Concussion Prevention and Early Intervention

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**Conflict of Interest**

In compliance with continuing education requirements, all presenters must disclose any financial or other associations with companies to which they have a direct link and/or financial relationship that is related to the topic/content of their presentation.

The presenter has no conflicts of interest to report.
Learning Objectives

After attending this session attendees will be able to:

1. Describe the players and steps involved with academic/whole person management of concussion
2. Apply return to learn and return to play protocols to student athletes
3. Examine a novel project which provided concussion/traumatic brain injury education to community health centers and local schools
4. Utilize the ATSU concussion toolkit
Outline

• Whole person management of concussion
• Rest vs. Activity
  – Berlin consensus meeting updated recommendations
• Academic outcomes following concussion
• Policies to aid return to school
• Plan implementation
  – Novel approach to education in CHCs
  – ATSU Concussion Toolkit
Concussion Effects

- Increased Self-Report Symptoms
- Vestibular Dysfunction
- Postural Control Deficits
- Mental Status Deficits
- Neurocognitive Deficits
Health-Related Quality of Life

- Spiritual
- Economic
- Social
- Psychological
- Physical
- School

Russel, 2017; Iadeavia 2015; Houston, 2016; Hutchison, 2010; Vassilyadi, 2015; Valovich McLeod, In review
REST

Physical Rest

Cognitive Rest
Cognitive Rest

Asleep or comatose

Goal: limit cognitive activity to a level that is tolerable and does not exacerbate symptoms

Normal school
<table>
<thead>
<tr>
<th><strong>Cognitive Rest Recommendations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AMSSM, 2012</strong></td>
</tr>
<tr>
<td>• Students will require <strong>cognitive rest</strong> and may require academic accommodations such as reduced workload and extended time for tests while recovering from a concussion.</td>
</tr>
<tr>
<td><strong>AAN, 2013</strong></td>
</tr>
<tr>
<td>• LHCPs might develop individualized graded plans for return to physical and <strong>cognitive activity</strong>, guided by a carefully monitored, clinically based approach to minimize exacerbation of early postconcussive impairments (Level C).</td>
</tr>
<tr>
<td><strong>NATA, 2014</strong></td>
</tr>
<tr>
<td>• Athletic trainers should work with school administrators and teachers to include appropriate <strong>academic accommodations</strong> in the concussion-management plan. Strength of Recommendation: C</td>
</tr>
<tr>
<td><strong>Berlin, 2017</strong></td>
</tr>
<tr>
<td>• Brief period of complete rest (24-48 hr)</td>
</tr>
<tr>
<td>• Gradual and progressive sub-symptom threshold activity</td>
</tr>
</tbody>
</table>
1. How often are cognitive and physical rest, including academic adjustments, utilized by health care providers in managing sport-related concussion?

2. In patients sustaining a concussion, does the use of physical and cognitive rest reduce the severity and duration of concussion-related impairments?
<table>
<thead>
<tr>
<th>Study</th>
<th>Key Results</th>
</tr>
</thead>
</table>
| Arbogast, 2013        | 62% of physicians described awareness of CR as part of management; only 2.4% described CR in detail  
11% of charts reviewed included written CR recommendations                                                                                   |
| Carson, 2014          | Worsening of symptoms in 44.7% of patients following premature RTL  
Patients with prior history of concussion required more rest days before being cleared                                                      |
| Grubenhoff, 2015      | Patients with PPCS missed 50% more school days than patients with no PPCS  
36% of PPCS patients received AA, while 53% of no PPCS patients received AA  
There was an association between follow-up visits and receiving AA (RR=2.2; 95% CI = 1.4-3.5)                                               |
| Olympia, 2015         | 58% of SN are responsible for guiding students’ graduated academic re-entry process                                                                                                                       |
| Upchurch, 2014        | CR was not recommended to any patient prior to 2008  
CR was only recommended to 12% of patients by 2012                                                                                             |
| Weber, 2015           | 59.4% of student-athletes with concussion under SN care received AA, yet only 27.7% of SN always or almost always recommend AA following sport-related concussion                                                 |
| Wilkins, 2013         | Instructions for RTT increased from 24% prestandardization to 98% poststandardization                                                                                                                     |
| Williams, 2015        | 41% of student-athletes with concussion under AT care received AA                                                                                                                                          |
| Zemek, 2015           | CR recommendations were limited; 40% of physicians did not recommend school absence, 30% did not recommend schoolwork reduction, 35% did not recommend limiting screen time |
Effectiveness of Rest

3 studies showing too much activity delayed recovery = worse outcomes (Majerske, 2008; Brown, 2014; Maerlender, 2015)

2 studies show rest improves outcomes (Moser, 2012, 2015)

