“The Ball’s in Your Court: Best Practices for the Concussion Conundrum and REAP”

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www.biaia.org
Concussion / mild TBI

- **What?**

- What do you want / need to know?
Concussion / mild TBI

PART 1

Where did this issue come from?
Incidence of brain injury in Military

• 15% - 23% of service members returning from OIF and OEF with disability from brain injury.
What has happened to make Brain Injury such a big deal?

**IN SPORTS**

- Increasing awareness and incidence
  - High profile athletes over the past 20 years
    - Steve Young, Troy Aikman, Brianna Scurry, Junior Seau
  - Bigger and faster kids = increased opportunities for injury.
- Retired players suing NFL
- Iowa’s youth sports and concussion law.
Proliferation of Sports Concussion Research, Legislation and Litigation

• In the early 2000’s there were a wave of studies that showed a correlation of concussive impact with disabling outcomes
Concussion / mild TBI

PART 2

Noggin Nuggets
2% Weight
20%

Energy
This is your brain
Brain Behavior Relationships

Frontal Lobe
- Initiation
- Problem solving
- Judgment
- Inhibition of behavior
- Planning/anticipation
- Self-monitoring
- Motor planning
- Personality/emotions
- Awareness of abilities/limitations
- Organization
- Attention/concentration
- Mental flexibility
- Speaking (expressive language)

Parietal Lobe
- Sense of touch
- Differentiation: size, shape, color
- Spatial perception
- Visual perception

Occipital Lobe
- Vision

Temporal Lobe
- Memory
- Hearing
- Understanding language (receptive language)
- Organization and sequencing

Cerebellum
- Balance
- Coordination
- Skilled motor activity

Brain Stem
- Breathing
- Heart rate
- Arousal/consciousness
- Sleep/wake functions
- Attention/concentration
how does this thing work?
Concussion / mild TBI

PART 3

Focal and Diffuse TBI
Coup- contracoup injury

- Localized damage at point of impact (coup) and second injury as brain bounces to opposite side (contracoup)
Closed Head Injury: Primary Injury

- Locations of contusions in 72 fatally injured TBI patients

Gurdjian et al. (1966)
**Brain Behavior Relationships**

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- Sense of touch
- Differentiation: size, shape, color
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**Occipital Lobe**
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**Cerebellum**
- Balance
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**Brain Stem**
- Breathing
- Heart rate
- Arousal/consciousness
- Sleep/wake functions
- Attention/concentration
Diffuse axonal injury

DAI is caused by sudden rotational movement of the brain in the skull, resulting in shearing of nerve fibers.
Concussion / mild TBI

PART 4
Impact and Recovery in Kids
A complex landscape

Preinjury Environment

Genotype

Trauma Exposure (combat intensity) and Extracranial Injury

Cognitive and Brain Reserve

Co-morbidities
- PTSD
- Mood Disorder

Post-injury Environment

Outcome
- Cognitive Function
- Emotional Function
- Neurological Function
- Functional Status

Injury
- Mechanism/Type
- Severity and # of Events

Vulnerability

Secondary Pathology
- Altered Connectivity
- White Matter Integrity
- Lesions
- Brain Function

Interventions

Post-injury Environment

Moderators

Trauma

Host Factors

Moderators

Post Injury

Pathology

Typical path of the five neuro-developmental stages between birth and 21+ years

Savage, 2003
Adolescent Cognition and Behavior

Driven by Rapid Development in Prefrontal Cortex

Executive Functions

Self-Control
Inhibition
Flexibility
Initiation

Planning
Organize
Reasoning
Judgment

Self-Monitor
Delay Gratification
Assess Consequences
Perspective-Taking
Frontal Lobe Injury

Command and Control Center
The frontal lobe is considered the emotional control center and the home of our personality.

It controls higher level thinking.

- Initiation
- Problem solving
- Judgment
- Inhibition of behavior
- Planning / anticipation
- Self-monitoring

- Personality / emotions
- Awareness of abilities and limitations
- Organization
- Attention / Concentration
- Mental Flexibility
- Expression
Executive Functions
Cortical Maturation

The shades of blue symbolize maturing brain functions.

Maturation culminates in the **prefrontal cortex**, the area just behind the brow. This is the seat of Executive Functions, the area that controls judgment and the weighing of risks and consequences.

Previously this area was thought to be mature by 16 but studies suggest this area is not fully developed until 25 or later.

“Kids Grow Into Their Brain Injuries”
Severity of Injury ≠ Severity of Outcome

Severity of injury does not presage outcome.

Persons who sustain a mild brain injury may have ongoing difficulties for years to come and persons with a severe brain injury may make marked improvements over time.

Every brain injury is unique.
Does the brain recover from injury?
What was

'Hell No'

Is now.....
OH
Hell
yeah!
Neuro-Plasticity

The brain is able to alter its structure and function in reaction to experience.
Mechanisms of plasticity

> altered synaptic activity

> synaptogenesis

> neurogenesis
Neurons that “fire together”, “wire together”!
Concussion / mild TBI

PART 5

Concussion in Iowa Incidence and Response
“The Silent Epidemic”

Percentage of Traumatic Brain Injury (TBI)–Related Deaths,* by Underlying Cause and Age Group — United States, 2013
Estimates for concussion in school age children range from 2% - 5%

Iowa Dept. of Education reports 520,701 public and private school students for 2016

Brain Injury Alliance
This translates into 10,000 – 26,000 youth concussions in Iowa each year.
47% of high school football players say they suffer a concussion each season.

37% of those reporting multiple concussions in a season.

85% of sports-related concussions go undiagnosed.

National Center for Injury Prevention, American College of Sports Medicine
# Not Just a Football Problem

<table>
<thead>
<tr>
<th>Sport</th>
<th>Injury Rate per 100,000 Player Games</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>47</td>
</tr>
<tr>
<td>Girls soccer</td>
<td>36</td>
</tr>
<tr>
<td>Boys soccer</td>
<td>22</td>
</tr>
<tr>
<td>Girls basketball</td>
<td>21</td>
</tr>
<tr>
<td>Wrestling</td>
<td>18</td>
</tr>
<tr>
<td>Boys basketball</td>
<td>07</td>
</tr>
<tr>
<td>Softball</td>
<td>07</td>
</tr>
</tbody>
</table>

*Jnl Ath. Training, 2007*
Problems for Athletes-
Post-Concussion symptoms

- Most (80-90%) concussed young athletes will recover within 1 to 4 weeks
- The remainder may have symptoms lasting from weeks to months interfering with school and daily life
- Deficits may persist a lifetime
Post-concussion “syndrome”
Risk factors for complicated recovery

- Re-injury before complete recovery
- Over-exertion early after injury
- Significant stress
  - Unable to participate in sports
  - Medical uncertainty
  - Academic difficulties
- Prior or comorbid condition
  - Migraine
  - Anxiety, MH diagnosis
  - ADHD, LD
Brain swells rapidly, and catastrophically, after a person suffers a second concussion before symptoms from an earlier one have subsided.

