Head Injury
Pediatric After-Hours Version - Standard - 2014

DEFINITION

- Injuries to the head including scalp, skull and brain trauma

INITIAL ASSESSMENT QUESTIONS

1. MECHANISM: "How did the injury happen?" For falls, ask: "What height did he fall from?" and "What surface did he fall against?" (Suspect child abuse if the history is inconsistent with the child's age or the type of injury.)
2. WHEN: "When did the injury happen?" (Minutes or hours ago)
3. NEUROLOGICAL SYMPTOMS: "Was there any loss of consciousness?" "Are there any other neurological symptoms?"
4. MENTAL STATUS: "Does your child know who he is, who you are, and where he is? What is he doing right now?"
5. LOCATION: "What part of the head was hit?"
6. SCALP APPEARANCE: "What does the scalp look like? Are there any lumps?" If so, ask: "Where are they? Is there any bleeding now?" If so, ask: "Is it difficult to stop?"
7. SIZE: For any cuts, bruises, or lumps, ask: "How large is it?" (Inches or centimeters)
8. PAIN: "Is there any pain?" If so, ask: "How bad is it?"
9. TETANUS: For any breaks in the skin, ask: "When was the last tetanus booster?"

- Author's note: IAQ's are intended for training purposes and not meant to be required on every call.

TRIAGE ASSESSMENT QUESTIONS

Call EMS 911 Now

[1] Major bleeding (actively dripping or spurting) AND [2] can't be stopped

   FIRST AID: apply direct pressure to the entire wound with a clean cloth
   CA: 50, 10

[1] Large blood loss AND [2] fainted or too weak to stand

   R/O: impending shock
   FIRST AID: have child lie down with feet elevated
   CA: 50, 10

[1] ACUTE NEURO SYMPTOM AND [2] symptom persists (DEFINITION: difficult to awaken or keep awake OR confused thinking and talking OR slurred speech OR weakness of arms OR unsteady walking)

   R/O: cerebral contusion, subdural or epidural hematoma
   CA: 50, 10

Seizure (convulsion) for > 1 minute

   CA: 50, 10

Knocked unconscious for > 1 minute

   CA: 50, 10
[1] Dangerous mechanism of injury (e.g., MVA, diving, fall on trampoline, contact sports, fall > 10 feet, hanging) AND [2] NECK pain or stiffness present now AND [3] began < 1 hour after injury

FIRST AID: protect the neck from movement. Don't move until a neck brace is applied.
CA: 50, 11, 10

Penetrating head injury (eg arrow, dart, pencil)

FIRST AID: do not remove the object before being seen
Reason: could initiate severe bleeding
CA: 50, 10

Sounds like a life-threatening emergency to the triager
CA: 50, 10

See More Appropriate Guideline

Go to Guideline: Neck Injury (Pediatric)

Go To Guideline: Concussion Follow-Up Call (Pediatric)

Wound infection suspected (cut or other wound now looks infected)
Go to Guideline: Wound Infection Suspected (Pediatric)

Go to ED Now

[1] Neck pain (or shooting pains) OR neck stiffness (not moving neck normally) AND [2] follows any head injury
R/O: cervical spine injury, whiplash injury, muscle strain
FIRST AID: Discuss protecting the neck from movement before driving in
CA: 51, 12, 17, 13, 10

[1] Bleeding AND [2] won't stop after 10 minutes of direct pressure (using correct technique)
R/O: need for sutures
CA: 51, 14, 13, 10

Skin is split open or gaping (if unsure, refer in if cut length > 1/4 inch or 6 mm on the face)
R/O: need for sutures
CA: 51, 17, 15, 13, 10

Can't remember what happened (amnesia)
Reason: probably concussion, but needs neuro exam
CA: 51, 17, 13, 10

Altered mental status suspected in young child (awake but not alert, not focused, slow to respond)
R/O: concussion, intracranial bleed
CA: 51, 17, 13, 10
[1] Age 1-2 years AND [2] swelling > 2 inches (5 cm) in size (EXCEPTION: forehead only location of hematoma, no need to see)
   R/O: severe injury causing large hematoma
   CA: 51, 17, 13, 3, 10

[1] Age < 12 months AND [2] swelling > 1 inch (2.5 cm)
   R/O: severe injury causing large hematoma
   CA: 51, 17, 13, 3, 10