4 studies found no association between rest and outcomes (Gibson, 2013; Buckley, 2015; Moor, 2015; deKruijk, 2002)

1 RCT found strict rest resulted in a longer recovery (Thomas, 2015)
Clinical Bottom Line

1. Physical and cognitive rest is underutilized by healthcare providers (SOR = B)
   • Need to educate community providers regarding best practices for rest, treatment, and activity
   • Develop strategies to build a collaborative concussion management team

2. Moderate physical and cognitive rest may facilitate recovery during the initial days after concussion (SOR = B)
   • Recommendations for rest are broad and not specific for individual patients
   • An initial period of rest may be beneficial
   • Balance rest and active treatments for each patient
   • For athletic trainers, these decisions are ones that should be made in conjunction with their directing physician and in collaboration with other concussion team members

Activity or Rest?

- School or exercise activity
- School activity only
- School activity and light activity at home
- School and sports practice
- School and sports games

[Majerske, JAT, 2008]
Consensus Questions

1. What is the definition of concussion?
2. What are the critical elements of sideline screening that can be used to establish the diagnosis of concussion?
3. What tests and measures should be added to the SCAT3 and related tests to improve their reliability, sensitivity and/or specificity in sideline concussion diagnosis?
4. What domains of clinical function should be assessed post-injury?
5. What advanced or novel tests can assist in the evaluation of concussion?
6. What is the evidence for and efficacy of specific treatment interventions?

McCrory, 2017
Consensus Questions

7. What is the time course of physiological recovery after sports concussion?

8. What are the key modifiers of concussion outcomes?

9. What is the difference in concussion management in children as compared to adults?

10. What is the best approach to investigation and treatment of persistent post-concussive symptoms?

11. What is the current state of the scientific evidence about the prevalence, risk factors and causation of possible long term-term sequelae like CTE and other neurodegenerative diseases, with respect to sports concussion?

12. What strategies can be used to effectively reduce the risk of concussion in sport?

McCrory, 2017
Rest

- **Brief period** (24–48 hours) of complete rest
- Gradually and progressively more active
  - Staying below their cognitive and physical symptom
  - Avoid heavy exertion
- The exact amount and duration of rest is not yet well defined

Schneider, BJSM, 2017
Rehabilitation

- A variety of treatments may be required for ongoing symptoms and impairments
- Cervical and vestibular rehabilitation
  - Persisting dizziness, c-spine pain and headaches
- Closely monitored active rehabilitation programs
  - Controlled sub-symptom threshold, submaximal exercise
- Specific treatments based on clinical examination findings and symptoms
- *Needs to include cognitive and school activities*
Return to Sport

• Brief period of initial rest (24-48 hr)
• Symptom limited activity
• Off medications
• **Full return to school**
• Return to baseline on adjunct assessments
  – Neurocognitive
  – Balance

Broglio, 2014, McCrory, 2017
Reconsider: Pediatric

• Requires special paradigms suitable for the developing child and adolescent (<18)
  – Child – ages 5-12
  – Adolescent – ages 13-18
• Expected duration of symptoms is 4 weeks
• Age-specific, validated tools
  – Questionable role and utility of computerized testing
• Need to address academics
  – Successfully return to school first, then sport!

McCrory et al, Br J Sport Med. 2017
Concussion and the Classroom

The Academic Fallout Of Teen Athlete Concussions
by TOM GOLDMAN

May 19, 2010

Most of the discussion on concussions in sports has focused on professional athletes -- mainly foot how there needs to be better knowledge and training in treating head injuries. The issue is much m serious at young concussions occur has been on how examining what student athlete.

Cognitive Rest: The Often Neglected Aspect of Concussion Management

Tamara C. Valovich McLeod, PhD, ATC • A.T. Still University and Gerard A. Gioia, PhD • Children’s National Medical Center

Supporting the Student-Athlete’s Return to the Classroom After a Sport-Related Concussion

Neal McGrath, PhD
Sports Concussion New England, Brookline, MA
Publications in PubMed

- **Concussion AND AA**
  - 2000-2010: 2
  - 2011-present: 126

- **Concussion AND RTL**
  - 2000-2010: 4
  - 2011-present: 130
Return to School Laws

• As of November 2016
• 9 states
  – Illinois, Massachusetts, Maryland, Maine, Nebraska, New York, Oklahoma, Virginia and Vermont
## Effects of Concussion on Learning

<table>
<thead>
<tr>
<th>Somatic</th>
<th>Cognitive</th>
<th>Sleep</th>
<th>Emotional</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Affects ability to function in class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Unsteadiness</td>
<td>• Difficulty learning and retaining new information</td>
<td>• Results in issues with cognition, behavior, and mood</td>
<td></td>
</tr>
<tr>
<td>• Concentration difficulty</td>
<td></td>
<td>• Decreased alertness in class</td>
<td>• Anxiety can hinder cognition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Adherence to prescribed rest</td>
</tr>
</tbody>
</table>
Concussion & Academic Outcomes

