IMPROVING CONCUSSION MANAGEMENT: LESSONS LEARNED

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Evolution of Concussion Knowledge

Centers for Disease Control and Prevention Guideline on the Diagnosis and Management of Mild Traumatic Brain Injury Among Children

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**Importance** Mild traumatic brain injury (mTBI), or concussion, in children is a rapidly growing public health concern because epidemiologic data indicate a marked increase in the number of emergency department visits for mTBI over the past decade. However, no single approach to clinical decision making has been widely endorsed by health care providers.
Concussion Definition

• Sport related concussion is a traumatic brain injury induced by biomechanical forces. Several common features that may be utilised in clinically defining the nature of a concussive head injury include:

• SRC may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head.

• SRC typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, signs and symptoms evolve over a number of minutes to hours.
Concussion Definition

• SRC may result in neuropathological changes, but the acute clinical signs and symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.

• SRC results in a range of clinical signs and symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive features typically follows a sequential course. However, in some cases symptoms may be prolonged.

• The clinical signs and symptoms cannot be explained by drug, alcohol, or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction, etc) or other comorbidities (eg, psychological factors or coexisting medical conditions).
Concussion’s Medical Neighborhood

Emerg Dept ➔ Primary Care ➔ Specialty Care

Triage Qs/ Red Flags

Symptom Management/ Active Rehabilitation

School Return & Supports

Physical Activity/ Sports & Recreation Return
Recovery from Concussion
Typical / Atypical

• Largest study to date (n=3000, age 5-18; Zemek, 2016) indicates 70% recover within 4 weeks

• Risk factors for longer recovery
  • Demographics: Adolescent, Female
  • Hx: concussion > 1 week, Migraine
  • Sx: headache, sensitivity to noise, fatigue, answering questions slowly
  • Balance exam: >4 errors on tandem stance

Clinical Risk Score for Persistent Postconcussion Symptoms Among Children With Acute Concussion in the ED

Roger Zemek, MD; Nick Barrowman, PhD; Stephen B. Freedman, MDCM, MSc; Jocelyn Gravel, MD; Isabelle Gagnon, PhD; Candice McGahern, BA; Mary Aglipay, MSc; Ganninder Sangha, MD; Kathy Boutsis, MD; Darcy Beer, MD; William Craig, MDCM; Emma Burns, MD; Ken J. Fanion, MD; Angelo Mikrogianakis, MD; Karen Barlow, MD; Alexander S. Dubrovsky, MDCM, MSc; Willem Mooiwaarde, MD, PhD; Gerard Ghita, PhD; William P. Meehan III, MD; Miriam H. Beauchamp, PhD; Yael Kamli, BSc; Anne M. Grool, MD, PhD, MSc; Blaine Hoshtizaki, PhD; Peter Anderson, PhD; Brian L. Brooks, PhD; Keith Owen Yeates, PhD; Michael Vassilyadi, MDCM, MSc; Terry Klassen, MD; Michelle Keightley, PhD; Lawrence Richer, MD; Carol DeMatteo, MSc; Martin H. Osmond, MDCM; for the Pediatric Emergency Research Canada (PERC) Concussion Team
CHOP/ CDC study

Original Investigation

Point of Health Care Entry for Youth With Concussion Within a Large Pediatric Care Network

Kristy B. Arbogast, PhD; Allison E. Curry, PhD; Melissa R. Pfeiffer, MPH; Mark R. Zonfrillo, MD, MSCE; Juliet Haarbauer-Krupa, PhD; Matthew J. Breiding, PhD; Victor G. Coronado, MD, MPH; Christina L. Master, MD