This second blow may occur minutes, days or weeks after an initial concussion, and even the mildest concussion can lead to SIS.

The condition is **RARE** yet often fatal, and almost everyone who is not killed is severely disabled.

The cause of SIS is still uncertain.

~ 2010 - Second Impact Syndrome incidents observed around the country

2017, US National Library of medicine
The response was challenging

It’s not a lack of information…

It’s a difficulty of implementation!
Phase I: and get a law passed
2011 - Iowa Senate File 367

- Requires the **distribution of guidelines and information** to coaches, students and parents/guardians about the risks, signs and symptoms of concussions/brain injuries.
- Also requires a student’s **immediate removal** from athletic participation upon exhibiting signs, symptoms or behaviors consistent with a concussion or brain injury.
- The student may not recommence participation until they have been **evaluated and cleared by a licensed health care provider**.
Iowa Code Section 280.13C
An Act concerning the protection of student athletes from concussions and other head injuries.

1. a. The Iowa high school athletic association and the Iowa girls high school athletic union shall work together to distribute the guidelines of the centers for disease control and prevention of the United States department of health and human services and other pertinent information to inform and educate coaches, students, and the parents and guardians of students of the risks, signs, symptoms, and behaviors consistent with a concussion or brain injury, including the danger of continuing to participate in extracurricular interscholastic activities after suffering a concussion or brain injury and their responsibility to report such signs, symptoms, and behaviors if they occur.

b. Annually, each school district and nonpublic school shall provide to the parent or guardian of each student a concussion and brain injury information sheet, as provided by the Iowa high school athletic association and the Iowa girls high school athletic union. The student and the student’s parent or guardian shall sign and return the concussion and brain injury information sheet to the student’s school prior to the student’s participation in any extracurricular interscholastic activity for grades seven through twelve.

2. If a student’s coach or contest official observes signs, symptoms, or behaviors consistent with a concussion or brain injury in an extracurricular interscholastic activity, the student shall be immediately removed from participation.

3. A student who has been removed from participation shall not recommence such participation until the student has been evaluated by a licensed healthcare provider trained in the evaluation and management of concussions and other brain injuries and the student has received written clearance to return to participation from the healthcare provider.

4. For the purposes of this section:
   a. “Extracurricular interscholastic activity” means any extracurricular interscholastic activity, contest, or practice, including sports, dance, or cheerleading.
   b. “Licensed healthcare provider” means a physician, physician assistant, chiropractor, advanced registered nurse practitioner, nurse, physical therapist, or athletic trainer licensed by a board designated under 147.13.
Most concussion in sports laws include three action steps:

1. **Educate Coaches, Parents, and Athletes:** Inform and educate coaches, athletes, and their parents and guardians about concussion through training and/or a concussion information sheet.

2. **Remove Athlete from Play:** An athlete who is believed to have a concussion is to be removed from play right away.

3. **Obtain Permission to Return to Play:** An athlete can only return to play or practice after at least 24 hours and with permission from a health care professional.

Phase II: lay in waiting then pounce
Football head injury case: Iowa player gets nearly $1 million

$1 million verdict offers teachable moment for youth sports

IOWA SCHOOLS BRACE FOR IMPACT OF CONCUSSION LAWSUITS

Bedford, IA
Litigation - May, 2015

- Bedford, Iowa
- Violation of Iowa’s Youth Sports and Concussion law
- ~$1 million judgment
Partners of the Iowa Concussion Consortium

Iowa Department of Education
Iowa Department of Public Health
Iowa Association of School Boards
Iowa Athletic Trainers’ Association
Iowa Girls High School Athletic Union
Iowa High School Athletic Association
Blank Children’s Hospital / Unity Point
Brain Injury Alliance of Iowa
Centers for Disabilities and Development - University of Iowa Children’s Hospital
ChildServe
Epilepsy Foundation of Iowa
Iowa Advisory Council on Brain Injuries

On With Life, Inc.
Opportunities Unlimited
REM Iowa
Rocky Mountain Hospital for Children
Safe Kids Iowa
School Administrators of Iowa
St. Luke’s Hospital / Unity Point
University of Iowa—Iowa Injury Prevention Research Center
University of Iowa Hospitals and Clinics—Concussion Clinic
Veteran’s Administration Medical Center of Iowa City
Iowa Concussion Consortium Goals:

• To **reduce the occurrence** of sports related concussions through increased public and professional awareness, training, safety practices, and policies.

• To **reduce the potential adverse impact** of concussions through improved recognition, assessment and management of concussion.
A collaborative approach shows clinically and statistically significant improvements in post-concussive symptoms at 6 months compared with controls.

- 42% - of adolescents studied with no collaborative care (controls) had levels of enduring symptoms at 6 months post concussion
- Only 13% had levels of enduring symptoms with collaborative care at 6 months post concussion

McCarty et al., Pediatrics, 2016
Concussion / mild TBI

PART 6

Getting the message
# Education

## Table 2  Concussion Education Programs for Pediatric Stakeholders

<table>
<thead>
<tr>
<th>Education Program</th>
<th>Targeted Stakeholders</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDC Heads Up</td>
<td>Youth sport coaches, high school coaches, parents, youth and high school athletes, health care providers, school personnel</td>
<td><a href="http://www.cdc.gov/headsup/">www.cdc.gov/headsup/</a></td>
</tr>
<tr>
<td>Barrow BrainBook</td>
<td>High school athletes</td>
<td><a href="http://www.craniumcommons.com/bb/">www.craniumcommons.com/bb/</a></td>
</tr>
<tr>
<td></td>
<td>Parents</td>
<td><a href="http://brain101.orcasinc.com/3000/">http://brain101.orcasinc.com/3000/</a></td>
</tr>
<tr>
<td></td>
<td>Teen athletes</td>
<td><a href="http://brain101.orcasinc.com/5000/">http://brain101.orcasinc.com/5000/</a></td>
</tr>
<tr>
<td>National Federation of State High School Associations</td>
<td>High school coaches, parents, high school athletes, officials, administrators</td>
<td><a href="https://nfhslearn.com/courses/38000">https://nfhslearn.com/courses/38000</a></td>
</tr>
<tr>
<td>Sports Legacy Institute Community Educators (SLICE)</td>
<td>Student-athletes (grades 4–12)</td>
<td><a href="http://www.sportslegacy.org/education/slice/">www.sportslegacy.org/education/slice/</a></td>
</tr>
<tr>
<td>ThinkFirst</td>
<td>Schools, community groups</td>
<td><a href="http://www.thinkfirst.org/concussion">www.thinkfirst.org/concussion</a></td>
</tr>
</tbody>
</table>
Effect of Educational Intervention

• Improved immediate knowledge
  – Cook, 2003
  – Goodman, 2006
  – Glang, 2010
  – Koh, 2011
  – Bagley, 2012
  – Miyashita, 2013
  – Manasse-Cohick, 2014
  – Cusimano, 2014
  – Hunt, 2015

• No effect on knowledge
  – Echlin, 2010
  – Kroshus, 2013
  – Cusimano, 2014
  – Manasse-Cohick, 2014
  – Register-Mihalik, 2015
  – Register-Mihalik, 2015

Increase in immediate knowledge in some studies but the long-term effects of interventions on retention and reporting behaviors are unclear (Caron, 2015)
Concussion Reporting Barriers

- Athletes know concussions are dangerous
- Most would still play with symptoms
- Athletes want to keep playing
- It’s hard to tell if you are injured
- You’re supposed to play injured
- Don’t want to let team down
- Hesitant to report to coach

Chrisman, 2012
Culture change

Young Athletes May Feel Pressure to Hide Their Concussion Symptoms

Report Concussion Symptoms

Young Athletes Are More Likely to Play With a Concussion During a Big Game

Culture Around Concussion
Developing Effective Education: What Do Athletes Want?