Large dent in skull (especially if hit the edge of something)
   R/O: depressed skull fracture
   CA: 51, 17, 13, 10

   R/O: raccoon eyes from basilar skull fracture
   CA: 51, 17, 13, 10

Dangerous mechanism of injury caused by high speed (e.g., serious MVA), great height (e.g., over 10 feet) or severe blow from hard objects (e.g., golf club)
   Reason: increased risk of injury warrants neuro exam
   CA: 51, 17, 13, 10

[1] Concerning falls (under 2 y o: over 3 feet; over 2 y o: over 5 feet; OR falls down stairways) AND [2] not acting normal after injury (Exception: crying less than 20 minutes immediately after injury)
   CA: 51, 17, 13, 10

Sounds like a serious injury to the triager
   CA: 51, 17, 13, 10

**Go to ED Now (or PCP triage)**

[1] ACUTE NEURO SYMPTOM AND [2] now fine (DEFINITION: difficult to awaken OR confused thinking and talking OR slurred speech OR weakness of arms OR unsteady walking)
   R/O: concussion causing transient neuro symptom
   CA: 52, 17, 13, 10

   R/O: post-traumatic seizure
   CA: 52, 17, 13, 10

   R/O: concussion
   CA: 52, 17, 13, 10

Age < 6 months (Exception: very minor type of injury)
   Reason: difficult to assess, consider non-accidental trauma
   CA: 52, 17, 13, 10

   Reason: neuro status difficult to assess by phone
[1] SEVERE headache (e.g., crying with pain) AND [2] not improved after 20 minutes of cold pack

R/O: severe injury
CA: 52, 17, 13, 10

Watery or blood-tinged fluid dripping from the NOSE or EARS now
(Exception: tears from crying)

R/O: CSF leak from basilar skull fracture
CA: 52, 17, 13, 10

[1] Vomited 2 or more times AND [2] within 24 hours of injury

CA: 52, 13, 17, 10


CA: 52, 17, 13, 10

Suspicious history for the injury (especially age < 1 yo)

R/O: child abuse
CA: 52, 17, 13, 10

High-risk child (e.g., bleeding disorder, V-P shunt, brain tumor, brain surgery, etc)

CA: 52, 17, 13, 10


CA: 52, 13, 10

**Urgent Home Treatment with Follow-Up Call**

[1] Concerning falls (under 2 y o: over 3 feet; over 2 y o: over 5 feet; OR falls down stairways) AND [2] acting completely normal now (Exception: if over 2 hours since injury, continue with triage)

CA: 74, 2, 3, 4, 5, 28, 10

**See PCP When Office is Open (within 3 days)**


CA: 55, 6, 3, 5, 4, 30, 31, 10

[1] Headache is main symptom AND [3] present > 24 hours (Exception: Only the injured scalp area is tender to touch with no generalized headache)

R/O: mild concussion
CA: 55, 18, 30, 31, 10

[1] Scalp area tenderness is main symptom AND [2] persists > 3 days

R/O: skull fracture
CA: 55, 18, 19, 10

[1] DIRTY cut or scrape AND [2] last tetanus shot > 5 years ago

CA: 55, 21, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

**Home Care**
Scalp swelling, bruise or scalp tenderness (all triage questions negative)

*Reason: minor head injury and all triage questions negative*

*CA: 58, 1, 3, 6, 5, 4, 7, 20, 8, 9, 10*

ALSO, small cut or scrape present (all triage questions negative)

*CA: 58, 22, 23, 24, 25, 10*


*CA: 58, 29, 6, 3, 5, 7, 30, 31, 10*


*CA: 58, 16, 4, 5, 7, 20, 19, 10*

[1] Transient pain or crying AND [2] no visible injury (all triage questions negative)

*CA: 58, 27, 4, 5, 7, 19, 10*

External occipital protuberance, concerns about (all triage questions negative)

*CA: 58, 26, 19, 10*

**CARE ADVICE (CA) -**

1. **Reassurance:** It sounds like a scalp injury rather than a brain injury or concussion. Treatment at home should be safe.

2. **Bleeding:** If there is a scrape or cut, wash it off with soap and water. Then apply pressure with a sterile gauze for 10 minutes to stop any bleeding.

