or may not include loss of consciousness (LOC), and results in physical, cognitive, emotional and/or sleep-related symptoms. The cornerstone of concussion management is timely proper identification of concussion as well as institution of cognitive rest and a progressive physical rehabilitation program. This physical rehabilitation program consists of 5 steps and is known as a graduated return-to-play protocol. This protocol allows the concussed child to increase their physical exertion once the acute symptoms of concussion have resolved in a stepwise fashion. Each step requires 24 hours and the concussed child may proceed to the next step if asymptomatic at the current step. If symptoms reoccur, the child should drop back to the previous step.

Those with a minor head trauma ie: Glasgow Coma Score (GCS) of 14-15 should be evaluated for a clinically-important TBI as well as a concussion. Included in this clinical guideline is an algorithm for the evaluation of minor head trauma that is adapted from the PECARN CT algorithm for children <2 yrs of age and 2 years of age and older as well as the ACE-ED (Acute Concussion Evaluation protocol modified for the ED) for the evaluation of concussion in those 8 years of age and older.

Population:

Any child whom has sustained a head trauma either direct head trauma or indirect force to the neck or elsewhere in the body that leads to an impulsive force to the head and has a GCS of 14-15.

Mechanism of Injury and Concurrent Diagnosis: Any force that may lead to direct or indirect injury to the head.

- Falls from a significant height
- Head/Scalp Lacerations
- Motor Vehicle Collisions
- Assault
- Sports or recreational related injuries
First Step: Refer to Table 1 below and assess the Glasgow Coma Score

- If GCS is less than 14
  - Do not proceed with the Minor Head Trauma/Concussion Guideline
  - Alert ED attending and/or fellow ASAP
  - Consider Trauma Activation

- If GCS is 14-15
  - Proceed with the Minor Head Trauma/Concussion Algorithm

Table 1: Glasgow Coma Scale for Infants, Children, and Adolescents *

<table>
<thead>
<tr>
<th></th>
<th>Child/Adolescent</th>
<th>Infant</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Opening</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Spontaneous</td>
<td>- Spontaneous</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>- To speech</td>
<td>- To speech</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>- To pain</td>
<td>- To pain</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>- None</td>
<td>- None</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Best Verbal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Oriented,</td>
<td>- Coos and</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>- Confused</td>
<td>- babbles</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>- Inappropriate</td>
<td>- Irritable,</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>- Incomprehensible sounds</td>
<td>cries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- None</td>
<td>- Moans</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>- None</td>
<td>- None</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Best Motor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Obeys commands</td>
<td>- Moves</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>- Localizes</td>
<td>spontaneously</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>- Withdraws in</td>
<td>and purposely</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>- Withdraws in</td>
<td>response to</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>- Flexion in</td>
<td>response to</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>- Extension in</td>
<td>response to</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>- None</td>
<td>- None</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

*adapted from PALS American Heart Association 2011

Second Step: Refer to Minor Head Trauma/Concussion Evaluation Flow Diagram
Comer Emergency Department (ED) Clinical Guidelines: 
Minor Head Trauma and Concussion

*Parts of the algorithm are adapted from Kuppermann, N et al. "Identification of children at very low risk of clinically-important brain injuries after head trauma: a prospective cohort study" Lancet, 2009; 374:1160-70

**Figure 1:** Acute Concussion Evaluation ED Version- Validated in children 8 years of age and older

<table>
<thead>
<tr>
<th>Observed Signs</th>
<th>Physical Symptoms</th>
<th>Cognitive Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appears dazed or stunned</td>
<td>Headache</td>
<td>Difficulty concentrating</td>
</tr>
<tr>
<td>Confused about events</td>
<td>Nausea or vomiting</td>
<td>Difficulty remembering</td>
</tr>
<tr>
<td>Repeats question</td>
<td>Balance problems or dizziness</td>
<td>Feeling foggy</td>
</tr>
<tr>
<td>Answers questions slowly</td>
<td>Fatigue</td>
<td>Emotional Symptoms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Irritable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More emotional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Just don’t feel “right”</td>
</tr>
</tbody>
</table>

5. **Risk Factors for Prolonged Post-Concussion Symptoms**

Prior concussions: No ______  Yes ______  # ______
Prior diagnosis of migraine/ chronic headaches: No ______  Yes ______

6. **Concussion Diagnosed (check if applicable)** (ICD-9: 850)

Concussion diagnosis requires:
a) Positive blunt trauma to head (#2)
b) Key injury characteristic (#3) and/or presence of any associated signs/symptoms (#4).