Negative

- Cumulative GPA significantly lower in youth with 2+ concussions & recent concussion (Moser, 2005)
- Higher academic dysfunction scores 1 week after concussion compared to extremity injured (Wasserman, 2016)
- Symptomatic students had increased level of concern for impact of concussion on academic performance and more school related problems (Ransom, 2015)
- Vision symptoms, hearing difficulty, and concentration difficulty were significantly associated with academic difficulty (Swanson, 2016)
- 79% of ATs managed patient who experienced a decrease in school and academic performance following concussion (Williams, 2015)

None

- Concussion did not alter academic outcomes when using end of year GPA (Russel, 2016)
## Recovery & School Function

<table>
<thead>
<tr>
<th></th>
<th>Short</th>
<th>Moderate</th>
<th>Prolonged</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 3</td>
<td>Day 10</td>
<td>Day 30</td>
</tr>
<tr>
<td></td>
<td>90.6 (86.3, 95.2)</td>
<td>98.0 (93.1, 100)</td>
<td>97.4 (92.5, 100)</td>
</tr>
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<td>98.0 (93.1, 100)</td>
<td>97.4 (92.5, 100)</td>
</tr>
<tr>
<td>Moderate</td>
<td>80.1 (75.7, 84.8)</td>
<td>92.3 (87.2, 97.7)</td>
<td>97.1 (91.7, 100)</td>
</tr>
<tr>
<td>Prolonged</td>
<td>64.6 (61.1, 68.3)</td>
<td>77.4 (73.3, 81.7)</td>
<td>95.3 (90.1, 100)</td>
</tr>
<tr>
<td>Pairwise comparisons</td>
<td>P&lt;M&lt;S, p&lt;.01</td>
<td>P&gt;M&amp;S, p&lt;.001</td>
<td>S=M=P</td>
</tr>
</tbody>
</table>

Short = 0-7 days, Moderate = 8-14 days, Prolonged > 14 days
## Recovery & Cognitive Fatigue

<table>
<thead>
<tr>
<th></th>
<th>Cognitive</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 3</td>
<td>Day 10</td>
<td>Day 30</td>
</tr>
<tr>
<td><strong>Short</strong></td>
<td>87.3 (80.6, 94.7)</td>
<td>94.3 (86.7, 100)</td>
<td>95.2 (87.5, 100)</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>71.2 (65.0, 78.0)</td>
<td>94.1 (85.7, 100)</td>
<td>94.9 (86.5, 100)</td>
</tr>
<tr>
<td><strong>Prolonged</strong></td>
<td>62.4 (57.0, 68.4)</td>
<td><strong>77.7 (71.2, 84.8)</strong></td>
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<td><strong>Pairwise</strong></td>
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<td>S=M=P</td>
</tr>
</tbody>
</table>

Short = 0-7 days, Moderate = 8-14 days, Prolonged > 14 days
## Patient Specific Functional Scale Themes

<table>
<thead>
<tr>
<th>Sport and Physical Activity (SPA)</th>
<th>Cognitive and School (COG)</th>
<th>Activities of Daily Living (ADL)</th>
<th>Screen Time (SCR)</th>
<th>Sleep (SLP)</th>
<th>Social Activity (SOC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sports</td>
<td>School</td>
<td>Showering</td>
<td>Video games</td>
<td>Bright lights</td>
<td>Social activities</td>
</tr>
<tr>
<td>Physical education</td>
<td>Paying attention</td>
<td>Driving</td>
<td>Watching film</td>
<td>Sleep</td>
<td></td>
</tr>
<tr>
<td>Running</td>
<td>Thinking quick</td>
<td>Walking up stairs</td>
<td>TV</td>
<td>Staying awake</td>
<td></td>
</tr>
<tr>
<td>Lifting</td>
<td>Reading</td>
<td>Walking to class</td>
<td>Texting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rec-recreational activities</td>
<td>Memory</td>
<td></td>
<td>Computer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Focus in class</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Taking notes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Valovich McLeod, NATA, 2017
PSFS Scores
Day 3: 5.0±2.7
Day 10: 6.6±3.7
RTP: 9.0±2.6
Influence on school attendance and activities

- Academic accommodations
- Left school early due to symptoms
- Decrease in grades
- Wanted to be in school

Effect on school role

- Physical symptoms impact on school
- Absences
- Academic adjustments
- Inconsistency of school personnel in assisting

Iadevaia, 2015

Valovich McLeod, In Review
Who Has Problems in School?