- **Content**
  - Symptoms
  - Proper management
  - Long-term issues
  - Impact on athletic performance
  - Impact on academics
  - Importance of self-reporting

- **Mode of Delivery**
  - Lecture (57%)
  - Video (54%)
  - Handout (28%)

- 40% want education provided by **coach**
Rule Changes

- Kickoff to 35 yd line
- Banning wedge kickoff
- Helmet to helmet hits
- Targeting fouls
- Helmet dislodgement
- Contact restriction
- Fair play rules
Rule Changes

- Hockey Education Program resulted in a 30% reduction in dangerous infractions and hits to the head (Smith, 2009)
- Fair play rules resulted in fewer concussions, facial lacerations, and time loss injuries (Roberts, 1996)
- Body checking related to higher rates of concussion (Macpherson, 2006; Emery, 2010)
- Limited interchange rule in rugby lowered concussion rates by 30% (Gabbett, 2007)
Protective Gear

**Helmets**
- Protect against head and facial injury in high velocity sports
- Do not reduce the risk of concussions
- Can reduce the rate of superficial head injury

**Helmet Covers**
- No protective benefit
- Concerns with adding weight to helmet (c-spine risk)

**Headbands**
- Limited research, not encouraged or discouraged

**Mouthguards**
- Reduces dental and orofacial injuries
- No evidence to support reduction in concussion risk

**Face Shields**
- Full face shields decrease lacerations and dental, facial and eye injuries
- No change in concussion risk

Schneider, 2016; Broglio, 2014; Benson, 2009; Halstead, 2001; ACSM, 2011; Hagel, 2005; Mueller, 2008; Sulheim, 2006
# Concussion Rates per 10,000 AEs

<table>
<thead>
<tr>
<th>Sport</th>
<th>Overall</th>
<th>Rank</th>
<th>Practice</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>7.44</td>
<td>1</td>
<td>3.54</td>
<td>1</td>
</tr>
<tr>
<td>Boys’ Ice Hockey</td>
<td>6.57</td>
<td>2</td>
<td>1.48</td>
<td>5</td>
</tr>
<tr>
<td>Boys’ Lacrosse</td>
<td>4.97</td>
<td>3</td>
<td>1.64</td>
<td>4</td>
</tr>
<tr>
<td>Girls’ Soccer</td>
<td>4.63</td>
<td>4</td>
<td>0.96</td>
<td>10</td>
</tr>
<tr>
<td>Girls’ Lacrosse</td>
<td>3.82</td>
<td>5</td>
<td>1.41</td>
<td>6</td>
</tr>
<tr>
<td>Girls’ Basketball</td>
<td>3.12</td>
<td>6</td>
<td>1.08</td>
<td>9</td>
</tr>
<tr>
<td>Boys’ Wrestling</td>
<td>3.08</td>
<td>7</td>
<td>2.08</td>
<td>3</td>
</tr>
<tr>
<td>Boys’ Soccer</td>
<td>2.68</td>
<td>8</td>
<td>0.65</td>
<td>13</td>
</tr>
<tr>
<td>Girls’ Field Hockey</td>
<td>2.63</td>
<td>9</td>
<td>1.19</td>
<td>7</td>
</tr>
<tr>
<td>Cheerleading</td>
<td>2.02</td>
<td>10</td>
<td>2.16</td>
<td>2</td>
</tr>
<tr>
<td>Boys’ Basketball</td>
<td>1.68</td>
<td>11</td>
<td>0.82</td>
<td>11</td>
</tr>
<tr>
<td>Girls’ Softball</td>
<td>1.66</td>
<td>12</td>
<td>1.11</td>
<td>8</td>
</tr>
</tbody>
</table>

Cheerleaders don’t always have a safe practice space. Cheerleading practice concussions occur on tile, asphalt, and concrete.

Courtesy of R. Dawn Comstock, PhD; National High School Sports-Related Injury Surveillance System (High School RIO)
Concussion Rates per 10,000 AE Over Time:
High School RIO Data

Concussion crisis?
No!

Courtesy of R. Dawn Comstock, PhD;
National High School Sports-Related Injury Surveillance System (High School RIO)
Concussion / mild TBI

PART 7

REAP

• Remove/Reduce
• Educate
• Adjust/Accommodate
• Pace
REAP

- A best practice model
- 10 states and counting
- REAP is the current Iowa protocol
- IDPH, DoE, BIAIA endorsed
- A collaborative model
Iowa School District Enrollment Change 2001-02 to 2015-16

*Based on combined certified enrollment from districts before reorganization; 2001 number may have supplementary weighing from state incentives.
**Substantial change to boundaries through neighboring district dissolution; 2001 number based on different geographical area.

Graphic by Jeff Morrison using basemap from Iowa Department of Education
IOWA CONCUSSION CONSORTIUM
Brain Injury Alliance
IOWA

How every family, school and medical professional can create a Community-Based Concussion Management Program

REAP™ The Benefits of Good Concussion Management

Center for Concussion
REAP™
Remove/Reduce
Educate
Adjust/Accommodate
Pace

Authored by Karen McAvoy, PsyD
80 to 90% odds

- 40% of concussions are resolved in 1 week
- 70% of concussions are resolved in 2 weeks
- 80% of concussions are resolved in 3 weeks
- 95% of concussions are resolved in 5 weeks

80 to 90% odds!

Cha-ching

Collins et al, 2006 Neurosurgery
Let REAP be your roadmap

Family

Medical

Common Language

School Team/Academic

School Team/Physical
"Concussion"

1. 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:

2. 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**.
The 5th International Consensus Statement

3. 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.

4. 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.
The 5th International Consensus Statement

5. 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.

