Returning to the Classroom Following a Concussion

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Disclosures

- I have no relevant financial relationships with the manufacturers(s) of any commercial products(s) and/or provider of commercial services discussed in this CME activity.
- I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.
Learning Objectives

• Describe current guidelines on concussion diagnosis, treatment and prevention

• Understand impact of a concussion on learning

• Design and implement a return to learn (RTL) protocol
Concussions: Recognition, treatment and prevention
Current guidelines

- “Zurich guidelines”
- 2016/2017 Berlin guidelines expected March, 2017
- International panel of experts on head injuries
- Apply to age 10 and older
Current guidelines

- Halstead and Walters, 2010
- Based on Zurich guidelines
- Specifically address young athletes
What is a concussion?

“A complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces.”

- Zurich CIS, *CJS M* 2009
What is a concussion?

• A concussion is a **brain injury**
  • Caused by a blow to the head, **OR**
  • Caused by a blow to the body that causes a jolt to head

• Results in impaired neurologic function
  – Transient
  – Resolves spontaneously
  – May or may not involve loss of consciousness (LOC)

• **NOT** a structural injury (e.g. not a bruise or bleed)
  – Cannot be seen on a CT scan or MRI
Why do we worry about concussions?
The New York Times

Suicide Reveals Signs of a Disease Seen in NFL

Los Angeles Times

Dave Duerson's suicide could be a turning point for NFL

Former Bengal Henry Found to Have Had Brain Damage

Dave Duerson was a former Chicago Bears and New York Giants safety who grew... (Charles Cherney / Chicago Tribune)
Chronic Traumatic Encephalopathy (CTE)

- About 150 cases to date
  - Contact sport athletes (mostly former NFL players)
  - Behavioral/Mood/ Cognitive Changes
  - Donated their brains to research
  - Post-mortem histopathologic findings:
    - Neurofibrillary tangles
    - Neuritic threads
  - No control group

Omalu et al, J Forensic Nursing, 2010
NFL: Concussion research

- Study of >3400 former NFL Players (Lehman, Neurology, 2012)
  - ≥5 playing seasons 1959-1988

- Mortality rate about ½ of expected for age

- 10/384 deaths were due to neurodegenerative causes

- 17/384 with neurodegenerative condition contributing to cause of death (3x expected rate)
What are the long-term effects of repeated concussions?

- Study of college football players followed for 3 yrs
  - Those w/ 3 or more concussions (vs. < 3 concussions)
    - Had more severe neurologic dysfunction
    - Had longer recovery period
    - Had greater risk of cumulative neurologic impairment

- Repeat injuries
  - 92% occurred within 10 days of first concussion
  - 75% occurred within 7 days of first concussion

Guskiewicz et al, 2003
Who gets concussions?

• 200,000 sports-related head injuries seen in emergency departments each year
  – Highest rates are in 10-14 year-olds, followed by 15-19 year-olds

• Concussions represent 9% of all high school sports injuries
  – 5-10% of high school football players each year
Epidemiology

- Incidence is likely underestimated
  - Milder injuries may go unnoticed
  - Athletes may not report symptoms for fear of being withheld from play
  - Lack of data in elementary school athletes
## Concussion rates in high school sports

<table>
<thead>
<tr>
<th>Sport</th>
<th>Injury Rate (per 1000 athlete exposures)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>0.47-1.03</td>
</tr>
<tr>
<td>Girls Soccer</td>
<td>0.36</td>
</tr>
<tr>
<td>Boys Lacrosse</td>
<td>0.28-0.34</td>
</tr>
<tr>
<td>Girls Basketball</td>
<td>0.21</td>
</tr>
<tr>
<td>Wrestling</td>
<td>0.17</td>
</tr>
<tr>
<td>Boys Soccer</td>
<td>0.17</td>
</tr>
<tr>
<td>Girls Lacrosse</td>
<td>0.10-0.21</td>
</tr>
<tr>
<td>Girls Softball</td>
<td>0.07</td>
</tr>
<tr>
<td>Boys Basketball</td>
<td>0.07</td>
</tr>
<tr>
<td>Cheerleading</td>
<td>0.06</td>
</tr>
<tr>
<td>Boys and Girls Volleyball</td>
<td>0.05</td>
</tr>
<tr>
<td>Boys baseball</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Concussions in young athletes

