Disclaimer

• I receive royalties from the American Academy of Pediatrics for the book I authored, *Pediatric Nurse Telephone Triage*.
• Views expressed are mine, inherent with my experience and biases.
• Recommendations partially based on Telephone Triage Guidelines, Barton Schmitt, MD
Objectives

1. Identify why children with head trauma may need to be seen urgently/emergently.
2. Identify causes of over referral for pediatric head trauma nurse telephone triage.
3. Identify recommendations for home care advice for pediatric head trauma.
Agenda

1. Who are we?
2. Head trauma background information
3. Potential complications from head trauma
4. Concussions, when to evaluate and return to play
5. When to be seen for head trauma
6. Home care instructions
# 2014 Top Guidelines

<table>
<thead>
<tr>
<th>Rank</th>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cough</td>
<td>6.73%</td>
</tr>
<tr>
<td>2</td>
<td>Vomiting Without Diarrhea</td>
<td>6.08%</td>
</tr>
<tr>
<td>3</td>
<td>Colds</td>
<td>5.82%</td>
</tr>
<tr>
<td>4</td>
<td>Fever - 3 Months or Older</td>
<td>5.80%</td>
</tr>
<tr>
<td>5</td>
<td>Medication Question Call</td>
<td>4.03%</td>
</tr>
<tr>
<td>6</td>
<td>Asthma Attack</td>
<td>3.18%</td>
</tr>
<tr>
<td>7</td>
<td>Trauma - Head</td>
<td>3.26%</td>
</tr>
<tr>
<td>8</td>
<td>Diarrhea</td>
<td>2.70%</td>
</tr>
<tr>
<td>9</td>
<td>Rash or Redness - Widespread</td>
<td>2.63%</td>
</tr>
<tr>
<td>10</td>
<td>Immunization Reactions</td>
<td>2.40%</td>
</tr>
<tr>
<td>11</td>
<td>Eye - Pus Or Discharge</td>
<td>2.37%</td>
</tr>
<tr>
<td>12</td>
<td>Constipation</td>
<td>2.26%</td>
</tr>
<tr>
<td>13</td>
<td>Vomiting With Diarrhea</td>
<td>2.07%</td>
</tr>
<tr>
<td>14</td>
<td>Croup</td>
<td>1.98%</td>
</tr>
<tr>
<td>15</td>
<td>Earache</td>
<td>1.89%</td>
</tr>
<tr>
<td>16</td>
<td>Recent Medical Visit For Illness: Follow-up Call</td>
<td>1.87%</td>
</tr>
<tr>
<td>17</td>
<td>Sore Throat</td>
<td>1.61%</td>
</tr>
<tr>
<td>18</td>
<td>Abdominal Pain</td>
<td>1.73%</td>
</tr>
<tr>
<td>19</td>
<td>Hives</td>
<td>1.30%</td>
</tr>
<tr>
<td>20</td>
<td>Ear Infection Follow-up Call</td>
<td>1.04%</td>
</tr>
</tbody>
</table>
# Top Referral Guidelines

(911, Go to ED, Call PCP, See in 4)

<table>
<thead>
<tr>
<th></th>
<th>Condition</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Abdominal Pain</td>
<td>35%</td>
</tr>
<tr>
<td>2</td>
<td>Croup</td>
<td>30%</td>
</tr>
<tr>
<td>3</td>
<td>Asthma Attack</td>
<td>24%</td>
</tr>
<tr>
<td>4</td>
<td>Trauma - Head</td>
<td>23%</td>
</tr>
<tr>
<td>5</td>
<td>Vomiting without Diarrhea</td>
<td>14%</td>
</tr>
<tr>
<td>6</td>
<td>Vomiting with Diarrhea</td>
<td>13%</td>
</tr>
<tr>
<td>7</td>
<td>Cough</td>
<td>11%</td>
</tr>
<tr>
<td>8</td>
<td>Colds</td>
<td>8%</td>
</tr>
<tr>
<td>9</td>
<td>Diarrhea</td>
<td>7%</td>
</tr>
<tr>
<td>10</td>
<td>Fever - 3 Months or Older</td>
<td>6%</td>
</tr>
<tr>
<td>11</td>
<td>Eye - Pus or Discharge</td>
<td>6%</td>
</tr>
<tr>
<td>12</td>
<td>Constipation</td>
<td>6%</td>
</tr>
<tr>
<td>13</td>
<td>Immuzation Reactions</td>
<td>6%</td>
</tr>
<tr>
<td>14</td>
<td>Earache</td>
<td>4%</td>
</tr>
<tr>
<td>15</td>
<td>Rash or Redness - Widespread</td>
<td>3%</td>
</tr>
</tbody>
</table>
Developing Brain

• Children are not adults!