- 8083 patients with diagnosed concussions
- First visit point of entry
  - Primary care = 81.9%
  - ED = 11.7%
  - Specialty care = 5.7%
- Age variation: 0-4 yrs 52% to ED, > 75% 5-17 to PC
- Insurance status: Medicaid 37% to ED, pvt 7% to ED
PRIMARY CARE
CLINICAL PATHWAY
CONCUSSION MANAGEMENT
<table>
<thead>
<tr>
<th>Event</th>
<th>Action</th>
<th>Tools</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Injury Notification (via Phone Call)</td>
<td></td>
<td>To Family: If positive Red Flags, refer to ED If negative Red Flags, Office visit</td>
</tr>
<tr>
<td>2a</td>
<td>Office Visit 1 - Diagnosis</td>
<td></td>
<td>To Family, School: Symptom Checklist (Return to School Letter)</td>
</tr>
<tr>
<td></td>
<td>Concussion Education</td>
<td>CDC Instructions</td>
<td>Education &amp; reassurance about diagnosis &amp; reinjury risks, early symptom-based management guidance</td>
</tr>
<tr>
<td></td>
<td>Develop management strategy</td>
<td>ACE Care Plan</td>
<td>To School: Letter re: return date, safety &amp; symptom profile</td>
</tr>
<tr>
<td></td>
<td>School Symptom Profile</td>
<td>CDC Instructions/ ACE Care Plan</td>
<td></td>
</tr>
<tr>
<td>2b</td>
<td>Office Visit 1 - Mgt.</td>
<td></td>
<td>To Family: Education &amp; reassurance about diagnosis &amp; reinjury risks, early symptom-based management guidance</td>
</tr>
<tr>
<td></td>
<td>Sports/ PE/ Recreation</td>
<td></td>
<td>To School: Letter re: return date, safety &amp; symptom profile</td>
</tr>
<tr>
<td>3</td>
<td>Office Visit - Follow Up</td>
<td>Home Management</td>
<td>School progress update</td>
</tr>
<tr>
<td></td>
<td>ACE Care Plan</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>School Symptom Monitor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>Office Visit - Clearance</td>
<td></td>
<td>To Family: counsel on gradual return process</td>
</tr>
<tr>
<td></td>
<td>Assess for full recovery</td>
<td></td>
<td>To School: clearance to return to PE/recess</td>
</tr>
<tr>
<td></td>
<td>1. No symptoms at rest/ no medication use to return</td>
<td></td>
<td>To School: clearance to begin gradual Return to Play protocol; monitor until Final Clearance</td>
</tr>
<tr>
<td></td>
<td>2. Return to Physical Activity (Full Return to Sport)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>*PCSI (Student, Parent)</td>
<td></td>
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<tr>
<td></td>
<td>*Medical Clearance for Return</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Contact physical and cognitive activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Cognitive functions at typical baseline</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>4. Normal balance and coordination</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. No other medical/neuro complaints</td>
<td></td>
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<tr>
<td></td>
<td>RTP program</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Gradual Return to Sport</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td>Referral Criteria for Prolonged/Complicated Recovery</td>
<td></td>
<td>To Family: Discuss referral to specialist, make referral to concussion clinic</td>
</tr>
</tbody>
</table>

- **Injury Notification**
- **Office Visit 1 - Diagnosis**
- **Office Visit 1 – Mgt.**
- **Office Visit – Follow Up**
- **Office Visit – Clearance**
- **Prolonged/Complicated Recovery - Referral**
- **Return to Activity**
- **School**
- **Physical Activity**
- **Social**
Concussion as ADHD in 1980

**ADHD**
- 1980: Most kids were evaluated and treated by specialists
- 2019: Most kids treated by primary care physicians
  - Refer Complex Cases

**Concussion**
- Pre-2019: Care is more variable. More ED/ Urgent Care/ specialists
- 2019+: Most kids treated by primary care physicians
  - Refer Complex Cases
CONCUSSION ACADEMY SKILLS TRAINING PROGRAM (CAST)
Goals/ Intended Outcomes for Providers

• Increase skill & confidence in clinical evaluation/management, using clinical pathway, tools
• Improve communication with school, assist with return
• Solidify understanding of recovery criteria, return to risk
• Differentiate complex cases and make appropriate referral, specialty care

Improve Concussion Care for children & adolescents
Elements of the Primary Care Clinical Pathway

1. Triage questions and “red flags” asked at first contact
2. Patients were appropriately referred to the ED
3. An Acute Concussion Evaluation (ACE) protocol was completed
4. The patient was sent home with an ACE Care plan
5. Patients provided a return to school letter
6. Post-concussion symptom inventory was used in follow up
7. Medical clearance was documented
8. The patient was referred to a specialist if appropriate
9. Concussion diagnosis was coded properly
Concussion Learning Sessions (5)

• September, 2017
  • Kickoff General Overview: Primary Concussion Care
  • Diagnosis & initial education/management (incl. triage/red flags)

• November, 2017
  • Management principles & practice

• January, 2018
  • Return to School: communication & management issues

• March, 2018
  • Criteria for Recovery & Return to Risk (Sport, etc.)