• Younger athletes take longer to recover

• Athletes with concussions in the past are more likely to have concussions in the future

• Having a repeat concussion before recovering from the first concussion leads to a longer recovery and may cause problems with memory and thought
Concussions in young athletes

• Young athletes may not tell adults about concussion symptoms because they...
  – Can’t: They may be dazed or ‘out-of-it’
  – Won’t: Want to keep playing
  – Don’t: Unaware that symptoms are important to report

• Not like a sprained ankle
  – Can’t always ‘see’ a concussion
Risk factors

• Higher risk for prolonged symptoms:
  – Previous concussion
    • especially if it was associated with prolonged symptoms
  – Younger age
  – h/o learning disability, ADD
  – h/o migraines (or family history of migraines)
  – h/o anxiety or mood disorder
# Signs and symptoms

## PHYSICAL
- Headache
- Dizziness
- Nausea
- Vomiting
- Balance problems
- Visual problems
- Sensitive to light
- Sensitive to noise

## COGNITIVE
- Feeling “foggy”
- Feeling slow
- Poor concentration
- Poor memory
- Repeats questions

## EMOTIONAL
- Irritable
- Sad
- Emotional
- Nervous

## SLEEP
- Drowsy
- Sleeping more
- Sleeping less
- Can’t fall asleep
## Symptom Checklist Example

Please rate your symptoms based on how much you have felt in the last 24 hours.

<table>
<thead>
<tr>
<th>symptom</th>
<th>None</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Nausea</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Vomiting</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Drowsiness</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Numbness or tingling</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Dizziness</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Balance problems</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sleeping more than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sensitivity to light</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sensitivity to noise</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Feeling slowed down</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Feeling as if “in a fog”</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Difficulty concentrating</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Difficulty remembering</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Trouble falling asleep</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>More emotional than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Irritability</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sadness</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Nervousness</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Fatigue</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sleeping less than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Visual problems</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Signs and symptoms

• May not be noticed until days or weeks after the injury

• Headache
  – Most frequently reported symptom
  – Occurs in 75% of concussions

• LOC
  • Occurs in <10% of concussions
  • Not predictive of severity

• Dizziness and “fogginess” at time of injury
  – May be predictive of prolonged symptoms
• Outline:
  – Brief management slide
  – Typical recovery (insert time frame slide)
  – Atypical/prolonged recovery
  – Discuss post-concussion syndrome
  – Help kids with 3 areas of function:
    • 1. School
    • 2. Physical activity
    • 3. Social/other recreational
  – Move neuropsych later in the midst of school stuff
Office Treatment

• Relative Rest Protocol
  1. Sports/Physical activities
     • Recent studies support light aerobic activity while symptomatic
  2. Cognitive rest = ‘Brain rest’
  3. Recreational/Screen time

• Average recovery is 2 weeks for high school students

• Referral for additional evaluation if symptoms are atypical/prolonged >6 weeks
Typical concussion recovery times

- College and professional athletes:
  - Average recovery 7-10 days

- High school athletes:
  - Average recovery in 2 weeks

- Elementary school athletes:
  - Less data
  - Average recovery 2-4 weeks

- 10-15% of concussions result in prolonged recovery (>6 wks)
Team Approach

- Primary Care Providers
- Sports Medicine Physicians/Team Physicians
- Certified Athletic Trainers
- School Nurses
- Teachers
- School Administrators/counselors
- Neurology
- Neuropsychology
- Physical Therapy
- Occupational Therapy
- Optometry
- Psychology/Psychiatry
New Concepts in Early Concussion Management
Cognitive Rest and Graduated Return to Usual Activities Versus Usual Care for Mild Traumatic Brain Injury: A Randomized Controlled Trial of Emergency Department Discharge Instructions.
Varner CE, McLeod S, Nahiddi N, Lougheed RE, Dear TE, Borgundvaag B.

Benefits of strict rest after acute concussion: a randomized controlled trial.
Thomas DG, Apps JN, Hoffmann RG, McCrea M, Hammekes T.

Use of graded exercise testing in concussion and return-to-activity management.
Leddy JJ, Willer B.

Association Between Early Participation in Physical Activity Following Acute Concussion and Persistent Postconcussive Symptoms in Children and Adolescents.
Return-to-play protocol

May be appropriate to allow light to moderate activity in athletes with symptoms.