6. 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).
### Signs of concussion

<table>
<thead>
<tr>
<th>Signs Observed by Coaching Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appears dazed or stunned</td>
</tr>
<tr>
<td>Is confused about assignment or position</td>
</tr>
<tr>
<td>Forgets sports plays</td>
</tr>
<tr>
<td>Is unsure of game, score, or opponent</td>
</tr>
<tr>
<td>Moves clumsily</td>
</tr>
<tr>
<td>Answers questions slowly</td>
</tr>
<tr>
<td>Loses consciousness (even briefly)</td>
</tr>
<tr>
<td>Shows behavior or personality changes</td>
</tr>
<tr>
<td>Can’t recall events prior to hit or fall</td>
</tr>
<tr>
<td>Can’t recall events after hit or fall</td>
</tr>
</tbody>
</table>
### Symptoms of concussion

<table>
<thead>
<tr>
<th>SYMPTOMS REPORTED BY ATHLETE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache or “pressure” in head</td>
</tr>
<tr>
<td>Nausea or vomiting</td>
</tr>
<tr>
<td>Balance problems or dizziness</td>
</tr>
<tr>
<td>Double or blurry vision</td>
</tr>
<tr>
<td>Sensitivity to light</td>
</tr>
<tr>
<td>Sensitivity to noise</td>
</tr>
<tr>
<td>Feeling sluggish, hazy, foggy, or groggy</td>
</tr>
<tr>
<td>Concentration or memory problems</td>
</tr>
<tr>
<td>Confusion</td>
</tr>
<tr>
<td>Does not “feel right”</td>
</tr>
</tbody>
</table>
Pathophysiology

Impulsive forces transmitted to brain (directly or indirectly)

Results in a Complex Metabolic Cascade
Complex process resulting in glucose supply / demand mismatch

Theory
Brain is very prone to worsen injury if hit again while the metabolism is healing
May also be microstructural injury to the brain
Due to the inefficiency of the cells, the brain “runs on empty” and flares symptoms – like a car with a very small gas tank. The small-tanked car can leave the garage, it just has to drive a little, fill up, drive a little, fill up.

A student with a concussion, CAN get out of the garage (go to school) and do many things (academically), they just can’t go as fast and cover as much territory.

They have to learn a little, rest a little, read a little, rest a little, work on the computer a little, rest a little.
Risk Factors for more complicated recovery

- Gender
- Past concussions
- History of headaches/migraines or family history
- Learning, attentional, neurological, emotional, vision issues at baseline
REAP

“Remove/Reduce”
REMOVE/REDUCE

REMOVE from all physical activities!
  • No organized sports
  • No recreational play
  • No PE, dance class
  • No physical play at recess

REDUCE home stimulation!
  • Limit texting
  • Limit TV
  • Limit computer screens
  • Limit video games

REDUCE school demands!
  • Mental Fatigue
  • Slowed Processing Speed
  • Difficulty converting memory into New Learning
Once a concussion has been diagnosed:

**STEP ONE: REMOVE** student/athlete from all physical activities. **REDUCE** school demands and home/social stimulation.

**The biggest concern with concussions** in children/teens is the risk of injuring the brain again before recovery. The concussed brain is in a vulnerable state and even a minor impact can result in a much more severe injury with risk of permanent brain damage or rarely, even death. “Second Impact Syndrome” or “SIS” is thought to occur when an already injured brain takes another hit resulting in possible massive swelling, brain damage and/or death. Therefore, once a concussion has been identified, it is critical to **REMOVE** a student/athlete from ALL physical activity including PE classes, dance, active recess, recreational and club sports until medically cleared.

Secondly, **while the brain is still recovering**, all school demands and home/social stimulation should be **REDUCED**. Reducing demands on the brain will promote **REST** and will help recovery.

<table>
<thead>
<tr>
<th>Family Team</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REMOVE</strong> student/athlete from all physical activity immediately including play at home (ie. playground, bikes, skateboards), recreational, and/or club sports.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>REDUCE</strong> home/social stimulation including texting, social media, video games, TV, driving and going to loud places (the mall, dances, games).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage <strong>REST</strong>.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School Team/Physical</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REMOVE</strong> student/athlete from all physical activity immediately.</td>
<td></td>
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</tr>
<tr>
<td>Support <strong>REDUCTION</strong> of school demands and home/social stimulation.</td>
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</tr>
<tr>
<td>Provide encouragement to <strong>REST</strong> and take the needed time to heal.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>School Team/Academic</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>REMOVE</strong> student/athlete from all physical activity at school including PE, recess, dance class.</td>
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<tr>
<td><strong>REDUCE</strong> school demands (see <strong>ADJUST/ACCOMMODATE</strong> for Educators on pages 9-10).</td>
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<tr>
<td>Encourage “brain <strong>REST”</strong> breaks at school.</td>
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<thead>
<tr>
<th>Medical Team</th>
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<tbody>
<tr>
<td><strong>REMOVE</strong> student/athlete from all physical activity immediately.</td>
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<tr>
<td><strong>RULE-OUT</strong> more serious medical issues including severe traumatic brain injury. Consider risk factors – evaluate for concussion complications.</td>
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<tr>
<td>Support <strong>REDUCTION</strong> of school demands and home/social stimulation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encourage <strong>REST</strong>.</td>
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</tbody>
</table>

Soccer had been Kathy’s love since age 12. By the time she reached high school, she had sustained several concussions on the field. The first game of her Junior year of high school, she went up for a header in the air at the same moment as a teammate, and their heads smacked together. They both went down. Her friend was able to get back up without difficulty, but Kathy lingered on the ground sick to her stomach and with fuzzy vision.

She sat out the rest of that game plus the next three games and ended up with referrals to multiple medical specialists. She had frequent and severe headaches requiring her to lie down in a dark room, a decline in memory and attention and an increase in frustration. She also had had a marked decline in academic performance in areas that she had previously excelled. Her family and teachers were unsure how to help.

Over the next three months, Kathy gave her brain time to rest and worked with her school to get accommodations in the classroom. Eventually, her symptoms resolved and her academic performance returned to near pre-injury levels.
Response / Treatment / Management

- REMOVE
- REDUCE
- REST
- REST
- REST
- REST
- PHYSICAL AND MENTAL REST AND TIME

“Yo, Dewey! Got another one over here when you’re done.”
How to increase physical activity without increasing injury risks?

Management of injury risk is key to successfully promoting physical activity.
Too little rest: = prolonged recovery

Too much rest: = prolonged recovery

Adapted from GetSchooledOnConcussions.com
ACTIVE KIDS DO BETTER IN LIFE
WHAT THE RESEARCH SHOWS ON THE COMPOUNDBENEFITS

ACTIVE PARENTS ASSOCIATED WITH ACTIVE KIDS

KIDS OF ACTIVE MOMS ARE 2X MORE LIKELY TO BE ACTIVE

INTERGENERATIONAL CYCLE
COMPRESSION OF MORBIDITY 1/5 THE RATE OF DISABILITY

- Reduced risk of heart disease, stroke, cancer, diabetes
- More productive at work
- Lower health costs
- 7-8% higher annual earnings
- 15% more likely to go to college
- 1/10 as likely to be obese
- Up to 40% higher test scores
- Less smoking, drug use, pregnancy, and risky sex

PHYSICALLY ACTIVE CHILDREN

EARLY CHILDHOOD ADOLESCENCE ADULTHOOD
A Multi-Disciplinary Team is essential

*Shared responsibility* of the management of the concussion is essential. Multiple perspectives and multiple sources of data.