• Head
  – Different % water content
  – Different blood volume
  – Different degree of nerve myelination
  – Different skull structure and elasticity
  – Different cognitive development
Parts of the Scalp/Head

CORONAL SECTION OF SKULL, SCALP & MENINGES IN MIDLINE

To show layers of scalp, meninges and falx cerebri

- Skin
- Connective tissue
- Aponeurosis
- Loose areolar tissue
- Pericranium

- Superior sagittal sinus
- Lateral blood lake
- Arachnoid granulations (a mass of villi) indenting the skull

- Dura
  - Endostial (periosteal)
  - Meningeal (fibrous)

- Arachnoid
- Pia

- Falx cerebri
- Inferior sagittal sinus

Brain

CSF
Complications of Head Trauma

1. Laceration
2. Hematoma
3. Skull Fracture
4. Intracranial Injury
5. Concussion
6. Post Concussion Syndrome
Laceration

• Look at it bleed!! Blood everywhere!
• Scalp is highly vascular
• If cannot be controlled – be seen
• Basic bleeding care – pressure
• Does it need to be stitched?
  – Gaping? Do the edges touch?
  – Can you fit a dime on its side between the skin edges?
Hematoma

• Cephalohematoma – bleeding beneath the skull periosteum
• Can become very large due to the elasticity of the soft tissue
• In young children, the larger the hematoma, the more likely intracranial pathology – over 2 inches ↑ chance
Skull Fractures

1. Linear skull fracture
2. Depressed skull fracture
3. Basilar skull fracture

   - Warning signs
     • Raccoon eyes
     • Post auricular bruising
     • CSF/bloody leak from ear or nose
Intracranial Injuries

- Epidural Hematoma
- Subdural Hematoma
- Cerebral Contusion
- Concussion
Epidural Hematoma

- Tears in meningeal arteries
- Often associate with skull fracture (temporal bone)
- Blood between skull and dura mater
- Rapid deterioration or asymptomatic at first, deterioration within hours (1/3 of pts)
- Can increase intracranial pressure
Epidural Hematoma
Subdural Hematoma

- More common
- Tearing of surface blood vessels
- Can lead to increased pressure and shift brain
- Often associated brain injury too
- Unconscious
- **Chronic Subdural Hematoma**
  - Slowly developing process
  - Increasing symptoms
  - Can deteriorate hours to days later
Subdural Hematoma
Concussion

1. Trauma induced
2. Alteration in brain function
Concussion

• Does **NOT** require loss of concussion
• Must have some alteration in neurological function
Pathophysiology

• Biomechanical forces
• Injury to brainstem, forebrain and temporal lobe

Bigler 2008 JIntNeuro1Soc; Leddy 2007 Neurorehab
Metabolic Brain Changes after Concussion

- Blood flow changes
- Glucose metabolism
- Autoregulation changes
- Neurotransmitter changes
Second Impact Syndrome

Second impact syndrome (SIS) occurs when an athlete who has sustained an initial head injury, most often a concussion, sustains a second head injury before symptoms associated with the first have fully cleared.

Defines SIS by the event (2nd concussion while symptomatic), allowing for other sequelae, such as ↑ symptoms, prolonged recovery, and potentially permanent cognitive or physical symptoms.
Second Impact Syndrome

• More Severe Sx
• Slower Trajectory
• Possible Permanent Cog/Phys Sx

Symptom Levels

Pre-Injury  Injury 1  Injury 2
Single, uncomplicated concussion

University Hospitals
Rainbow Babies & Children’s Hospital
Goals in Concussion Management

• Prevent Repeat Injury (SIS)
• Facilitate Recovery
• Manage Symptoms and Their Impact on Activities and Quality of Life
Most Common Symptoms

• Headache
  – Usually “pressure”
  – Site specific or generalize
  – Worse with physical activity
• Vision changes
  – Blurry, change peripheral vision
• Photo sensitivity
Most Common Symptoms

- Balance problems
- Fatigue / Foggy feeling
- LOC: only 10%
Concerning Symptoms

• Severe or worsening headache
• Worsening mental status
• Prolonged LOC
What’s Different in Children?

• More prolonged/diffuse swelling after concussion
  – Sx resolve slower in children/high school
• Immature brain may be more sensitive to glutamate
  – Neurotrans involved in metabolic cascade

Pickles 1950 NEJM, McDonald 1990 BrainResRev
Early Management

• COMPLETE rest from ALL physical activity after injury
  – NO SAME DAY RETURN TO PLAY (RTP)
  – 33% who RTP same day have delayed onset sx @ 3h vs. 12.6% who don’t
  – Second impact syndrome
  – Post-concussion syndrome
Early Management

• Mental rest
  – Stay home from school
• NSAID/acetaminophen for headache
• Avoid sensory overload
  – Computers/computer games/Loud TV/Texting
• Sleep
Return to Play

Stepwise return to play - 24 hrs between steps

Step 1: No activity, complete rest
   When asymptomatic (OFF of all medications) proceed to level 2

Step 2: Light aerobic exercise
   Walking, stationary bike

Step 3: Sport-specific training (non-contact)
   Skating, running
Return to Play

Step 4: Non-contact training drills
  Passing, throwing, shooting
  Medical clearance 1st