3. **Cold Pack:**
   - For pain, swelling or bruising, use a cold pack. You can also use ice wrapped in a wet cloth.
   - Put it on the area for 20 minutes.
   - Repeat in 1 hour. Then, use as needed.
   - Reason: Helps with the pain and helps stop any bleeding. Also, will help prevent big lumps ("goose eggs").
   - Caution: Avoid frostbite.

4. **Observation:**
   - Observe your child closely during the first 2 hours following the injury.
   - Encourage your child to lie down and rest until all symptoms have cleared. Mild headache, mild dizziness and nausea are common.
   - Allow your child to sleep if he wants to, but keep him nearby.
   - Awaken after 2 hours of sleeping to check the ability to walk and talk.

5. **Diet:** Offer only clear fluids to drink, in case he vomits. Return to regular diet after 2 hours.
6. **Pain:**
   - For pain relief, give acetaminophen every 4 hours **or** ibuprofen every 6 hours as needed. (See Dosage Table.) **Exception:** Avoid until 2 hours have passed from injury without any vomiting.
   - Never give aspirin to children and teens. (Reason: always increases risk of bleeding.)

7. **Special Precautions At Night:**
   - Mainly, sleep in same room as your child for 2 nights.
   - Reason: If a complication occurs, you will recognize it because your child will first develop a severe headache, vomiting, confusion or other change in their behavior.
   - Optional: if you are worried, awaken your child once during the night.
   - Check the ability to walk and talk. (For infants, check the ability to become fully alert and move both arms and legs normally.)
   - After 48 hours, return to a normal routine.

8. **Expected Course:** Most head trauma only causes a scalp injury. The swelling may take a week to resolve. The scalp tenderness at the site of impact usually clears in 3 days.

9. **Call Back If**
   - Severe headache or crying persists after 20 minutes of ice pack
   - Vomiting occurs 2 or more times
   - Your child becomes difficult to awaken or confused
   - Walking or talking becomes difficult
   - Headache lasts more than 24 hours
   - Scalp tenderness lasts more than 3 days
   - Your child becomes worse

10. **Care Advice** per Head Injury (Pediatric) guideline.

11. **Protect the Neck** from any turning or bending. Do not move your child until a neck brace or spine board has been applied.

12. **Neck:** Encourage your child not to move the neck until seen.

13. **NPO:** Do not allow any eating or drinking. Also avoid pain medicines until seen. (Reason: condition may need surgery and general anesthesia.)

14. **Bleeding:**
   - Continue direct pressure with a sterile gauze or clean cloth until seen.

15. **Dressing:** Cover with a sterile gauze or cloth until seen.

16. **Reassurance:** If your child is now acting normal and there is no swelling or bruise, the injury sounds like a minor one. Your child should do fine.

17. **Bleeding:** Apply gentle pressure to stop any bleeding. Don't wash this wound before coming in. (Reason: could be an open fracture.)

18. **Pain:** For pain relief, give acetaminophen every 4 hours **or** ibuprofen every 6 hours as needed. (See Dosage table.)

19. **Call Back If**
   - Your child becomes worse.
20. **Soft Spot - Concerns About:**
   - The soft spot (fontanel) is present from birth until 12 to 18 months of age.
   - It's covered and protected by a thick layer of fibrous tissue.
   - Injuries near the soft spot do not cause any additional complications.

21. **Tetanus For Dirty Cuts:** If last tetanus shot was given over 5 years ago, your child needs a booster. See PCP as soon as office is open (3 days or less).

22. **Reassurance:** It sounds like a small cut or scrape that you can treat at home.

23. **Cut or Scrape:**
   - Wash the wound with soap and water for 5 minutes.
   - For any dirt, scrub gently with a wash cloth.
   - For any bleeding, apply direct pressure with a sterile gauze for 10 minutes.
   - Apply an antibiotic ointment (OTC) 3 times per day.
   - For large scrapes or cuts, cover with a Band-Aid. Change daily or if gets wet.

24. **Tetanus for Clean Cuts and Scrapes:** If last tetanus shot was given over 10 years ago, needs a booster. Call PCP during regular office hours (within 3 days).

25. **Call Back If**
   - Dirt in the wound persists after scrubbing
   - Looks infected (pus, redness)
   - Doesn't heal within 10 days

26. **Black Eyes:** Most bruises occur on the forehead. The blood in these bruises can spread downward with gravity and cause black eyes on 1 or both sides. The black eyes begin about 3 days after the forehead bruise and can last 2 weeks. No special treatment is necessary or helpful.