- 1/3 of patients presenting to specialty clinic had school problems
  - Higher initial 3 of symptoms
    - 9.5 (6.7) vs. 2.6 (6.0)
  - Higher initial symptom severity
    - 23.3 (22.2) vs. 13.5 (17.0)
  - Significantly worse SCAT2 score (total)
- 60.8% no absence
- 24.1% missed 1-3 d
- 16.5% missed 4-21 d
School – Medical Partnership: Policy and Infrastructure
## Activities and Responsibilities: Before School Year

<table>
<thead>
<tr>
<th>Activity</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concussion management policies and procedures (P &amp; P)</td>
<td>School administration [school nurse, counselor, psychologist]</td>
</tr>
<tr>
<td>Development of school concussion resource team</td>
<td>School administration; school nurse, counselor, psychologist, designated teacher, athletic trainer</td>
</tr>
<tr>
<td>Examine teaching/support methods to support recovery, maximize learning/performance, reduce symptom exacerbation</td>
<td>School administration; school nurse, counselor, psychologist</td>
</tr>
<tr>
<td>Teacher/staff education and training</td>
<td>Teacher, school counselor, school nurse, administrators</td>
</tr>
<tr>
<td>Develop list of concussion resources for education, consultation &amp; referral</td>
<td>School administrators</td>
</tr>
</tbody>
</table>

**Goal:** Written Policy, Verification of Education, List of Resources

Sady, 2011; Gioia, 2016
# Activities and Responsibilities: During School Year

<table>
<thead>
<tr>
<th>Activity</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review/reinforce concussion policy and procedures</td>
<td>School administration, school nurse/counselor</td>
</tr>
<tr>
<td>Monitoring for injury, parent informed of injury</td>
<td>Coach, athletic trainer, school health personnel</td>
</tr>
</tbody>
</table>

**Goal:** Have tools available for assessment and education
### Activities and Responsibilities: Post-Injury

<table>
<thead>
<tr>
<th>Activity</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical evaluation &amp; school treatment planning</td>
<td>Licensed health care professional with concussion training, school concussion resource team</td>
</tr>
<tr>
<td>Gradual return to school program</td>
<td>Licensed health care professional with concussion training, school concussion resource team</td>
</tr>
<tr>
<td>In-school observation, monitoring, &amp; supports</td>
<td>School concussion resource team</td>
</tr>
<tr>
<td>Clearance for full return to academics</td>
<td>Licensed health care professional with concussion training, school concussion resource team</td>
</tr>
</tbody>
</table>

**Goal:** Proper documentation, written plans for school and activity

---

Sady, 2011; Gioia, 2016
Defining and training an interdisciplinary school concussion management team

Professional development of the school and medical communities with respect to concussion management in the school

Identification, assessment, and progress monitoring protocols

Availability of a flexible set of intervention strategies to accommodate the student’s recovery needs

Systematized protocols for active communication among medical, school, and family team members

Gioia, 2016
School System Preparation

1. Establish state and local school **policies and procedures**
   - Identification and academic management of students with mild traumatic brain injury

2. Educate school personnel about mild traumatic brain injury
   - Formation and role definition of the school-based team

3. Implementation of school-based concussion management action plans

Gioia, 2016
Regular, ongoing communication between the medical, school, and family to ensure understanding of the student’s evolving medical, academic, and social-emotional support needs

Development and active use of a student-specific medical management plan

Use of standardized forms to guide teaching staff in symptom monitoring, support provision and communication

Preparation of the school environment, noting possible triggers of symptom exacerbation

Definition of roles for all with respect to activities and strategies to promote recovery

Formal education and training of school personnel

Gioia, 2016
School System Concussion Education

• Concussion and their effects
• Each professional’s role in management
• Start of the school year
• Includes teachers, counselors, administrators, coaches, and medical providers
• Staff familiarized with policy
Medical System Preparation

• Training resources for medical providers
  – General concussion education
  – Use of assessment tools
  – Use of TBI-specific discharge instructions and planning tools (ACE)

• Communication with school personnel
Medical – School Partnership

• Effective and efficient communication of the students’ needs

• Student’s symptom profile can be communicated to the team

• Periodic in-school monitoring of symptom progress can be conducted
  – Cognitive activity log
Ideal Policy

Brief description of mild traumatic brain injury/ concussion

Definition of the school “receiving team” to guide reentry

The gradual process to assist the student’s return into school life (learning, social activity, etc.),

Criteria for when students can safely return to physical activity and full cognitive activity

Gioia, 2016
Consensus-Based RTL Implementation Model

• Domain 1: Lack of RTL policy
  – Only 12% had formal RTL policy

• Domain 2: Barriers to providing accommodations
  – Only 30% of teachers receive concussion training