**Step 1:** Light aerobic exercise (stationary cycling, jogging)

**Step 2:** Sport-specific training (skating, throwing, kicking)

**Step 3:** Non-contact training drills (decision-making)

**Step 4:** Full-contact training

**Step 5:** Game play

- Must wait a minimum of 24 hours between steps
- Advance to next level only if no recurrence of symptoms at current level
- If symptoms recur, go back to previous level, and wait 24 hours before trying to progress
Neuropsychology Testing
Neuropsychological (NP) testing

- Provides objective measure of brain function

- *Not necessary for all concussions*

- Consider neuropsych testing:
  - To identify deficits that may interfere with school or sport
  - For athletes who may not be truthful about symptoms
NP testing methods

• Pencil-and-paper tests
  – Administered by a neuropsychologist
  – Typically 4-10 hours
  – Shorter “mini-evaluations”
  – Limited availability and insurance coverage

• Computerized tests
  – ImPACT, ANAM, CogState, HeadMinder
  – Visual/verbal memory, visual-motor processing speed, reaction time
  – Take 30 minutes
  – Non-neuropsychologists can interpret
Computerized NP testing

- Most useful when compared to athlete’s baseline
  - If baseline unavailable, scores can be compared to established norms for age/sex

- Not well-validated under age 14
  - Some normative data available

- NOT a substitute for evaluation by MD

- “one tool in our toolbox”
Designing a Return-to-Learn Protocol
Concussion & Learning

• Student appears well
  – “Invisible injury”
Concussions are like snowflakes

- No two concussions are alike
- Hard to compare students suffering from concussions
- No way to predict how long any single concussion will last
Concussion Impact on learning

• Physical symptoms: affect ability to focus

• Cognitive symptoms: interfere with overall ability to learn

• Sleep dysfunction may lead to fatigue and drowsiness during school day
Concussion Impact on Learning: Age differences

• **ELEMENTARY SCHOOL**
  – Complain of physical problems
  – Misbehave in response to concussion symptoms

• **MIDDLE SCHOOL**
  – Sensitive to feeling different
  – May minimize symptoms to avoid standing out
  – Problems w/ executive function (organization/planning) may have a great impact on academic performance

• **HIGH SCHOOL**
  – Busy schedules, high achievers, larger volume of work, ACT and college planning
  – Prioritizing activities and reducing overall demands important
Return to Learn protocols: General Framework

• Allow student to participate in modified fashion
  – May need trial and error process of determining “how much is too much”

• Teachers are encouraged to apply “mastery learning” criteria within their subject matter

• Medical team must keep benefits of school participation in mind
  – Academic
  – Social
Framework for a Return to Learn Protocol

• Length of each phase will vary from student to student
• Some students may be able to pass through some phases very quickly or skip them altogether
Phase 1: No School—Complete Cognitive Rest

- Symptom severity:
  - High level of symptoms
  - Physical symptoms most prominent
  - Unable to tolerate school environment

- Many children do not require complete rest from school
- If needed, this phase is generally brief
- Children who need to be out of school should not be participating in other extracurricular activities
Phase 2: Part Time with Accommodations

• Symptom severity:
  – Symptoms more manageable
    • Less severe, Not constant
    • Able to tolerate environmental stimuli

• Optimally, can maximize time in school with comprehensive list of accommodations
Phase 3: Full-Day Attendance with Accommodations

- **Symptom severity:**
  - Symptoms decreased in number and severity
  - Symptoms still exacerbated by certain activities
  - Advice families that increased ‘cognitive load’ may increase symptoms

- **Treatment:**
  - Gradual increase of cognitive demands as tolerated

- Typically the longest phase for individuals with prolonged symptoms
Phase 4: Full-Day Attendance Without Accommodations

• Symptom severity:
  – No symptoms or mild intermittent symptoms

• Treatment:
  – Remove accommodations as able
  – Continue to evaluate symptoms and academic performance to make sure student is tolerating removal of accommodations

• Intervention Examples:
  – Make a plan to complete missed academic work
  – Provide extended time to complete missed work
    • Try to avoid specifying specific due dates
  – Physical activities as specified by student’s health care provider
Phase 5: Full School & Extracurricular Involvement

• Symptom severity:
  – No symptoms present
  – Consistently tolerating full school days and academic load