REAP is a Community-Based Concussion Management Protocol:

- Family
- School Physical
- School Academic
- Medical
Legislation

CONCUSSION

Fam/Stud.

Coach ATC Nurse

Medical

Who/When

FAMILY TEAM

REDUCE

Limit texting.

Limit TV, video games, computer time.

Limit homework.

Limit driving.

Keep home from dances, games, the mall. Decrease stimulation.

REST!

SCHOOL ACADEMIC TEAM

Keep home if severely symptomatic.

Return to school when symptoms are still present but tolerable.

Eliminate work,

REDUCE work, adjust work.

PACE MENTAL DEMANDS

T I M E (usually between 7 to 21 days)
Fastest Road to Recovery

◆ Physical Rest:
  ◆ **REMOVE** all physical activity – no club sports, no recreational sports, no PE, no physical play.
  ◆ Home Rest:
  ◆ **REDUCE** texting, computer time, video games, TV and stimulation (limit extracurricular activities)
  ◆ Cognitive Rest:
  ◆ **REDUCE** schoolwork, reading, tests
Goldilock Model

Too Little
Physical and Cognitive

Physical Therapy may direct some safe cardio.
May be back at school with a reasonable, adjusted level of school work.
May be involved at home with a small, reasonable amount of electronics, socializing, etc.

Guidelines for management have to be REASONABLE and REALISTIC or they cannot (will not) be followed!

Just Right!

Too Much
Physical and Cognitive

Do a little, rest a little!

Rehab model!
Return to Work (School)

- Return to work when:
  - Symptoms are tolerable, short-lived and amenable to rest or intervention
  - Take frequent rest breaks
  - Dial down the amount of work and pace of work
  - Don’t take on new projects; “subsist”
  - Understanding boss, helpful co-workers
REAP

“Educate”
STEP 2: Educate: Symptoms tell the story of recovery

After a concussion, the brain cells are not working well. The good news is that with most concussions, the brain cells will recover in 1 to 3 weeks. When you push the brain cells to do more than they can tolerate (before they are healed) symptoms will get worse. When symptoms get worse, the brain cells are telling you that you’ve done too much. As you recover, you will be able to do more each day with fewer symptoms. If trying to read an algebra book or going to the mall flares a symptom initially, the brain is simply telling you that you have pushed too hard today and you need to back it down... try again in a few days. Thankfully, recovery from a concussion is quite predictable... most symptoms will decrease over 1 to 3 weeks and the ability to add back in home/social and school activities will increase over 1 to 3 weeks. Therefore, learn to “read” the symptoms. They are actually telling you the rate of recovery from the concussion.

NOTE: Home/social stimulation and school tasks can be added back in by the parent/teacher as tolerated. Physical activities, however, cannot be added back in without medical approval (see PACE).

<table>
<thead>
<tr>
<th>PHYSICAL</th>
<th>COGNITIVE</th>
<th>EMOTIONAL</th>
<th>SLEEP/ENERGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>How a Person Feels Physically</td>
<td>How a Person Thinks</td>
<td>How a Person Feels Emotionally</td>
<td>How a Person Experiences Their Energy Level and/or Sleep Patterns</td>
</tr>
<tr>
<td>Headache/Pressure</td>
<td>Nausea</td>
<td>Inappropriate emotions</td>
<td>Fatigue</td>
</tr>
<tr>
<td>Blurred vision</td>
<td>Vomiting</td>
<td>Personality change</td>
<td>Excess sleep</td>
</tr>
<tr>
<td>Dizziness</td>
<td>Numbness/Tingling</td>
<td>Nervousness/Anxiety</td>
<td>Drowsiness</td>
</tr>
<tr>
<td>Poor balance</td>
<td>Sensitivity to light</td>
<td>Feeling more “emotional”</td>
<td>Sleeping less than usual</td>
</tr>
<tr>
<td>Ringing in ears</td>
<td>Sensitivity to noise</td>
<td></td>
<td>Trouble falling asleep</td>
</tr>
<tr>
<td>Seeing “stars”</td>
<td>Disorientation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacant stare/Glasy eyed</td>
<td>Neck pain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Medical Box

"It is not appropriate for a child or adolescent athlete with concussion to Return-to-Play (RTP) on the same day as the injury, regardless of the athletic performance."


IMPORTANT!

All symptoms of concussion are important; however, monitoring of physical symptoms, within the first 48 to 72 hours, is critical! If physical symptoms worsen, especially headache, confusion, disorientation, vomiting, difficulty awakening, it may be a sign that a more serious medical condition is developing in the brain.

SEEK IMMEDIATE MEDICAL ATTENTION!
Early Symptoms

<table>
<thead>
<tr>
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<td>Disorientation</td>
</tr>
<tr>
<td>Vacant stare/Glassy eyed</td>
<td>Neck Pain</td>
</tr>
<tr>
<td>Feel in a “fog”</td>
<td>Difficulty remembering</td>
</tr>
<tr>
<td>Feel “slowed down”</td>
<td>Difficulty concentrating/easily distracted</td>
</tr>
<tr>
<td>Sensitivity to light</td>
<td>Slowed speech</td>
</tr>
<tr>
<td>Sensitivity to noise</td>
<td>Easily confused</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EMOTIONAL</th>
<th>SLEEP/ENERGY</th>
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<tr>
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<td>Personality change</td>
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<tr>
<td>Nervousness/Anxiety</td>
<td>Excess sleep</td>
</tr>
<tr>
<td>Feeling more “emotional”</td>
<td>Sleeping less than usual</td>
</tr>
<tr>
<td>Irritability</td>
<td>Trouble falling asleep</td>
</tr>
<tr>
<td>Sadness</td>
<td>Lack of motivation</td>
</tr>
</tbody>
</table>

EDUCATE – Let the symptoms tell us about the rate of recovery

---


**IMPORTANT!**

All symptoms of concussion are important; however, monitoring of physical symptoms, within the first 48 to 72 hours, is critical! If physical symptoms worsen, especially headache, confusion, disorientation, vomiting, difficulty awakening, it may be a sign that a more serious medical condition is developing in the brain.

SEEK IMMEDIATE MEDICAL ATTENTION!

---

**EDUCATE**

Let the symptoms tell us about the rate of recovery

**STEP TWO: EDUCATE** all teams on the story the symptoms are telling.

It might be two steps forward...one step back.

After a concussion, the brain cells are not working well. The good news is that with most concussions, the brain cells will recover in 1 to 3 weeks. When you push the brain cells to do more than they can tolerate (before they are healed) symptoms will get worse. When symptoms get worse, the brain cells are telling you that you've done too much. As you recover, you will be able to do more each day with fewer symptoms. If trying to read an algebra book or going to the mall flares a symptom initially, the brain is simply telling you that you have pushed too hard today and you need to back it down… try again in a few days. Thankfully, recovery from a concussion is quite predictable… most symptoms will decrease over 1 to 3 weeks and the ability to add back in home/social and school activities will increase over 1 to 3 weeks. Therefore, learn to “read” the symptoms. They are actually telling you the rate of recovery from the concussion.