• Domain 3: Variability in communication

• Domain 4: Shared recommendations for all stakeholders
  – Desire for readily available best practices, development of a formal school RTL policy for easy adoption and more training

Lyons, 2017
Concussion Management Team
Secondary School

Athletic Trainer

Team Physician

Coach

School Nurse

Outside referral sources

Counselor

Parents

Teachers

Student

<table>
<thead>
<tr>
<th>Team</th>
<th>Team Members</th>
<th>Roles</th>
</tr>
</thead>
</table>
| **Family**       | Patient, parents, guardians, relatives, peers, teammates, family friends    | Impose rest  
                    Monitor and track symptoms at home including emotional and sleep-related symptoms daily  
                    Communicate with school teams                                                 |
| **Medical**      | Primary care provider, team physician, emergency department, concussion specialist, neuropsychologist, other medical referrals | Rule out more serious injury  
                    Evaluate patient periodically  
                    Coordinate information from other teams  
                    Encourage physical and cognitive rest                                             |
| **School**       | Academic  
                   School nurse, school counselor, teachers, school psychologist, social worker, school administrator, school physician, school occupational or physical therapist | Reduce cognitive load  
                    Meet with patient to create academic adjustments  
                    Watch, monitor, and track academic and emotional issues                               |
| **School**       | Physical Activity  
                   Athletic trainer, school nurse, coach, physical education teacher, school physician, playground supervisor | Watch, monitor, and track physical symptoms  
                    Athletic trainer should do daily follow-up examinations  
                    Ensure no physical activity                                                       |
Collaboration

• School personnel and health care providers play important and cooperative roles

• School personnel provide expertise in developing the academic adjustments
  – Need guidance from the health care providers on the specific targets toward which they should direct the school supports

• Medical evaluation and the resulting student symptom profile is the first step to constructing the plan of accommodations and adjustments
Frequency of Communication with School Professionals

Kasamatsu, 2016
RTL Law Implementation

• Qualitative study of MA law implementation

  So...(the athletic trainer) does a good job with the paper work and the documentation and the communication between the two of us...I get an email from her all the time about...somebody had a head injury or a potential concussion.

• She’ll give me a heads up so that we have that information at school in the morning...when kids are here for class.

Doucette, 2016
Important Factors for CMT

• **Years of experience** (Valovich McLeod, 2014)
  – Important for building collaborative relationships and understanding the intricacies of concussion management, which includes AA

• **Employment model** (McLeod, 2015)
  – Employed directly by the school more likely to have policy and greater familiarity with AA
Importance of AT Access

• School counselors with AT access were more familiar with 504 and IEP (Johnson, 2017)
  – 53.2% vs. 28.3%

• School administrators with ATs agreed more strongly that they were knowledgeable about and were more confident in their knowledge regarding AA, RTL, and RTP criteria post-SRC (Johnson, 2016)

• AT employment was associated with more school administrators (Kasamatsu, 2016)
  – Reported AA provided to student-athletes following concussion (73.3% vs. 26.7%)
  – Reported existence of an established academic support team (78.7% vs. 21.3%)
Barriers to Collaboration

• Community physician knowledge (Williams, 2015; Kay, 2015; Sleight, 2015; Erickson, 2015; Doucette, 2016; Blackwell, 2016)

• Communication with physician (Doucette, 2016; Blackwell 2016)

• Lack of collaboration (Minthorn, 2014)
  – Only half of SNs with an AT have an established professional relationship

• Teacher knowledge and training (Lyons, 2016; Valovich McLeod, PRISM, 2017)

• Limited access to school counselors (Blackwell, 2016)
Areas of Improvement

Speech Language
- Better communication
- More training in TBI
- Improved access to assessment tools

School Nurses
- Communication (73%)
- Training (38%)
- Time (30%)
- Perception not SN role (15%)

School Nurses
- Communication
- Standardized protocols
- Education on managing younger patients
- Communication about non-sports concussions

Athletic Trainer
- Patient/Parent compliance
- Education
- Formal Policy
- Inconsistency between RTP and RTL

Duff, 2014
Wing, 2015
Blackwell, 2016
Welch Bacon, In Press
Policies to Aid Return to School
# Return-To-Learn Policy

<table>
<thead>
<tr>
<th>Secondary School</th>
<th>College</th>
</tr>
</thead>
</table>
| - 44% of ATs had RTL policy  
  (Kasamatsu, 2016) | - 66.6% of colleges had RTP policies  
  (Kerr, 2016) |
| - 24.3% address AA in written plan  
  (Heyer, 2015) | - 3.1% involved academic support |
| - 30% written policy  
  (Wing, 2015) | - 86.4% had RTL section  
  (Buckley, 2017) |
| - 12% had RTL Policy  
  (Lyons, 2016) |         |
Policies