• Treatment:
  – No accommodations necessary

• Intervention Examples:
  – Must have written clearance by health care provider before return to PE/sports
  – Student should complete a gradual RTP protocol as indicated by health care provider
Providing Accommodations
Accommodation Examples

• Attendance:
  - No School
  - Part time attendance as tolerated
  - Please allow student to attend every other class as tolerated
  - Please allow student to attend half days as tolerated
  - Full school days as tolerated
  - Homebound tutoring

• Breaks:
  - Please determine a non-verbal cue for the student to notify the teacher if symptoms have increased
  - Please allow the student to go to the nurse’s office if symptoms increase
  - Allow the student to go home if symptoms do not subside or improve to a manageable level
Accommodation Examples

- **Visual Stimulus:**
  - Allow student to wear sunglasses at school
  - Pre-printed notes for class material
  - Limit smart boards, projectors, computers, TV screens
  - Enlarged font when possible
  - Please allow for a short break (10-15 minutes) during prolonged screen time and/or reading & writing

- **Audible Stimulus:**
  - Allow student to leave class 5 minutes early to avoid noisy hallway
  - Lunch in a quiet place
  - Audible learning (discussions, text to speech programs, audio books, etc.)
  - Please allow for a short break (10-15 minutes) as needed when in a noisy environment (band class, assembly’s, etc.)
  - Please allow student to refrain from band class, orchestra, choir and/or theater, practices & rehearsals
Accommodation Examples

• Workload/Multi-Tasking:
  – Reduce overall amount of make-up work, class work and homework to essential materials only (enough to demonstrate mastery concepts)
  – No Homework
  – No in-class reading or writing
  – Limit homework to *** minutes a night
  – Resume homework as tolerated
  – Please delay large assignments
  – No due dates for homework assignments
  – Extra time to complete homework & reading assignments
  – Limit in-class reading & writing seatwork to *** minutes/class period

• Testing:
  – No testing
  – Extra time to complete tests
  – No more than one test a day
  – Divide longer tests into multiple sections to allow for up to a 30 minute break between sections
  – Oral testing
  – Open book testing
  – Resume testing as tolerated
  – Delay standardized testing
Accommodation Examples

• Physical Exertion:
  – No physical exertion/athletics/physical education class
  – No Recess
  – Begin return to play protocol prior to returning to PE class or athletics
  – Non-contact activities/sports in PE class
  – Please allow student to use their PE class period as a study hall or rest period
  – Please allow student to rest if symptoms increase with activity
  – The student should not participate in any activities or environments that place them at risk for further injury (i.e. the sideline)

• Additional Recommendations:
  – No driving
  – Limit TV, text messaging, video games and computer work
  – Please allow for preferential seating to minimize distractions
  – Please provide a tutor as needed
Return to Learn Education

- www.luriechildrens.org/rtl

- Free 30 minute online education for school administrators, teachers & school nurses on integrating children back to the classroom following a concussion.
Privacy

• Student medical and academic information is considered private and is protected by:
  – HIPAA (Health Insurance Portability and Accountability Act)
  – FERPA (Family Education Rights and Privacy Act)

• Detailed note can be delivered by parents to school

• Student’s parent/guardian must sign Release of Medical Information form at physician’s office for direct communication with schools
Formal Education Plans

• Majority of students will not require a formalized plan

• Some students with prolonged symptoms may require a formalized program
  – 504: For students with persistent symptoms
  – IEP: For students with disability that adversely impacts educational performance
Concussion Legislation
First Concussion Law

• Washington, 2009
  – Zackery Lystedt
    • Middle school football player who suffered a permanent brain injury
    • Law: Athletes with suspected concussion must be removed from play and returned only after MD clearance

• As of 2013, all 50 states now have concussion laws
Concussion legislation in Illinois

- Original law passed in 2011
  - Based on IHSA concussion policy

- Any athlete suspected of having a concussion must be removed from play and may not return to sports until evaluated by, and given written clearance from, a *licensed health care provider.*

*A physician licensed to practice medicine in all of its branches (MD/DO), OR a certified athletic trainer working under the supervision of a physician licensed to practice medicine in all its branches.*
Concussion legislation in Illinois

- Additional requirements:
  - Schools must have a return-to-play (RTP) protocol regarding head injuries
  - RTP protocol information must be included in contract athletes/parents sign to participate in sports
  - Schools must educate coaches, athletes, parents about concussions using materials provided by IHSA
Concussion legislation in Illinois