NOTE: Home/social stimulation and school tasks can be added back in by the parent/teacher as tolerated. Physical activities, however, cannot be added back in without medical approval (see PACE).
“Adjust / Accommodate (communicate)”
Step 3: Adjust/Accommodate Accordingly

- Family Team: Cut back on electronics/stimulation at home… begin to add back in …

- School Academic Team: Cut back on cognitive demands at school… begin to add back in …

- Test out recovery in these 2 safe ways first before testing it out physically

- … Emerging data on promising “rehab” model
After your child has received the diagnosis of concussion by a healthcare professional, their symptoms will determine when they should return to school. As the parent, you will likely be the one to decide when your child goes back to school because you are the one who sees your child every morning before school. Use the chart below to help decide when it is right to send your child back to school:

**Stay Home – Bed Rest**
If your child’s symptoms are so severe that he/she cannot concentrate for even 10 minutes, he/she should be kept home on total bed rest - no texting, no driving, no reading, no video games, no homework, limited TV. It is unusual for this state to last beyond a few days. Consult a physician if this state lasts more than 2 days.

**Maximum Rest = Maximum Recovery**

**Stay Home – Light Activity**
If your child’s symptoms are improving but he/she can still only concentrate for up to 20 minutes, he/she should be kept home — but may not need total bed rest. Your child can start light mental activity (e.g. sitting up, watching TV, light reading), as long as symptoms do not worsen. If they do, cut back the activity and build in more REST.

**No physical activity allowed!**

**Transition Back to School**
When your child is beginning to tolerate 30 to 45 minutes of light mental activity, you can consider returning them to school. As they return to school:

- Parents should communicate with the school (school nurse, teacher, school mental health and/or counselor) when bringing the student into school for the first time after the concussion.

- Parents and the school should decide together the level of academic adjustment needed at school depending upon:

  - The severity of symptoms present
  - The type of symptoms present
  - The times of day when the student feels better or worse

- When returning to school, the child MUST sit out of physical activity – gym/PE classes, highly physically active classes (dance, weight training, athletic training) and physically active recess until medically cleared.

- Consider removing child from band or music if symptoms are provoked by sound.

---

Ciera was 15 years old when she suffered a concussion while playing basketball. Her symptoms of passing out, constant headaches and fatigue plagued her for the remainder of her freshman year. A few accommodations helped Ciera successfully complete the school year.

“It really helped me when my teachers had class notes already printed out. That way I could just highlight what the teacher was emphasizing and focus on the concept rather than trying to take notes. Since having a brain injury, I don't really see words on the board, I just see letters. Therefore, having the notes beforehand takes some of the frustration off of me and I am able to concentrate and retain what is being taught in class. Being able to rest in the middle of the day is also very important for me. I become very fatigued after a morning of my rigorous classes, so my counselors have helped me adjust my schedule which allows me some down time so I can keep going through my day. Lastly, taking tests in a different place such as the conference room or teacher's office has helped a great deal.”

**Ciera Lund**
How do I get back to my sport?
A.K.A. How do I get “cleared” from this concussion

While 80 to 90% of concussions will be resolved in 3 to 4 weeks, a healthcare professional, whether in the Emergency Department or in a clinic, cannot predict the length or the course of recovery from a concussion. In fact, a healthcare professional should never tell a family that a concussion will resolve in X number of days because every concussion is different and each recovery time period is unique. The best way to assess when a student/athlete is ready to start the step-wise process of “Returning-to-Play” is to ask these questions:

<table>
<thead>
<tr>
<th>Question</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the student/athlete 100% symptom-free at home?</td>
<td>Use the Symptom Checklist every few days. All symptoms should be at “0” on the checklist or at least back to the perceived “baseline” symptom level.</td>
</tr>
<tr>
<td></td>
<td>Look at what the student/athlete is doing. At home they should be acting the way they did before the concussion, doing chores, interacting normally with friends and family.</td>
</tr>
<tr>
<td></td>
<td>Symptoms should not return when they are exposed to the loud, busy environment of home/social, mall or restaurants.</td>
</tr>
<tr>
<td>Is the student 100% symptom-free at school?</td>
<td>Your student/athlete should be handling school work to the level they did before the concussion.</td>
</tr>
<tr>
<td></td>
<td>Use the Teacher Feedback Form (APPENDIX) to see what teachers are noticing.</td>
</tr>
<tr>
<td></td>
<td>Watch your child/teen doing homework; they should be able to complete homework as efficiently as before the concussion.</td>
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<tr>
<td></td>
<td>In-school test scores should be back to where they were pre-concussion.</td>
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<tr>
<td></td>
<td>School workload should be back to where it was pre-concussion.</td>
</tr>
<tr>
<td></td>
<td>Symptoms should not return when they are exposed to the loud, busy environment of school.</td>
</tr>
<tr>
<td>If the school or healthcare professional has used neurocognitive testing, are scores back to baseline or at least reflect normative average and/or baseline functioning?</td>
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</tr>
<tr>
<td>If a Certified Athletic Trainer is involved with the concussion, does the ATC feel that the student/athlete is 100% symptom-free?</td>
<td>Ask ATC for feedback and/or serial administrations of the Symptom Checklist.</td>
</tr>
<tr>
<td>Is your child off all medications used to treat the concussion?</td>
<td>This includes over the counter medications such as ibuprofen, naproxen and acetaminophen which may have been used to treat headache or pain.</td>
</tr>
</tbody>
</table>
Teacher Feedback Form

Student: you have been diagnosed with a concussion. It is your responsibility to gather data from your teachers before you return to the doctor for a follow-up visit. A day or two before your next appointment, go around to all of your teachers (especially the CORE classes) and ask them to fill in the boxes below based upon how you are currently functioning in their class(es).

<table>
<thead>
<tr>
<th>1. Your name</th>
<th>Is the student still receiving any academic adjustments in your class? If so, what?</th>
<th>Have you noticed, or has the student reported, any concussion symptoms lately? (e.g. complaints of headaches, dizziness, difficulty concentrating, remembering; more irritable, fatigued than usual etc.)? If yes, please explain.</th>
<th>Do you believe this student is performing at their pre-concussion learning level?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>□ Yes  □ No</td>
<td>□ Yes  □ No</td>
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<td>□ Yes  □ No</td>
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<td>Signature:</td>
<td>Signature:</td>
</tr>
</tbody>
</table>

Teachers: Thank you for your help with this student. Your feedback is very valuable. We do not want to release this student back to physical activity if you are still seeing physical, cognitive, and emotional or sleep/energy symptoms in your classroom(s). If you have any concerns, please state them below.
Take Home Points to Teachers

- You are the master of your domain
- There is NO medical clearance for Return to School/Learn (YET!); There is only medical clearance for Return to Play
- There is NO medical clearance for academic adjustments being placed or removed… Apply FREELY! GENEROUSLY! Maximize the Window of Opportunity!
- Don’t need a 504 plan or IEP (yet)