27. **Reassurance:**
   - The lump you feel at the base of the skull is a normal bony prominence.
   - If you feel carefully, you will find one on yourself or other children.
   - This is not caused by your child's injury.

28. **Call Back If:**
   - Vomiting occurs
   - Your child develops any symptom
   - Your child starts to act abnormal

29. **Reassurance:**
   - Headache is your child's main symptom.
   - That's common after a bump on the head.
   - If the headache doesn't get worse, your child should do fine.
   - If it lasts more than 24 hours, he probably needs to be checked.
   - In the meantime, avoid any sports or vigorous activities until the headache is gone.
   - Here is some care advice that should help.
30. **Avoid Sports and Strenuous Activities:**
- Until evaluated, your child should avoid any strenuous activity or sports.
- Your child should not return to full play until the headache and other symptoms are completely gone. The headache must be gone both at rest and during exercise.
- Your doctor will talk to you further about when your child can safely return to these activities.

31. **Call Back If:**
- Headache becomes severe
- Vomiting occurs 2 or more times
- Your child becomes difficult to awaken or confused
- Walking or talking becomes difficult
- Headache lasts more than 24 hours
- Your child becomes worse

32. **Reassurance:**
- It sounds like your child wasn't injured.
- It's great that you were using a car safety seat.
- Watching him at home should be safe.

50. **Call EMS 911 Now:** Your child needs immediate medical attention. You need to hang up and call 911 (or an ambulance). (Triage Discretion: I'll call you back in a few minutes to be sure you were able to reach them.)

51. **Go To ED Now:** Your child needs to be seen in the Emergency Department immediately. Go to the ER at ___________ Hospital. Leave now. Drive carefully.

52. **Go To ED Now (or PCP Triage):**
- **If No PCP Triage:** Your child needs to be seen within the next hour. Go to the ER/UCC at ___________ Hospital. Leave as soon as you can.
- **If PCP Triage Required:** Your child may need to be seen. Your doctor will want to talk with you to decide what's best. I'll page him now. If you haven't heard from the on-call doctor within 30 minutes, or your child becomes worse, go directly to the ER/UCC at ___________ Hospital.

53. **See Physician Within 4 Hours (or PCP triage):**
- **If No PCP Triage:** Your child needs to be seen. Go to ______ (ED/UCC or office if it will be open) within the next 3 or 4 hours. Go sooner if your child becomes worse.
- **If PCP Triage Required:** Your child may need to be seen. Your doctor will want to talk with you to decide what's best. I'll page him now. If you haven't heard from the on-call doctor within 30 minutes, call again. (Note: If PCP can't be reached, send to ED/UCC or office.)

54. **See Physician Within 24 Hours:**
- **If Office Will Be Open:** Your child needs to be examined within the next 24 hours. Call your child's doctor when the office opens, and make an appointment.
- **If Office Will Be Closed And No PCP Triage:** Your child needs to be examined within the next 24 hours. Go to ______ at your convenience.
- **If Office Will Be Closed And PCP Triage Required:** Your child may need to be seen within the next 24 hours. Your doctor will want to talk with you to decide what's best. I'll page him now. (Exception: from 10 pm to 7 am. Since this isn't serious, we'll hold the page until morning.)
55. See PCP Within 3 Days: Your child needs to be examined within 2 or 3 days. Call your child's doctor during regular office hours and make an appointment. (Note: if office will be open tomorrow, tell caller to call then, not in 3 days.)

56. See PCP Within 2 Weeks: Your child needs an evaluation for this ongoing problem within the next 2 weeks. Call your child's doctor during regular office hours and make an appointment.

57. Follow-Up: Discuss ________ with your child's doctor at the next regular office visit. (Call sooner if you become more concerned.)

58. Home Care: You should be able to treat this at home.

59. Call PCP Now: You need to discuss this with your child's doctor. I'll page him now. If you haven't heard from the on-call doctor within 30 minutes, call again.

60. Call PCP Within 24 Hours: You need to discuss this with your child's doctor within the next 24 hours.
   • If Office Will Be Open: Call the office when it opens tomorrow morning.
   • If Office Will Be Closed: I'll page him now. (Exception: from 9 pm to 9 am. Since this isn't urgent, we'll hold the page until morning.)