Temporary Academic Adjustments

504 Plans

Individualized Education Plans (IEP)
<table>
<thead>
<tr>
<th>Type of Accommodation</th>
<th>Definition</th>
<th>Time frame</th>
<th>Implementation Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Adjustment</td>
<td>Non-formalized changes in environment</td>
<td>3-5 weeks</td>
<td>Informal negotiation with teachers and academic administrators</td>
</tr>
<tr>
<td>Academic Accommodation</td>
<td>Longer academic accommodation needs (i.e. alternative arrangements for standardized testing)</td>
<td>5 weeks – 4 months</td>
<td>504 Plan</td>
</tr>
<tr>
<td>Academic Modification</td>
<td>More prolonged changes necessary (special education)</td>
<td>&gt; 4- 6 months</td>
<td>Individualized Education Plan (IEP)</td>
</tr>
</tbody>
</table>
Symptom Wheel
Suggested Academic Adjustments

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

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

COGNITIVE:
- REDUCE workload in the classroom/homework
- REMOVE non-essential work
- REDUCE repetition of work (ie. 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 FEELING MORE:
- emotional
- nervous
- sad
- angry
- irritable

PHYSICAL
- headache/nausea
- dizziness/balance problems
- light sensitivity/blurred vision
- noise sensitivity
- neck pain

COGNITIVE TROUBLE WITH:
- concentration
- remembering
- mentally "foggy"
- slowed processing

SLEEP/ENERGY
- mentally fatigued
- drowsy
- sleeping too much
- sleeping too little
- can't initiate/maintain sleep

SLEEP/ENERGY:
- Allow for rest breaks in classroom or clinic (ie. "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/cg/40/6/return-to-learning.aspx
Healthcare Providers
- Athletic Trainers
- School Nurses
- Physicians
- Physician Assistants

School Personnel
- School Counselors
- Principals
- Superintendents
- Teachers
- Coaches

Concussion Management, Academic Adjustments
Knowledge, Management, Academic Adjustments
## AT Perceptions of AA

### Roles
- Initiate AA
- Facilitate AA
- Inconsistency in perceived role
- Understanding of AA
- Lack of a role regarding AA

### Procedures
- Formal policy
- Describes types of AA
- RTL progression
- AA management point person
- AA management personnel

### Challenges
- Parent/patient
- Compliance
- Lack of education/awareness
- School personnel
- Lack of formal policy
- Inconsistency between RTP and RTL

Kay, 2015; Sleight, 2015; Erickson, 2015 (abstracts)
Familiarity with 504s and IEPs

School Nurses

Physicians

PAs

ATs

Welch Bacon, 2016
School Personnel & AA

• School personnel felt minimally to moderately knowledgeable and confident in their knowledge

• Coaches had highest perceived knowledge and confidence
  – Past educational efforts regarding concussion have focused on coaches (Sarmiento, 2010)

• Educational efforts directed at school personnel are needed
  – Pediatric sports medicine providers can play a key role in facilitating education and collaboration

Valovich McLeod, PRISM, 2017
Predicting Factors

• Strong predictor of having RTL policy = frequent communication with teachers (Kasamatsu, 2016)
  – Presence of AT
  – Higher # of concussions managed annually Direct employed ATs

• Direct employed ATs (Williams, 2015)
  – More familiar with 504 plans and IEPs
  – Greater belief ATs should have role in AA
  – Years of experience and experience in SS correlated with greater familiarity with 504 and IEP
<table>
<thead>
<tr>
<th>Who?</th>
<th>Medical, School, Athletic, and Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>What?</td>
<td>Written Concussion Policy</td>
</tr>
<tr>
<td></td>
<td>Communication</td>
</tr>
<tr>
<td>When?</td>
<td>Preseason</td>
</tr>
<tr>
<td></td>
<td>In-season</td>
</tr>
<tr>
<td>Where?</td>
<td>School or district level</td>
</tr>
<tr>
<td></td>
<td>Athletic trainer, directing physician level</td>
</tr>
<tr>
<td>How?</td>
<td>In-services and educational sessions</td>
</tr>
<tr>
<td></td>
<td>Routine practice</td>
</tr>
</tbody>
</table>
Concussion Plan Components

- PPE
- Equipment
- Baseline
- Post-Injury Testing
- Return to School
- RTP
- Referral Sources
CMT trained for role

Initial medical evaluation

Medical – School Partnership

CMT translates symptom profile into AA

Student-specific MTBI management plan developed

Periodic in school monitoring of symptoms

Regular on-going communication between CMT

Gioia, 2016
Acute Concussion Evaluation (ACE)

www.cdc.gov/concussion
Returning to School (Continued)