• May, 2018
  • Rehabilitation & specialty medical management
Needs Assessment

Least Confident In

- Concussion management skills
- Patient/family education
- Return to School guidance
- Return to Play guidance

Reasons to Refer Out

- Lack of resources
- Patients with prolonged recovery
- Uncomfortable with management
Provider Pre- and Post-CAST Confidence About Evaluation and Patient Education

- I have adequate training to perform an appropriate evaluation. (High)
- I have adequate time to complete an appropriate evaluation. (High)
- It is my role to conduct a concussion evaluation. (High)
- I have adequate training to educate patient/family about concussion care. (High)
- I have adequate time to educate patient/family about concussion care. (High)
- It is my role to educate patient/family about concussion care. (High)
- I have useable materials to assist education of patient/family about concussion care. (High)

Pre-CAST

Post-CAST
I have adequate training to guide return to school.
I have adequate time to recommend return to school.
I have adequate knowledge to recommend return to school.
I have adequate training to determine when it is appropriate to return to school.
I have adequate knowledge to provide the necessary medical information to facilitate return to school.
I have adequate knowledge to recommend appropriate academic accommodations to facilitate success in school.

Provider Pre- and Post-CAST Perception About Return to School

<table>
<thead>
<tr>
<th>Perception</th>
<th>Pre-CAST</th>
<th>Post-CAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have adequate training to guide return to school.</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>I have adequate time to recommend return to school.</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>I have adequate knowledge to recommend return to school.</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>I have adequate training to determine when it is appropriate to return to school.</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>I have adequate knowledge to provide the necessary medical information to facilitate return to school.</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>I have adequate knowledge to recommend appropriate academic accommodations to facilitate success in school.</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>
I have adequate knowledge of the criteria for medical clearance to prescribe a gradual return to play protocol for sports.

I have adequate training to prescribe and oversee a gradual return to play protocol for sports.

I have adequate time to prescribe and oversee a gradual return to play protocol for sports.

I have adequate knowledge to prescribe a gradual return to play protocol for sports.

Provider Pre- and Post-CAST Perception About Return to Play
Future of Pediatrics 2019

Confidence in Training Pre- and Post-CAST

<table>
<thead>
<tr>
<th>Training task</th>
<th>Pre-CAST</th>
<th>Post-CAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine when it is appropriate to return to school</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Provide the necessary medical information to facilitate return to school</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Recommend appropriate academic accommodations to facilitate success in school</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Training to prescribe and oversee a gradual return to play protocol for sports</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Training to educate patient/family about concussion care</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Training to guide return to school</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Training to perform an appropriate evaluation</td>
<td>6</td>
<td>8</td>
</tr>
</tbody>
</table>

Notes:
- Confidence scale: Low, Medium, High
- Post-CAST represents training confidence after CAST education.
Adequate knowledge to recommend return to school

Adequate knowledge of the criteria for medical clearance to prescribe a gradual return to play protocol for sports.

Adequate knowledge to prescribe a gradual return to play protocol for sports.

Provider Knowledge Pre- and Post-CAST

Pre-CAST

Post-CAST

High

Medium

Low
I have adequate time to complete an appropriate evaluation

I have adequate time to educate patient/family about concussion care

Adequate time to recommend return to school

Adequate time to prescribe and oversee a gradual return to play protocol for sports.
Resource Needs

**Available Resources**

- Decision Support Tool
- Discharge Instructions/Handouts
- Triage Service

**Key Rule for Activity**

"Not Too Little, Not Too Much"

**Acute Concussion Evaluation (ACE)**

**Care Plan**

- **Name:**
- **Age:**
- **Date of birth:**

**Today’s Date**

**Injury Date**

You have been diagnosed with a concussion, also known as a traumatic brain injury. To prevent further injury, do not return to any high-risk activities (e.g., sports, physical education, driving) until cleared by a qualified healthcare professional. To promote recovery, physical and cognitive activity must be carefully managed. Pay attention to your symptoms (listed below) and avoid too much of any activity that makes your symptoms worse. As this may affect your recovery. As symptoms improve, you can increase the level of daily activity slowly and carefully. You may need the help of parents, school, and athletic personnel to recover and safely return to activities.