61. Call PCP When Office Is Open: You need to discuss this with your child's doctor within the next few days. Call him/her during regular office hours.

74. Urgent Home Treatment With Follow-Up Call: Call Center Provides RN Call-Backs:
   • Your child will usually improve with the home treatment advice I give you.
   • I'll call you back in about 1-2 hours to see how your child is doing.
   • Call me back immediately if: Your child becomes worse before my follow-up call.
   Call Center Does Not Provide RN Call-Backs:
   • I'll explain how to treat your child's symptom.
   • After finishing the home treatment, call me back (in about 1-2 hours) and tell me how your child is doing.
   • Go to the ED immediately without calling back if: Your child Becomes Worse or Doesn’t Improve with treatment.
   RN Response To Follow-Up Call:
   • Evaluate child's response to home treatment.
   • If unchanged or worse, refer to ED Now.
   • If improved or resolved, review remaining triage questions and give care advice.

**FIRST AID**

First Aid Advice for Spinal Cord Injury: Do not move child until a cervical collar and spine board are applied.

First Aid Advice for Bleeding: Apply direct pressure to the entire wound with a clean cloth.

First Aid Advice for Shock: Lie down with the feet elevated.

First Aid Advice for Penetrating Object: If penetrating object still in place, don't remove it (Reason: removal could increase internal bleeding).
Types of Head Trauma

- **Scalp Injury:** Most head injuries only damage the scalp (a cut, scrape, bruise or swelling). It is common for children to fall and hit their head at some point while growing up. This is especially common when a child is learning to walk. Big lumps (bruises) can occur with minor injuries because there is a large blood supply to the scalp. For the same reason, small cuts on the head may bleed a lot. Bruises on the forehead sometimes cause black eyes 1 to 3 days later because the blood spreads downward by gravity.

- **Skull Fracture:** Only 1% to 2% of children with head injuries will get a skull fracture. Usually, there are no other symptoms except for a headache at the site where the head was hit. Most skull fractures occur without any injury to the brain and they heal easily. (Exception: skull fractures in children younger than 12 months have a higher risk of intracranial injury).

- **Concussion:** A concussion is a mild injury to the brain that changes how the brain normally works. It is usually caused by a sudden blow or jolt to the head. Many children bump or hit their heads without causing a concussion. The most common signs of a concussion are a brief period of confusion or memory loss following the injury. Other signs of a concussion can include a headache, vomiting, dizziness, acting dazed, or being knocked out. A person does NOT need to be knocked out (lose consciousness) to have had a concussion. Following a concussion, some children have ongoing symptoms such as mild headaches, dizziness, thinking difficulties, school problems or emotional changes for several days to weeks.

- **Brain Trauma:** recognized by the presence of Acute Neurologic Symptoms: (1) Difficult to awaken OR (2) confused or slow thinking and talking OR (3) slurred speech OR (4) weakness of arms or legs OR (5) unsteady walking. These Acute Neurologic Symptoms require an EMS (911) disposition. EXCEPTION: The following acute symptoms do not require an EMS (911) response: Headache, dizziness, vomiting or blurred vision as an isolated symptom.

**Lacerations: Indications for Suturing**

- Any cut that is split open or gaping probably needs sutures.
- Cuts longer than 1/2 inch (12 mm) usually need sutures.
- On the face, cuts longer than 1/4 inch (6 mm) need sutures.
- Any open wound that may need sutures should be evaluated by a physician and closed as soon as possible to get the best results.
- All open wounds, regardless of the time that has passed since the initial injury, need to be treated to prevent wound infection.

**U.S. Rule for Predicting Serious Head Injuries (Kuppermann 2009)**

This study analyzed 42,412 patients younger than 18 years presenting to the emergency department within 24 hours of head injury. Data was obtained across 22 hospitals within the Pediatric Emergency Care Applied Research Network in the U.S. All of the identified risk factors are included in the Head Trauma guideline.