Until you (or your child) have fully recovered, the following supports are recommended: (check all that apply)

__ No return to school. Return on (date)__________________________

__ Return to school with following supports. Review on (date)__________________________

__ Shortened day. Recommend ___ hours per day until (date)__________________________

__ Shortened classes (i.e., rest breaks during classes). Maximum class length: ______ minutes.

__ Allow extra time to complete coursework/assignments and tests.

__ Lessen homework load by ________ %. Maximum length of nightly homework: ______ minutes.

__ No significant classroom or standardized testing at this time.

__ Check for the return of symptoms (use symptom table on front page of this form) when doing activities that require a lot of attention or concentration.

__ Take rest breaks during the day as needed.

__ Request meeting of 504 or School Management Team to discuss this plan and needed supports.

Returning to Sports

1. **You should NEVER return to play if you still have ANY symptoms** — (Be sure that you do not have any symptoms at rest and while doing any physical activity and/or activities that require a lot of thinking or concentration.)

2. Be sure that the PE teacher, coach, and/or athletic trainer are aware of your injury and symptoms.

3. It is normal to feel frustrated, sad and even angry because you cannot return to sports right away. With any injury, a full recovery will reduce the chances of getting hurt again. It is better to miss one or two games than the whole season.

The following are recommended at the present time:

__ Do not return to PE class at this time

__ Return to PE class

__ Do not return to sports practices/games at this time

__ Gradual return to sports practices under the supervision of an appropriate health care provider (e.g., athletic trainer, coach, or physical education teacher).

- Return to play should occur in **gradual steps** beginning with aerobic exercise only to increase your heart rate (e.g., stationary cycle) moving to increasing your heart rate with movement (e.g., running); then adding controlled contact if appropriate; and finally return to sports competition.

- Pay careful attention to your symptoms and your thinking and concentration skills at each stage of activity. Move to the next level of activity only if you do not experience any symptoms at the each level. If your symptoms return, let your health care provider know, return to the first level, and restart the program gradually.

Gradual Return to Play Plan

1. No physical activity

2. Low levels of physical activity (i.e., **symptoms do not come back during or after the activity**). This includes walking, light jogging, light stationary biking, light weightlifting (lower weight, higher reps, no bench, no squat).

3. Moderate levels of physical activity with body/head movement. This includes moderate jogging, brief running, moderate-intensity stationary biking, moderate-intensity weightlifting (reduced time and/or reduced weight from your typical routine).

4. Heavy non-contact physical activity. This includes sprinting/running, high-intensity stationary biking, regular weightlifting routine, non-contact sport-specific drills (in 3 planes of movement).

5. Full contact in controlled practice.

6. Full contact in game play.

*Neuropsychological testing can provide valuable information to assist physicians with treatment planning, such as return to play decisions.*
Concussion Signs and Symptoms Checklist

Student's Name: ___________________ Student's Grade: ___________ Date/Time of Injury: ___________

Where and How Injury Occurred: (Be sure to include cause and force of the hit or blow to the head.)

Description of Injury: (Be sure to include information about any loss of consciousness and for how long, memory loss, or seizures following the injury, or previous concussions, if any. See the section on Slanger Signs on the back of this form.)

DIRECTIONS:

Use this checklist to monitor students who come to your office with a head injury. Students should be monitored for a minimum of 30 minutes. Check for signs or symptoms when the student first arrives at your office, fifteen minutes later, and at the end of 30 minutes.

Students who experience one or more of the signs or symptoms of concussion after a bump, blow, or jolt to the head should be referred to a health care professional with experience in evaluating for concussion. For those instances when a parent is coming to take the student to a health care professional, observe the student for any new or worsening symptoms right before the student leaves. Send a copy of this checklist with the student for the health care professional to review.

<table>
<thead>
<tr>
<th>OBSERVED SIGNS</th>
<th>0 MINUTES</th>
<th>15 MINUTES</th>
<th>30 MINUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appears dazed or stunned</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Is confused about events</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Repeats questions</td>
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<tr>
<td>Answers questions slowly</td>
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<tr>
<td>Can't recall events prior to the hit, bump, or fall</td>
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<tr>
<td>Can't recall events after the hit, bump, or fall</td>
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<tr>
<td>Loses consciousness (even briefly)</td>
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<tr>
<td>Shows behavior or personality changes</td>
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<tr>
<td>Forgets class schedule or assignments</td>
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</tr>
</tbody>
</table>

PHYSICAL SYMPTOMS
- Headache or “pressure” in head
- Nausea or vomiting
- Balance problems or dizziness
- Fatigue or feeling tired
- Blurry or double vision
- Sensitivity to light
- Sensitivity to noise
- Numbness or tingling
- Does not “feel right”