**Today following post-concussive symptoms are present (Circle or check):**

- **Noreported symptoms**

**Pre-CAST**
- **Post-CAST**

**Available Resources**

- Decision Support Tool
- Discharge Instructions/Handouts
- Triage Service
Reasons for Referral

- I am not always comfortable with management
- I do not always have adequate time for management
- I do not always have adequate resources for management
- It is not my role to manage
- My setting is not always appropriate for management
- Other

Percent Who Answered "Yes"

- Pre-CAST
- Post-CAST

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What We Learned - Successes

• The CAST program helps providers feel more confident in their assessment and management of concussions
• The CAST program increases the use of validated tools and best practices
• Providers want and benefit from having useful resources available to them
• Higher quality of referrals to neurology clinic
What We Learned - Challenges

- Incorporating forms into EMR made a big difference
- Different methods of triaging – answering service or not
- Many practices not seeing 10 concussion cases per month
  - Where are these patients being seen?
- It’s a challenge to evaluate appropriateness of referral patterns, especially referrals to the ED
CAP’S SUCCESSFUL JOURNEY WITH CONCUSSION

Maya Nair, MD
The Beginning:

- Building templates into EMR
- Having a concussion encounter plan in EMR (most important step)
  - ACE (Acute Concussion Evaluation) forms
  - Concussion PE template
  - Assessment and Plan with patient instruction
  - CDC handout for patients
- Kick-off educational session
You definitely have a concussion. Protocol is no TV, phone, reading, music, exercise, light, or sound.

Well, I guess I'll just be...

 Alone with my thoughts.

Actually, you're trying to rest your brain, so thoughts and thinking of any kind are detrimental.

Well! I guess I'll just be...

 Alone.
Roadblocks:

- Lack of proper patient triaging
- Inconsistent use of ACE care plan
- Poor documentation of patient follow up
- Inadequate guidance on back to school transition
CAST QI

- Monthly webinars
- PDSA cycles
- Tools for providers, patient, and school
Patient Case

_PDSA cycles explained_
“John”

18 yo Male

Injured while wrestling via a direct hit to the nose

No evidence of skull fracture

No retrograde or anterograde amnesia

No LOC

No seizure

Hx of 4 prior concussions

Negative for prior h/a, developmental problems and psychiatric problems
Patient Case

11/12/18: Injury Date

Triaged using Concussion Screening

Patient brought in same day

PDSA CYCLE 1: Phone triage

CONCUSSION SCREENING

A. If a likely traumatic force to the body has occurred, ask the following two triage questions to determine if further evaluation of a suspected concussion is warranted.

1. Was there a blunt force to the head and/or did the head move back and forth with a lot of force (like whiplash)?
   - No — No Trigger
   - Yes — Next Question

2. Was there a change in mental status (e.g., confusion; dazed, disoriented, or poor memory for events around the injury) or a change in the level of consciousness (seemed out of it, not responding as you normally do)?
   - No — No Trigger
   - Yes

B. Assess for Red Flags for Neurological Deterioration to determine if patient should go immediately to the Emergency Department.

<table>
<thead>
<tr>
<th>RED FLAGS: Consider sending to the Emergency Department with sudden onset of any of the following (check all that apply).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headaches that worsen</td>
</tr>
<tr>
<td>Seizures</td>
</tr>
<tr>
<td>Neck pain</td>
</tr>
<tr>
<td>Significant irritability</td>
</tr>
</tbody>
</table>
Patient Case

11/12/18: Initial Visit

Answered “yes” to:
- Headache
- Visual problems
- “Tingling”

ACE Score = 3

F/u in 2 days

PDSA CYCLE 2: Using the ACE

PDSA CYCLE 3: Documenting follow up

PDSA CYCLE 4: Providing the CDC Handout
Patient Case

11/15/18: Follow up Visit

Answered “no” to all prompts

ACE Score = 0. Able to tolerate 30 mts of cognitive work without symptoms

Cleared for return to school using ACE Care Plan

PDSA CYCLE 5: ACE care

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**KEY POINTS**

- Students with symptoms and/or neuropsychological dysfunction after a concussion often need support to perform school-related activities. As symptoms decrease during recovery, these supports may be gradually removed.
- Inform the teacher(s), school nurse, school psychologist or counselor, and administrator(s) about your injury and symptoms.
- School personnel should be instructed to watch for:
  - increased problems paying attention or concentrating
  - longer time needed to complete tasks or assignments
  - increase in symptoms (e.g., headache, fatigue, etc.)
- **Increased problems remembering or learning new information**
- **Greater irritability, less tolerance for stressors**
- **Difficulty managing and completing complex assignments**