What interventions you apply are based upon:

- What you teach
- How you teach
- When you teach
- How symptomatic
- Where you are in the course of recovery
- Where you are in the course of the semester
- “Money in the bank”
- Strength of your relationship with the student
**PHYSICAL:**
- "Strategic Rest" scheduled 15 to 20 minute breaks in clinic/quiet space (mid-morning; mid-afternoon and/or as needed)
- Sunglasses (inside and outside)
- Quiet room/environment, quiet lunch, quiet recess
- More frequent breaks in classroom and/or in clinic
- Allow quiet passing in halls
- REMOVE from PE, physical recess, & dance classes without penalty
- Sit out of music, orchestra and computer classes if symptoms are provoked

**COGNITIVE:**
- REDUCE workload in the classroom/homework
- REMOVE non-essential work
- REDUCE repetition of work (i.e. only do even problems, go for quality not quantity)
- Adjust "due" dates; allow for extra time
- Allow student to "audit" classwork
- Exempt/postpone large test/projects; alternative testing (quiet testing, one-on-one testing, oral testing)
- Allow demonstration of learning in alternative fashion
- Provide written instructions
- Allow for "buddy notes" or teacher notes, study guides, word banks
- Allow for technology (tape recorder, smart pen) if tolerated

**EMOTIONAL:**
- Allow student to have "signal" to leave room
- Help staff understand that mental fatigue can manifest in "emotional meltdowns"
- Allow student to remove him/herself to de-escalate
- Allow student to visit with supportive adult (counselor, nurse, advisor)
- Watch for secondary symptoms of depression and anxiety usually due to social isolation and concern over "make-up work" and slipping grades. These extra emotional factors can delay recovery

**SLEEP/ENERGY:**
- Allow for rest breaks—in classroom or clinic (i.e. "brain rest breaks = head on desk; eyes closed for 5 to 10 minutes")
- Allow student to start school later in the day
- Allow student to leave school early
- Alternate "mental challenge" with "mental rest"

Read “Return to Learning: Going Back to School Following a Concussion” at nasponline.org/publications/cc/40/6/return-to-learning.aspx
Legislation

Coach ATC

Health Care Provider

CONCUSSION

OK at home now!

OK at school now!

T I M E (usually between 7 to 21 days)
Communication and Collaboration
Community-responsibility
REAP

“Pace”
REAP suggests the following timeframe:

<table>
<thead>
<tr>
<th>TEAM</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Family Team</strong></td>
<td>• Impose rest.</td>
<td>• Continue to assess symptoms (at least 3× week or more as needed), monitor if symptoms are improving.</td>
<td>• Continue with all assessments (at least 2× week or more as needed).</td>
</tr>
<tr>
<td></td>
<td>• Assess symptoms daily – especially monitor sleep/energy and emotional symptoms.</td>
<td>• Continue to assess symptoms (at least 3× week or more as needed).</td>
<td>• Continue to assess symptoms and increase/decrease stimulation at home accordingly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>School Team/Physical</strong></td>
<td>• REMOVE from all play/physical activities!</td>
<td>• Continue to assess symptoms (at least 3× week or more as needed).</td>
<td>• Continue with all assessments (at least 2× week or more as needed).</td>
</tr>
<tr>
<td>Coach/ATC/School Nurse</td>
<td>• Assess physical symptoms daily, use objective rating scale.</td>
<td>• ATC: postural-stability assessment.</td>
<td>• ATC: postural-stability assessment.</td>
</tr>
<tr>
<td></td>
<td>• ATC: assess postural-stability (see NATA reference in RESOURCES).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• School Nurse: monitor visits to school clinic.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>If symptoms at school are significant, contact parents and send home from school.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>School Team/Academic</strong></td>
<td>• REDUCE (do not eliminate) all cognitive demands.</td>
<td>• Continue to assess symptoms (at least 3× week or more as needed) and slowly increase/decrease cognitive and academic demands accordingly.</td>
<td>• Continue with all assessments (at least 2× week or more as needed) and increase/decrease cognitive and academic demands accordingly.</td>
</tr>
<tr>
<td>Educators, School Psychologist, Counselor, Social Worker</td>
<td>• Meet with student periodically to create academic adjustments for cognitive/emotional reduction no later than Day 2/3 and then assess again by Day 7.</td>
<td>• Continue academic adjustments as needed.</td>
<td>• Continue academic adjustments as needed.</td>
</tr>
<tr>
<td></td>
<td>• Educate all teachers on the symptoms of concussion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• See ADJUST/ACCOMMODATE section.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Medical Team</strong></td>
<td>• Assess and diagnose concussion.</td>
<td>• Continue to consult with school and home teams.</td>
<td>• Continue to consult with school and home teams.</td>
</tr>
<tr>
<td></td>
<td>• Assess for head injury complications, which may require additional evaluation and management (Supplemental information for MDs may be found at RockyMountain HospitalForChildren.com).</td>
<td>• Follow-up medical check including comprehensive history, neurologic exam, detailed assessment of mental status, cognitive function, gait and balance.</td>
<td>• Weeks 3+, consider referral to a Specialty Concussion Clinic if still symptomatic.</td>
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<td>• Recommend return to school with academic adjustments once symptoms are improving and tolerable, typically within 48 to 72 hours.</td>
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<td>It is best practice that a medical professional be involved in the management of each and every concussion, not just those covered by legislation.</td>
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<td>• Educate student/athlete and family on the typical course of concussion and the need for rest.</td>
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<td>• Monitor that symptoms are improving throughout Week 1 – not worsening in the first 48 to 72 hours.</td>
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*Family should sign a Release of Information so that School Team and Medical Team can communicate with each other.

Don’t be alarmed by the symptoms - symptoms are the hallmark of concussion. The goal is to watch for a slow and steady improvement in ALL symptoms over time. It is typical for symptoms to be present for up to three weeks. If symptoms persist into Week 4, see SPECIAL CONSIDERATIONS.
# A Graduated Return-to-Play (RTP)

Recommended by The 2012 Zurich Consensus Statement on Concussion in Sport*

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<tr>
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<td>Return to play</td>
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*bpjn.bmj.com/content/47/5/250.full
Risk Factors: History of Concussion

- Player with one concussion in a season is 3–6 times more likely to suffer a second concussion than player without history.
- "cellular vulnerability" theory

Kontos, et al., 2016 – Athletes who continued to play with a SRC required nearly twice as long to recover as those who were immediately removed. -Jnl of Pediatrics
Front Load your interventions ... and then taper back

May be out of school Day 1 until Day 3 or 4?
Most generous interventions upon return to school in Week 1

Begin to expect more from student at school and with homework into Week 2

Back almost to 100% in Week 3
May just be making up reasonable amt of make-up wk.
It is not a lack of information anymore…

It’s a difficulty of implementation!
Seamless System of Communication and Collaboration

A “Multi-Disciplinary Team” Team members who provide multiple perspectives of the student/athlete AND Team members who provide multiple sources of data

**FAMILY TEAM**
Who will be on the Family Team (FT)? Who from the family will watch, monitor and track the emotional and sleep/energy symptoms of the concussion and how will the Family Team communicate with the School and Medical Teams?