Results: The study identified the following risk factors for intracranial complications. If all of the risk factors are absent, the negative predictive value is 100% for clinically-important traumatic brain injury (ciTBI). Approximately 4% of children with altered mental status or evidence of skull fracture will have ciTBI.
- Presence of altered mental status (e.g., agitation, sleepiness, slow responsiveness, repetitive questioning)
- Loss of consciousness over 5 seconds
- Severe headache
- Any vomiting
- Parental report of abnormal behavior

**Examination**

- Scalp hematoma other than frontal (for children under 2 years)
- Signs of basilar skull fracture

**Mechanism (Severe injury mechanism)**

- MVC with ejection from motor vehicle, death of other passenger, rollover
- Pedestrian or unhelmeted bicyclist struck by motor vehicle
- Fall over 5 feet if 2 years or older
- Fall over 3 feet if under 2 years
- Struck by high-impact object (e.g., golf club or baseball bat)

**UK Rule for Predicting Serious Head Injuries (Dunning 2006)**

A prospective study on 22,772 children with head injuries led to the development of a decision rule to identify children at high risk of intracranial complications. The rule has a sensitivity of 98% and specificity of 87%. The data comes from children seen at 10 hospital emergency departments in England. The following is the study’s list of high risk factors. All of them were already included in the Head Trauma guideline as indicators to be seen.

**History**

- Witnessed loss of consciousness of over 5 seconds duration
- History of amnesia of over 5 minutes duration
- Abnormal drowsiness
- 3 or more vomits after head injury (a vomit is defined as a single discrete episode of vomiting)
- Suspicion of non-accidental injury
- Seizure after head injury in a patient who has no history of epilepsy

**Examination**

- Glasgow Coma Score (GCS) under 14, or GCS under 15 if under 1 year old
- Suspicion of penetrating or depressed skull injury or tense fontanelle
- Signs of a basilar skull fracture (defined as evidence of blood or cerebrospinal fluid from ear or nose, panda eyes, Battles sign, hemotympanum, facial crepitus or serious facial injury)
- Positive focal neurology (defined as any focal neurology, including motor, sensory, coordination or reflex abnormality)
- Presence of bruise, swelling or laceration over 5 cm (2 inches) if under 1 year old

**Mechanism**

- High-speed road traffic accident either as pedestrian, cyclist or occupant (defined as accident with speed over 40 miles per hour)
- Fall of over 3 meters (10 feet) in height
High-speed injury from a projectile or an object

**Falls and Heights: 2010 changes**

- Premise: The greater the height of the fall, the more severe the potential injury. Most injuries are seen with falls from heights greater than 5 feet. Mortality rates increase with falls from heights greater than 15 feet (Judy, Pediatrics in Review 2011).
- Children younger than 3 years of age are less likely to have serious injuries from falls. Reasons: lower weight (body mass) and more fat and cartilage to dissipate energy. (Judy 2011).
- Falls: Ground-level falls or running into a stationary object are not considered to be high risk.
- Free-falls from a great height are considered high risk. Kuppermann’s study (2009) defined these heights as over 3 feet for age under 2 years, and over 5 feet for age over 2 years. The UK study defined the height as twice the child’s height or over 10 feet for school-age children.
- This guideline uses the more conservative cutoffs (3 and 5 feet).
- Practical implication: Countertops are usually 3 feet. Washers and dryers, shopping carts and from parent’s arms are usually over 3 feet. Tables and desks are usually 2 ½ feet. Highchair seats are usually 2 feet.
- Falls down stairways: Since most children roll down the stairs, these accidents are not equivalent to free falls. Nurse judgment is required in these cases. We are most concerned about pre-verbal children younger than 2 years. If a child is in a walker at the time, the risk for a serious injury is greatly increased. Children over age 2 can usually be triaged on the basis of symptoms. A steep concrete stairway is dangerous at any age. So, is a free fall that doesn't include rolling or tumbling.
- Sports that involve height: Dangerous injuries for severe neck injuries include trampolines, cheerleading stunts and diving.

**Falls and Dangerous Heights: 2012 changes**

- A 2011 outcome study (Children’s Hospital Colorado) found that seeing asymptomatic children who fell over 3 feet (under age 2) and or over 5 feet (over age 2) led to over-referral to the ED.
- After consultation with our ED head trauma expert (Dr. Joe Grubenhoff), the “fall distance” triage question was split into 2 questions. If the child fell from a “dangerous height” and had any symptoms, they are referred in now. If the child was asymptomatic at the time of the first call, they are observed at home with a nurse-initiated call-back in 1 hour to recheck the child’s status.
- Reason: 42 asymptomatic patients sent in because of a positive response to “dangerous mechanism of injury”; the majority of calls met the cutoff for “dangerous fall height”. The most common falls were down stairs or from a highchair.
- Results: 11 (26%) didn’t go in to the recommended site (presumed parental non-compliance based on review of EMR), 18 (43%) had normal neurological exam and were discharged, 12 (28%) were observed for 1-5 hours, and 1 (2%) who had a dresser and TV fall on the child needed an imaging study.