**Based on the above symptoms, the following supports are recommended:** (Check all that apply)

- No return to school at this time. Return when ____________________.
- Return to school with following supports. **Monitor above symptoms, as they may increase** with cognitive exertion (mental effort)
  - Shortened day. Recommend ___ hours per day until ____________________
  - Shortened classes (i.e., rest breaks during classes). Suggested class length: _____ minutes
  - Rest breaks during school day. ___ rest breaks/ day in quiet area. ___ AM ___ PM ___When symptoms worsen (“flash pass”). ___ min.
  - Allowances for extended time to complete coursework/assignments and tests
  - Reduced homework load. Max. length of nightly homework (including studying): _____ minutes. 20-30’ study, 10-15’ rest break.
  - Assign **essential** work only. Modify assignments when possible, such as odd/even numbered problems, requiring outline or bullet points instead of full written responses, allow oral responses to test questions, etc.
  - No / Modified classroom/ standardized testing - only if symptoms do not interfere and adequately prepared; allow breaks as needed.
  - Meet with academic coordinator to establish reasonable timeline for make-up learning/ work (only as symptoms permit).
  - Request meeting of School Management Team to discuss this plan and coordinate accommodations.

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**Children's National**

Future of Pediatrics 2019
<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Activity Level</th>
<th>Criteria to Move to Next Stage</th>
<th>Date Criteria Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No return, at home</td>
<td>Day 1 - Maintain low level cognitive and physical activity. No prolonged concentration. Cognitive Readiness Challenge: As symptoms improve, try reading or math challenge task for 10-30 minutes; assess for symptom increase.</td>
<td>To Move To Stage 1: (1) Student can sustain concentration for 30 minutes before significant symptom exacerbation, AND (2) Symptoms reduce or disappear with cognitive rest breaks* allowing return to activity.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Return to School, Partial Day (1-3 hours)</td>
<td>Attend 1-3 classes, intersperse rest breaks. No tests or homework. Minimal expectations for productivity.</td>
<td>To Move To Stage 2: Symptom status improving, tolerates 4-5 hours of activity-rest cycles; 2-3 cognitive rest breaks built into school day.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Full Day, Maximal Supports (required throughout day)</td>
<td>Attend most classes, with 2-3 rest breaks (20-30'), no tests. Minimal HW (≤ 60'). Minimal-moderate expectations for productivity.</td>
<td>To Move To Stage 3: Symptom number &amp; severity improving, needs 1-2 cognitive rest breaks built into school day.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Return to Full Day, Moderate Supports (provided in response to symptoms during day)</td>
<td>Attend all classes with 1-2 rest breaks (20-30'); begin quizzes. Moderate HW (60-90') Moderate expectations for productivity. Design schedule for make-up work.</td>
<td>To Move To Stage 4: Continued symptom improvement, needs no more than 1 cognitive rest break per day</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Return to Full Day, Minimal Supports (Monitor final recovery)</td>
<td>Attend all classes with 0-1 rest breaks (20-30'); begin modified tests (breaks, extra time). HW (90'+) Moderate-maximum expectations for productivity.</td>
<td>To Move To Stage 5: No active symptoms, no exertional effects across the full school day.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Full Return, No Supports Needed</td>
<td>Full class schedule, no rest breaks. Max. expectations for productivity. Begin to address make-up work.</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

*Cognitive rest break: a period during which the student refrains from academic or other cognitively demanding activities, including schoolwork, reading, TV/games, conversation. May involve a short nap or relaxation with eyes closed in a quiet setting.
### ACE Post-Concussion Gradual Return to School

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Activity Level</th>
<th>Criteria to Move to Next Stage</th>
</tr>
</thead>
</table>
| 0     | No return, at home                 | Day 1 - Maintain low level cognitive and physical activity. No prolonged concentration.  
Cognitive Readiness Challenge: As symptoms improve, try reading or math challenge task for 10-30 minutes; assess for symptom increase. | To Move To Stage 1:  
(1) Student can sustain concentration for 30 minutes before significant symptom exacerbation,  
AND  
(2) Symptoms reduce or disappear with cognitive rest breaks* allowing return to activity. |
| 1     | Return to School, Partial Day (1-3 hours) | Attend 1-3 classes, intersperse rest breaks.  
No tests or homework.  
Minimal expectations for productivity. | To Move To Stage 2:  
Symptom status improving, tolerates 4-5 hours of activity-rest cycles; 2-3 cognitive rest breaks built into school day. |
| 2     | Full Day, Maximal Supports (required throughout day) | Attend most classes, with 2-3 rest breaks (20-30’), no tests.  
Minimal HW (≤ 60’).  
Minimal-moderate expectations for productivity. | To Move To Stage 3:  
Symptom number & severity improving, needs 1-2 cognitive rest breaks built into school day. |
Patient Case