Step 5: Full-contact practice

Step 6: Game Play
Post Concussive Syndrome

• Can last days, weeks, months
  – Headache
  – Anxiety
  – Depression
  – Insomnia
  – Behavioral changes
  – Dizziness
  – Memory impairment
  – Cognitive impairment
Head Trauma Questions

Airway / Breathing –
Circulation –
Disability –
Evaluation –
Fall –
History –
TLT – send in

- All guidelines – avg. 15-17%
- Head trauma – 23-26%
# Review of Calls – TLT

<table>
<thead>
<tr>
<th>Disposition Reason</th>
<th>Total</th>
<th>App</th>
<th>Not- App</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 6 months, except minor</td>
<td>14</td>
<td>3</td>
<td>11</td>
<td>What is minor?</td>
</tr>
<tr>
<td>Acute neuro symptoms</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>How far after incident?</td>
</tr>
<tr>
<td>Neck pain or stiffness</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>How far after incident?</td>
</tr>
<tr>
<td>Amnesia</td>
<td>3</td>
<td>3</td>
<td></td>
<td>How far after incident?</td>
</tr>
<tr>
<td>Blurred vision</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dangerous mechanism</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin is split, open, gaping</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sounds like a serious injury</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomiting 2 or more times</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;12 months, swelling &gt;1&quot;</td>
<td>1</td>
<td>1</td>
<td></td>
<td>? Size</td>
</tr>
<tr>
<td>&lt;24 months and new onset fussy</td>
<td>1</td>
<td>1</td>
<td></td>
<td>How far after incident?</td>
</tr>
<tr>
<td>Concerning fall &lt; 2 yrs</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe headache</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water/bloody nasal discharge</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>26</strong></td>
<td><strong>19</strong></td>
<td><strong>58% 42%</strong></td>
</tr>
</tbody>
</table>
Reassuring Signs/Symptoms

• Don’t worry about pupil size and reactivity
• No change in mental status
• Normal activity
• No swelling of scalp
• Fall less than 3 feet, from standing position
• Fall down stairs and acting completely normal (movement) after crying stops
Concerning Signs/Symptoms

History
• Current altered mental status
• Loss of consciousness (>5 sec.)
• Amnesia
• Seizure post injury
• Severe headache
• Vomiting more than twice
• Abnormal behavior
Concerning Signs/Symptoms

Examination

• Scalp hematoma
  – >2 inches if 12-24 months, i.e. >
  – >1 inch if <12 months, i.e. >

• Dent in skull

• Signs of basilar skull fracture (raccoon eyes and battle sign – post. ear)
Concerning Signs/Symptoms

Mechanism

• Motor vehicle with ejection, passenger death, rollover
• Pedestrian without helmet
• Fall over 5 feet if 2 years or older
• Fall over 3 feet if under 2 years
• Caused by high impact object
# Heights

<table>
<thead>
<tr>
<th>Object</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen counter</td>
<td>3 feet</td>
</tr>
<tr>
<td>Table</td>
<td>2 ½ feet</td>
</tr>
<tr>
<td>Chair</td>
<td>1 ½ feet</td>
</tr>
<tr>
<td><strong>Parent’s arm</strong></td>
<td><strong>3 to 4 feet</strong></td>
</tr>
<tr>
<td>Couch</td>
<td>1 ½ feet</td>
</tr>
<tr>
<td>All beds</td>
<td>Less than 3 feet</td>
</tr>
<tr>
<td>1 Stair</td>
<td>~ 8 inches each</td>
</tr>
<tr>
<td>5 stairs – though does not fall entire height</td>
<td>~ 3 ¼ feet</td>
</tr>
</tbody>
</table>
Specific Falls

- Ground-level are low risk
- Child falls running hits head on floor
- Child bumps into something on own
Under 6 Months

• 0 – 3 months
  – Refer in or to clinician

• 3-6 months AND mild head trauma AND crying less than 5 min without other symptoms AND now normal
  – Reassure, call back in 1 hour and assess. Tell to call back for all calls if any change.
Key Points – Home Care

1. Drinking
   – May drink small amounts clear fluids
   – After 2 hours regular diet

2. Pain
   – May have analgesics after 2 hours (only because if vomits may confuse etiology)

3. Sleep
   – If desires, allow to sleep
   – Sleep in same room for two nights or awaken child once during each night
Home Care Advice

• Wound care should consist of cleansing and antibacterial ointments if available
• Ice or similar can be applied to areas of edema
Home Care Advice

- Patients should not be fed for a few hours as this may contribute to nausea and vomiting
- Reassure the caller that some scalp swelling is normal
- Discuss the possibilities of prolonged symptoms of the post-concussive syndrome
When to Call Back

Instruct the caller to call back for
  – any change in mental status
  – recurrent vomiting
  – worsening headache
  – or if the child seems worse in any way
Glad I could help, call back anytime!
Thank You!