**SCHOOL PHYSICAL TEAM**
Who will be on the School Team — Physical (ST-P)? Who at the school will watch, monitor and track the physical symptoms of the concussion? Who is the ST-P Point Person?

**SCHOOL ACADEMIC TEAM**
Who will be on the School Team — Academic (ST-A)? Who at the school will watch, monitor and track the academic and emotional effects of the concussion? Who is the ST-A Point Person?

**MEDICAL TEAM**
Who will be on the Medical Team (MT)? How will the MT get information from all of the other teams and who with the MT will be responsible for coordinating data and updates from the other teams?
Typical Recovery

First, the School Physical Team (coach, ATC, playground supervisor) and/or the Family Team (parent) have a critical role in the beginning of the concussion as they may be the first to RECOGNIZE and IDENTIFY the concussion and REMOVE the student/athlete from play.

Second, the Medical Team then has an essential role in DIAGNOSING the concussion and RULING-OUT a more serious medical condition.

Third, for the next 1 to 3 weeks, the Family Team and the School Academic Team will provide the majority of the MANAGEMENT by REDUCING social/home and school stimulation.

Fourth, when all FOUR teams decide that the student/athlete is 100% back to pre-concussion functioning, the Medical Team can approve the Graduated Return to Play (RTP) steps. See the PACE page.

Finally, when the student/athlete successfully completes the RTP steps, the Medical Team can determine final “clearance.”

Every team has an essential part to play at certain stages of the recovery. EVERY Member of Every Team is Important!

Who will be on the School Team — Physical (ST-P)? Who at the school will watch, monitor and track the physical symptoms of the concussion? Who is the ST-P Point Person?

Who will be on the Family Team (FT)? Who from the family will watch, monitor and track the emotional and sleep/energy symptoms of the concussion and how will the Family Team communicate with the School and Medical Teams?

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Who will be on the Medical Team (MT)? How will the MT get information from all of the other teams and who with the MT will be responsible for coordinating data and updates from the other teams?

A “Multi-Disciplinary Team” Team members who provide multiple perspectives of the student/athlete AND Team members who provide multiple sources of data.

Communication and Collaboration = Teamwork!
Multi-Disciplinary Teamwork = the safest way to manage a concussion!
Clearance to play:

- Sx-free cognitively and at home.
- No physical activity

Then, GRTP steps

= Clearance
How do I get back to my sport?

> Is the student/athlete 100% symptom-free at home?
  - Use the Symptom Checklist every few days. All symptoms should be at "0" on the checklist or at least back to the perceived "baseline" symptom level.
  - Look at what the student/athlete is doing. At home they should be acting the way they did before the concussion, doing chores, interacting normally with friends and family.
  - Symptoms should not return when they are exposed to the loud, busy environment of home/social, mall or restaurants.

> Is the student 100% symptom-free at school?
  - Your student/athlete should be handling school work to the level they did before the concussion.
  - Use the Teacher Feedback Form (APPENDIX) to see what teachers are noticing.
  - Watch your child/teen doing homework; they should be able to complete homework as efficiently as before the concussion.
  - In-school test scores should be back to where they were pre-concussion.
  - School workload should be back to where it was pre-concussion.
  - Symptoms should not return when they are exposed to the loud, busy environment of school.

> Has the school or healthcare professional has used neurocognitive testing, are scores back to baseline or at least reflect normative average and/or baseline functioning?

> If a Certified Athletic Trainer is involved with the concussion, does the ATC feel that the student/athlete is 100% symptom-free?
  - Ask ATC for feedback and/or serial administrations of the Symptom Checklist.

> Is your child off all medications used to treat the concussion?
  - This includes over the counter medications such as ibuprofen, naproxen and acetaminophen which may have been used to treat headache or pain.

If the answer to any of the questions is "NO," stay the course with management and continue to repeat:

- REMOVE physical activity
- REDUCE home and cognitive demands
- ADJUST/ACCOMMODATE home/social and school activities

EDUCATE: Let the symptoms direct the interventions... for however long it takes for the brain cells to heal!

Once the answers to the questions above are all "YES," turn the page to the PACE page to see what to do next!
**When to Return to Play? Consensus & data-driven decision**

Since an athlete must be 100% symptomatic-free before starting Graduated Return to Play steps and since being 100% back to pre-concussion learning levels is a sign of being symptom-free, **Therefore, No RTP until 100% back to RTL! #RTLB4RTP**

## A Graduated Return-to-Play (RTP) Recommended by The 2012 Zurich Consensus Statement on Concussion in Sport*

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PACE page 12

**STEP FOUR: PACE**

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Research Note:

Earlier introduction of physical activity is being researched and may become best practice. However, at this time, any early introduction of physical exertion should only be conducted in a supervised and safe environment by trained professionals.
CONCUSSION

ST/P Coach ATC Nurse

Medical Team

MANAGEMENT

FAMILY TEAM
REDUCE
Limit texting. Limit TV, video games, computer time.
Limit homework. Limit driving.
Keep home from dances, games, the mall. Decrease stimulation. REST!

SCHOOL TEAM/ACADEMIC
Keep home if severely symptomatic. Return to school when symptoms are still present but tolerable. Eliminate work, REDUCE work, adjust work.

PACE MENTAL DEMANDS

TIME (usually between 7 to 21 days)
Longer Recovery?

- History of headaches
- Family history of migraines
- History of past concussions
- Age of concussion
- Gender
- Learning issues
- Attentional issues
- Underlying neurological issues (spectrum)
- Underlying psychological issues (anxiety/dep)

10 to 20%? And within the 2\textsuperscript{nd} to 3\textsuperscript{rd} week…

- Oculomotor
- Vestibular
- Dysautonomia
- Convergence Insufficiency
• Speaker Bureau
• Training
• Manuals
• Consultation
• Resources
• Referral to medical professionals

www.iowaconcussion.org
BIAIA is a team of navigators

Systems to Navigate

- Acute Rehab
- Medical Assistance
- SNF
- Health/MH
- Transportation
- State BIA
- P&A
- ILC
- Advisory Council
- SSA Office
- VA Center
- Special Ed
- MR/DD & Disability Services
- Youth & Family Services
- VR
- Housing
- Aging Svcs
- Public Safety
- Corrections
- ILC
Brain Injury Alliance of Iowa

NEURO RESOURCE FACILITATION: Resource Facilitation is a partnership that helps individuals and communities choose, get AND keep information, services and supports to make informed choices and meet their goals.

CASE CONSULTATION: technical assistance to support organizations serving individuals and families experiencing brain injury to increase service planning and success.

OUTREACH AND TRAINING OPPORTUNITIES

www.biaia.org
Questions & Discussion

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