**Vomiting as Marker For Intracranial Injury**

Vomiting occurs in 14 to 19% of children sent to an ED for evaluation of head trauma. Two recent studies looked at the predictive value of vomiting for intracranial injury (ICI) documented by CT scan. Palchak (2003) found an 11.4% incidence of ICI and a 2.3 relative risk with vomiting. Haydel (2003) found a 2.46 relative risk. Based on these 2 studies, in 2004 this triage guideline now refers in any child who has vomiting 2 or more times following a head injury. (Note: neither pediatric study addressed how many times the child had vomited. Author’s observation: Vomiting once is often associated with the initial hard crying and pain). An excellent editorial by Greenes (2003) raises questions about the specificity and cost-effectiveness of some soft indications for CT. However, having these patients evaluated neurologically is a safe step.
Fluid Drainage From Nose: Rarely CSF

- Spinal fluid leakage from the nose or ear may be seen with basilar skull fractures.
- Symptom: Watery or blood-tinged fluid dripping from nose or ear
- Confirmation: must be present when child is not crying. Almost always, clear nasal drainage is from tears (or a recent viral URI). Clear ear canal drainage is also usually tears that have collected there while the child was lying down.
- Even if the drainage is CSF, it's not an emergency, so consider calling the parent back in 30 minutes for an update.
- Basilar skull fracture: fracture of the base of the skull. Usually only follows major head trauma. Acute neurological findings (e.g., altered mental status) are usually present. Diagnosis of basilar skull fracture: Mainly a clinical diagnosis. Usually not seen on skull films, but detected on helical CTs.
- Risk: If basilar skull fracture connects to nose or sinus, very small risk of meningitis until tear in dura membrane heals.
- Treatment: Close follow-up. Prophylactic antibiotics are not helpful.

Raccoon Eyes (Bilateral Black Eyes) Following Head Trauma

- The cause of bilateral black eyes can be determined by the timing of their onset.
- Forehead hematomas cause most of them. The black eyes appear 2 to 3 days after the initial minor forehead injury. Mechanism is the seepage of blood downward through the tissue planes with the help of gravity.
- Basilar skull fracture is occasionally the cause. A fracture of the frontal part of the base of skull can cause blood to seep anteriorly into the orbits. The black eyes usually appear within 12 hours of the initial injury. Also, there is no forehead bruise.
- Basilar skull fractures usually only follow major head trauma. Acute neurological findings (e.g., altered mental status) are usually present.

Acute Concussion - Symptoms (adapted from McCrory 2009 and Gedeit 2001)

- Loss of consciousness (LOC): only 10-20% of concussions have LOC. LOC prolonged over 1 minute suggests a more serious injury.
- Amnesia for the event, retrograde amnesia or memory deficit. With a concussion, it's more common to temporarily lose post-traumatic (anterograde memory) than pre-traumatic memory (retrograde memory). This means the inability to store new information and create new memories. It's manifested by repeatedly asking the same question and then forgetting what they were told. This can last minutes to hours. It's often the hallmark of a concussion. Longer duration of amnesia is more serious.
- Vacant stare, blank look or visual abnormalities
- Altered mental status (e.g., confusion or feeling like "in a fog")
- Slurred speech
- Inappropriate or exaggerated emotions (emotional lability)
- Dizziness or incoordination
- Headache
- Nausea or vomiting
- Cognitive impairment (e.g., slow reaction times)
- Drowsiness or other sleep disturbances

Concussion: Definition (Adapted from McCrory 2009)

- Definition: The rapid onset of a temporary impairment in neurological function following head trauma.
- Mechanism: The acute concussion symptoms largely reflect a functional disturbance rather than a
structural injury to the brain.