7. **Follow Up**

If concussion is diagnosed, provide Emergency Department Concussion Discharge Instructions.

8. **ACE-ED Completed by (circle one):**

MD  RN  EMT  PA  NP  Medical Student

Signature: __________________________________________
How to access the Acute Concussion Evaluation- ED form

- ACE-ED is now available in EPIC
- Open ED Note and in the SmartText enter ACE ED as shown below

**Step 1:** Locate SmartText in the ED Note’s menu bar

**Step 2:** Type ACE ED into the SmartText box

**Step 3:** Select “ED Acute Concussion Evaluation (ACE) COER”

**Step 4:** Fill out the ACE-ED form.
How to complete the Acute Concussion Evaluation-ED (ACE-ED) form

- Use the ACE-ED in children whom are 8 years of age and older who are at risk for a concussion ie: after any direct or indirect head trauma

- Complete parts 1-6 of the ACE-ED form

**Part 1 Injury description:** Include when the injury occurred from current date of visit. Describe in detail the mechanism of injury

**Part 2:** Identify whether blunt trauma to the head occurred

**Part 3 Key Injury Characteristics:** Check off the key injury characteristics that the patient experienced related to current head injury. Explain duration of symptoms.

**Part 4 Signs and Symptoms:** When asking for the symptoms, ask the caregiver and/or patient if these symptoms are changes from “usual” state of functioning. *For example*, if a child has a history of chronic headache, ask if this child has worsening headache post head injury

**Part 5 Risk Factors for Prolonged Post-Concussion Symptoms:** If the child has any risk factors for prolonged concussion symptoms, ie: prior concussion or migraines/chronic headaches please include this risk of prolonged recovery in the discharge instructions (this is an embedded option in the discharge instructions provided). Also strongly consider referral to a concussion specialist.

**Part 6 Concussion diagnosis:** Concussion is diagnosed if the child has 1) History of blunt head trauma (Section 2 of ACE ED) AND 2) Key injury characteristics (Section 3 of ACE ED) AND/OR presence of any signs and symptoms (Section 4 of ACE ED)

**Concussion Discharge Instructions**

If Concussion is diagnosed, provide Concussion Discharge Instructions (see Figure 2)

- You may either print the concussion discharge instructions from this guideline OR
- You may also import the instructions by typing *ED Concussion* in the SmartText window under the Discharge Instruction tab
- Select *ED Concussion DC Instructions COER*
**Comer Emergency Department (ED) Clinical Guidelines:**  
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**Referrals for Concussion**

National guidelines recommend all concussions need follow up within a week. The majority of children diagnosed with a concussion can be followed up by their primary care provider (PCP).

**When to refer to a specialist**

- Does not have an identifiable primary care provider or cannot be seen by a PCP within a week of head injury
- Concussions that need clearance to return to sport
- Those who have symptoms lasting more than 3 weeks
- Those who have risk factors for prolonged symptoms such as history of chronic headaches (ie: migraines) and those with a history of prior concussion

Patients with concussion can be referred to the concussion clinic at Comer Children's Hospital. Please complete the referral sheet indicating that the patient should be followed up in the Concussion Clinic through Neurosurgery (preferred) or Dr. Holly Benjamin Sport’s Medicine Clinic. **All referrals can be scheduled through our patient advocate. Please fill out a patient referral form.**

*The scheduling information below is for your information only. It is not necessary for you (as the provider) to schedule the appointment*

**Scheduling Information:**

**Neurosurgery Concussion Clinic**

To schedule an appointment, call the Section of Neurosurgery at (773) 702-2123. Appointments are held in the University of Chicago Medicine Outpatient Clinical Neurosciences Center at the: Duchossois Center for Advanced Medicine, Fourth Floor, 4D 5758 S. Maryland Avenue Chicago, IL 60637

**Dr. Holly Benjamin Sport’s Medicine Clinic**

Pediatric sports medicine care is offered at our main location at the University of Chicago medical campus in Chicago’s Hyde Park neighborhood, as well as two suburban locations in Matteson and Naperville. To schedule an appointment, call the appointment scheduling number at (888) 824-0200
CONCUSSION

Your child was seen in the Emergency Room today for a head injury and diagnosed with a concussion. A head injury of any severity can cause your child to have a concussion. A concussion is an injury to your child’s brain that usually heals by itself with time. Your child [did/did not] require head imaging at this time. The results were: [****/na]

Symptoms of a concussion may include the following:

**Physical symptoms:**
- Headache
- Nausea/vomiting
- Vision problems
- Balance problems
- Sensitivity to light or noise
- Dizziness

**Thinking symptoms:**
- Feeling mentally foggy
- Problems concentrating
- Problems remembering (amnesia)*
- Feeling more slowed down

**Emotional symptoms:**
- Irritability
- Sadness
- Feeling more emotional
- Nervousness

**Sleep symptoms:**
- Drowsiness
- Sleeping more than usual
- Sleeping less than usual
- Trouble falling asleep

*Research shows if your child has suffered from memory loss (amnesia) or has a history of headaches such as migraines, your child may have prolonged symptoms from a concussion.