11/19/18: Post-return to school

Answered “yes” to:
- Dizziness
- Sensitivity to light
- Mental fogginess
- Drowsiness
- Slowed down

ACE Score = 5

No longer cleared for school. Due to inability to tolerate cognitive work

11/23/18: Follow up

Answered “yes” to:
- Dizziness
- Sensitivity to light
- Mental fogginess
- Drowsiness
- Slowed down

ACE Score = 5 (intensity less)

Tolerating 2 hrs of cognitive work. Cleared for return to school per Post-Concussion Return to School letter

12/6/18: Follow up

Answered “yes” to:
- Headaches
- Fatigue
- Mental fogginess
- Problems concentrating
- Slowed down
- Irritable
- More emotional
- Difficulty falling asleep

ACE Score = 8

Referred to Concussion Clinic due to lack of progression
Concussion Specialty Referral Guideline

Concussion/ Mild TBI

Primary Care Evaluation:
ACE, Post-Concussion Symptom Inventory (PCS1)

Management:
CDC Discharge Instructions, ACE Care Plan,
Return to School Letter

Criteria for Specialty Referral
- Complex injury (e.g., multiple blows within short period of time, injury with rotational/neck injury, high severity of signs and symptoms)
- Persistent overall symptoms (greater than 2 weeks) without improvement (<20% symptom improvement)
- No change in neurocognitive performance or functioning
- Presence of risk factors (e.g., medical/neurological, psychiatric, learning/attention disorders) contributing to prolonged recovery
- Persistent cognitive dysfunction or school problems
- Intensive school program recommendation
- Significant emotional factors possibly interfering with recovery
- History of multiple concussions: assess risk/vulnerability
- Confirm/clearance for return to risk activities

Refer to Specialty clinic
(e.g., SCORE clinic)
Reasons for failure

- Poor adherence to cognitive rest
  - Circumstances ie: crucial school year
  - Thanksgiving break so he did not get adequate sleep and there was too much of screen time and partying.
- Hx of 4 prior concussions
## CAP Data

**Patient Cases received for Head Injury from 5/1/18-5/1/19**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total number of Calls Received</strong></td>
<td>261</td>
</tr>
<tr>
<td><strong>Appointment Made</strong></td>
<td>178</td>
</tr>
<tr>
<td><strong>Appointments Not Made</strong></td>
<td>83</td>
</tr>
</tbody>
</table>

**Patients who called but not seen for an appt**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appt cx</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Homecare</strong></td>
<td>43</td>
</tr>
<tr>
<td><strong>Went to concussion clinic</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Went to ER</strong></td>
<td>38</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>83</td>
</tr>
</tbody>
</table>
## CAP Data

### Breakdown of 38 ER visits

<table>
<thead>
<tr>
<th>Types</th>
<th># sent to ER</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck pain</td>
<td>2</td>
<td>Appropriate</td>
</tr>
<tr>
<td>No appts/After Hours</td>
<td>10</td>
<td>Potentially avoidable - <em>Triage education</em></td>
</tr>
<tr>
<td>Parent decided</td>
<td>8</td>
<td>Potentially avoidable - <em>Parent education</em></td>
</tr>
<tr>
<td>Vision/Hearing/Headache</td>
<td>10</td>
<td>Avoidable</td>
</tr>
</tbody>
</table>
Future Goals

- Improving triage
- Adequate neuro exam
  - Provider training
- PT/OT referrals
  - List of providers for clinical use
- Conducting neuro/psych testing
- Keeping relevant with current research
  - Adopting changes
  - Participating in Cast 2
CAST 2.0

- We were very successful and we want to offer it to more people
- Collect other useful data
  - Baseline vs. ongoing ER/urgent care utilization
  - Pre/post time to school return
  - How often is guidance given during pre-sports physicals
  - Monitor changes in referral patterns at SCORE and Neurology clinics
- Discuss preseason/post-concussion neuropsychological testing
CAST 2.0

• Can we tweak the model?
  • Practice champion engages in training and then disseminates to the group
  • More regular feedback to practices on performance
  • Have someone dedicated to help practices incorporate elements into EMR
  • Work on incorporating more case based discussion
  • Live sessions to teach the exam – with posted video
  • Offer it to other providers (ED/urgent care clinics, School Nurses, Athletic trainers, Neurologists)

• Integrate CAST 2.0 with the Pediatric Health Network members