- Diagnosis: The diagnosis is made by a doctor based upon the clinical examination of the injured person. The CT scan of a patient with a concussion (without any other brain injuries) is normal and the study is usually not indicated.
- Prognosis: 80 to 90% of concussion symptoms resolve in 7-10 days. The recovery time frame may be longer in children.
- Caution: All children with concussions need a neurological exam.
- "Second impact injury": A second concussion that occurs within 1 or 2 weeks after the first one. The outcome can be serious intracranial injury or even death.
- Sports: No child athlete who sustains a concussion should be returned to play on that same day.
- Post concussive syndrome: poor school performance, difficulty concentrating, personality changes can last 3 months or longer.

**External Occipital Protuberance (EOP): Confusion with Hematomas**

The EOP is a normal bony prominence found at the base of the skull (located at the lower midline of the occipital bone.) It is bony and feels like a hard knot. Its size can vary greatly. Following a fall or other head trauma, some callers (who have never felt it before) attribute it to the fall. The triager’s job is to avoid calling any lump at this site a hematoma. Usually additional questioning will pinpoint the classic site, that it feels like bone and that’s it’s non-tender. Many callers are reassured by being told how to feel their own EOP.

**Pupil Size and Head Injuries: Telephone Assessment Not Warranted**

- Pupil size assessment was purposely excluded from this guideline for the following reasons:
  - Normal variant: Unequal pupils are a normal finding in 10% of the population. (physiologic anisocoria). The difference can be so slight (usually 1 mm), that many parents don’t notice it until they are asked to compare pupils following a head injury. Looking at a previous photo often confirms this diagnosis.
  - Pupil size is difficult and time-consuming for most parents to assess, especially in young children or ones who are crying.
  - Brain stem herniation: Although a unilateral dilated pupil can be a sign of an intracranial hematoma and brain stem herniation, it is always a late sign and it’s never the only sign. (Altered mental status and severe headache are also present)
  - Local eye trauma: Blunt trauma to one eye can cause a unilateral dilated pupil (traumatic mydriasis). Associated symptoms are eye redness and pain.
  - Equal large pupils are common following any injury, because crying and pain release epinephrine which in turns dilates the pupils.

**Air Bag Deployment**

- Air bags inflate within 50 milliseconds of impact and at a speed of 100 miles per hour.
- The gas produced to inflate the airbag is completely HARMLESS.
- It’s mainly nitrogen.
- The chemical (sodium azide) that’s used to produce the gas is poisonous; however, there’s none of it in the gas.
- CDC reports no poisoning from airbag deployment. (2009)
- Front seating is not recommended until 13 years of age or older.
- Airbag injuries are mainly minor abrasions or burns. (EXCEPTION: in younger children who are inappropriately placed in front seat)

**Pain Medicine and Head Injuries**
• Post-traumatic headache and scalp pain is a symptom following many head injuries.
• This guideline recommends treating it with acetaminophen or ibuprofen.
• While ibuprofen produces some platelet dysfunction and a small increased risk of bleeding that lasts up to 6 hours, no one in the ED at our Children’s Hospital restricts the use of ibuprofen for minor head injury. (Exception: high risk patient with major head injury or underlying bleeding disorder who are referred in).
• On the other hand, aspirin produces platelet dysfunction and increased risk of bleeding that lasts for several days. Aspirin is never recommended following head trauma. (Note: also not recommended in children and teens because of increased risk of Reye syndrome)
• Vomiting: Since vomiting after a head injury is a possible marker for intracranial injury, all medicines are avoided during the first 2 hours post-injury.

Caution: Associated Neck Trauma

• Neck trauma should also be considered in all patients with a head injury. Concerning findings include: numbness, weakness, and neck pain.
• After using the Head Injury guideline, if the triager or caller has remaining concerns about neck trauma, then the patient also should be triaged using the Neck Injury guideline.

Expert Reviewer:

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REFERENCES


**SEARCH WORDS**

AMNESIA
BLACK EYES
BRAIN
BRAIN TRAUMA
BRIEF LOSS OF CONSCIOUSNESS
CNS
CONCUSSION
DIFFICULT TO AWAKEN
DING
EPIDURAL HEMATOMA
FALLS
GOOSE EGG
GRAZE
HEAD
HEAD INJURIES
HEAD INJURY
HEAD TRAUMA
HEADACHE
INJURIES
INJURY
KNOT
LOC
LOSS OF CONSCIOUSNESS
NECK PAIN
NEURO
RACCOON EYES
SCALP
SCALP BLEEDING