Please circle your child’s symptoms above so that you and your pediatrician may evaluate how your child is recovering. It is important that you share this information with your child’s pediatrician, gym teacher, coach, and teacher.

**If your child has a history of headaches or concussions, your child may experience concussion symptoms longer than usual. If your child has continued symptoms longer than 7 days, please see your child’s primary care doctor**

If your child has a headache you may give acetaminophen (Tylenol) or ibuprofen (Motrin) as directed.
Figure 2: Part 2 Concussion Discharge Instructions

**Graduated Return to Play Guideline**

This guideline has been set up to ensure that your child safely returns to normal activity. Please have your child follow each stage in a stepwise fashion.

Your child can only advance to the next step if he/she has no symptoms as described above for 24 hours. If symptoms arise or worsen, have your child return to the previous stage.

**It is very important to safeguard your child from another head injury while your child is recovering from their concussion**

- **Stage 1 (Complete Rest):** Upon discharge from the ER, your child should rest as much as possible and refrain from watching television, playing video games, doing homework, or reading.

- **Stage 2 (Light Aerobic Exercise):** Your child may now walk at a normal pace or participate in activities such as swimming.

- **Stage 3 (Sport Specific Exercise):** Your child may now run but continue to avoid activities that have an increase chance of causing a head injury.

- **Stage 4 (Non-contact Exercise):** Your child may start resistance training such as lifting weights.

- **Stage 5 (Full contact sport/ Gym):** Your child **MUST** be seen by a healthcare provider (pediatrician, family physician, nurse practitioner, etc), before participating in gym or high risk sports such as football, hockey, soccer, basketball, gymnastics.

Return to the Emergency Department or call 911 if your child has:

- Headaches that worsen
- Seizures
- Weakness or numbness of your child’s arms or legs
- Repeated vomiting
- Slurred speech
- Neck pain
- Increasing confusion or irritability
- Looks very drowsy or cannot be awakened

Adapted from:

6-day return protocol adapted from:
**Suggested Reading:**


**Article Synopsis:** In 2009, a group of investigators through PECARN (Pediatric Emergency Care Applied Research Network) published a study in *Lancet*. A total of 42,412 patients from 25 emergency departments were enrolled. From this study, validated clinical prediction rules were derived to help clinicians decide which children were at risk for a clinically-important TBI and therefore required emergency head imaging such as CT. Clinically-important TBI is defined as children with the following: death from TBI, neurosurgical intervention, intubation more than 24h for TBI, and hospital admission of 2 nights or more.  

Zuckerbraun, NS, Atabaki, S, Collins MW, Thomas, D, and Gioia GA. Use of modified acute concussion evaluation tools in the emergency department. *Pediatrics* 2014: 133: 635-642 [http://pediatrics.aappublications.org/content/133/4/635.long](http://pediatrics.aappublications.org/content/133/4/635.long)

**Article Synopsis:** In 2008, through the CDC ‘Heads Up: Brain Injury in Your Practice: A tool kit for Physicians’, the Acute Concussion Evaluation (ACE) protocol was derived. ACE is a structured clinical interview that has been validated as a useful clinical tool in the initial assessment of mTBI. The ACE is validated in children 8-18 years of age. The ACE has been modified for the use in the emergency department setting and is known as the ACE-ED. Recently published in *Pediatrics*, Zuckerbraun et al “Use of Modified Acute Concussion Evaluation Tools in the Emergency Department" highlighted the successful implementation of the ACE-ED in 2 pediatric emergency departments. The investigators noted that the utilization of the ACE-ED improved patient follow up and adherence to ED discharge recommendations in those diagnosed with a concussion.
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References:


DISCLAIMER:
This clinical guideline has been developed for the purpose of unifying the general emergency care of children with mild head trauma and concussion. It is intended to aid, rather than substitute for, professional judgment. It is not intended to serve as a rigid protocol or a written proxy for the standard of care. Failure to comply with this guideline does not represent a breach of the standard of care.