- 2014 amendment
  - Requires concussion education for HS coaches
  - Must be re-certified every 2 years
Concussion legislation in Illinois

• 2015 amendment
  – Lurie partnered w/ Senator Raoul to amend law:
    • Include **ALL schools**
      – Public, private, charter
      – High schools, middle schools, elementary schools
    • Schools must have **return-to-learn (RTL) protocol**
    • **Youth sports leagues** *encouraged* to have RTP protocols
Viewing the Legislation
www.ilga.gov

Enter SB219 here

Select this link

www.ihsa.org
IL Youth Sports Concussion Safety Act

• Signed into law August 2015

• Effective starting with 2016-17 school year

• Establishes a series of requirements for schools:
  – Must have a **Concussion Oversight Team (COT)**
  – **Mandatory concussion education** for coaches, officials, and COT members
  – Must have Return to Play (RTP) and **Return to Learn (RTL) protocols**
  – Must have **Emergency Action Plan (EAP)**
Mandatory Concussion Education

• The following individuals must complete minimum **2-hour training course every 2 years** from an approved provider:
  – All athletic coaches
  – Marching Band directors
  – IHSA-licensed sports officials
  – COT members (non-medical)*
    • Academic counselors, psychologists, school administrators, teachers

*Physicians, nurses, and certified athletic trainers on COT must maintain concussion education via appropriate CE/CME course.
Concussion Oversight Teams (COT)

• Law requires all schools to form a COT.

• Main function is to oversee elements of the law are properly followed at the school level.
Concussion Oversight Team (COT)

• **Members**
  
  - *At a minimum,* the school must appoint a person who is responsible for implementing and complying with the RTP and RTL protocols.
    
    • Thus, the “team” can be just one person.
    
    • This person may not be a coach.

  
  - If a school employs an athletic trainer, he/she **must** be on COT

  - If a school employs a nurse, he/she **must** be on COT

  - *To the extent practicable,* the COT must include a physician.
Concussion Oversight Team (COT)

Responsibilities

– Establish RTP protocols for a student’s return to practice and competition.

– Establish RTL protocols for a student’s return to the classroom.
  • Both RTP and RTL protocols must be based on peer-reviewed scientific evidence and consistent with guidelines from the Centers for Disease Control and Prevention.

– Review the school’s Emergency Action Plan
Emergency Action Plan (EAP)

• Schools must adopt venue-specific EAP for interscholastic athletic activities to address serious injuries (e.g. head/neck injury) and acute medical conditions (e.g. cardiac arrest, heat stroke) in which a student’s condition may deteriorate rapidly.

• EAP must include:
  – delineation of roles
  – methods of communication
  – availability of and access to emergency equipment (e.g. AED, spine board)
  – plan for emergency transport
Emergency Action Plan (EAP)

The EAP must be:

- In writing
- Reviewed by the COT;
- Approved by the district supt./designee, the chief school administrator/designee, or the appropriate administrative officer/designee;
- Distributed to all appropriate personnel;
-Posted conspicuously at all venues;
-Reviewed (and ideally rehearsed) annually by all athletic trainers, first responders, coaches, school nurses, athletic directors, and volunteers for interscholastic athletic activities.
IHSA/IESA RTP Protocols

A student with a suspected concussion shall not return to play until:

– Student is evaluated by and receives written clearance from:
  • Physician licensed to practice medicine in all its branches in Illinois (MD/DO)
  • Certified Athletic Trainer working in conjunction with MD/DO

– Student has completed all requirements of the RTP and RTL protocols

– Student and parent/guardian have signed the informed consent form
Pre-participation Requirements

• Schools must provide information regarding the head injury policy as a part of the agreement students/parents sign prior to participating in an interscholastic sports. (*This is already part of the IHSA PPE form*)

  – *It is recommended* that concussion and head injury information be a part of any pre-season meeting held with parents.

  – *Schools are encouraged* to retain a copy of the student/parent signed concussion acknowledgement form (valid for one year).
Educational Resources

- CDC materials: Heads Up!

- AAP: Return to learn policy statement
  - http://pediatrics.aappublications.org/content/132/5/948.abstract

- Safe Kids USA
  - http://www.safekids.org/sports-safety

- Institute for Sports Medicine
  - http://www.luriechildrens.org/rtl
Lurie Children’s Concussion Program
luriechildrens.org/sports

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