COGNITIVE SYMPTOMS
- Difficulty thinking clearly
- Difficulty concentrating
- Difficulty remembering
- Feeling more slowed down
- Feeling sluggish, hazy, foggy, or groggy

EMOTIONAL SYMPTOMS
- Irritable
- Sad
- More emotional than usual
- Nervous

To download this checklist in Spanish, please visit: www.cdc.gov/Concussion.
Para obtener una copia electrónica de esta lista de síntomas en español, por favor visite: www.cdc.gov/Concussion.
# Cognitive Activity Monitoring (CAM) Log

<table>
<thead>
<tr>
<th>Name</th>
<th>Parent/Teacher</th>
<th>Date</th>
<th>Time</th>
<th>Location (circle one)</th>
<th>Cognitive Activity</th>
<th>Duration</th>
<th>Symptom (PRE/POST)</th>
<th>Rate 0-10</th>
<th>Rate 0-10</th>
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<td>Home</td>
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<td>PRE-POST DIFFERENCE</td>
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</tbody>
</table>
Return to School Strategy

Daily activities at home that do not give the child symptoms

School activities

Return to school part-time

Return to school full time

McCrory, 2017
<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Activity Level</th>
<th>Criteria to Move to Next Stage</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>
</tr>
<tr>
<td>1</td>
<td>Return to School, Partial Day (1-3 hours)</td>
<td>Attend 1-3 classes, with interspersed rest breaks. Minimal expectations for productivity. No tests or homework.</td>
<td>To Move To Stage 2: Student symptom status improving, able to tolerate 4-5 hours of activity with 2-3 cognitive rest breaks built into school day.</td>
</tr>
<tr>
<td>2</td>
<td>Full Day, Maximal Supports (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: Number &amp; severity of symptoms improving, needs only 1-2 cognitive rest breaks built into school day.</td>
</tr>
<tr>
<td>3</td>
<td>Return to Full Day, Moderate Supports (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>
</tr>
<tr>
<td>4</td>
<td>Return to Full Day, Minimal Supports (Monitoring 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>
</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>
</tr>
</tbody>
</table>

Reproduced with permission, G. Gioia, 2014.
Table 1  Graduated return-to-sport (RTS) strategy

<table>
<thead>
<tr>
<th>Stage</th>
<th>Aim</th>
<th>Activity</th>
<th>Goal of each step</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Symptom-limited activity</td>
<td>Daily activities that do not provoke symptoms</td>
<td>Gradual reintroduction of work/school activities</td>
</tr>
<tr>
<td>2</td>
<td>Light aerobic exercise</td>
<td>Walking or stationary cycling at slow to medium pace. No resistance training</td>
<td>Increase heart rate</td>
</tr>
<tr>
<td>3</td>
<td>Sport-specific exercise</td>
<td>Running or skating drills. No head impact activities</td>
<td>Add movement</td>
</tr>
<tr>
<td>4</td>
<td>Non-contact training drills</td>
<td>Harder training drills, eg, passing drills. May start progressive resistance training</td>
<td>Exercise, coordination and increased thinking</td>
</tr>
<tr>
<td>5</td>
<td>Full contact practice</td>
<td>Following medical clearance, participate in normal training activities</td>
<td>Restore confidence and assess functional skills by coaching staff</td>
</tr>
<tr>
<td>6</td>
<td>Return to sport</td>
<td>Normal game play</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: An initial period of 24–48 hours of both relative physical rest and cognitive rest is recommended before beginning the RTS progression. There should be at least 24 hours (or longer) for each step of the progression. If any symptoms worsen during exercise, the athlete should go back to the previous step. Resistance training should be added only in the later stages (stage 3 or 4 at the earliest). If symptoms are persistent (e.g., more than 10–14 days in adults or more than 1 month in children), the athlete should be referred to a healthcare professional who is an expert in the management of concussion.

~24 hours between each stage
Rest and Return-to-Activity Following Sport-Related Concussion: 
A Systematic Review of the Literature

1. How often are cognitive and physical rest, including academic adjustments, utilized by health care providers in managing sport-related concussion?
2. In patients sustaining a concussion, does the use of physical and cognitive rest reduce the severity and duration of concussion-related impairments?
3. How compliant are healthcare providers in following current return-to-activity guidelines?
4. How effective are the graded return-to-activity protocols in improving patient outcomes following concussion?

Compliance With Return to Activity Guidelines

• No study found full compliance with using all three recommended areas of concussion-assessment for return-to-play
  – Symptoms, cognitive, balance
• Significant variability among guideline use by physicians
  – Clinical exam cited most for RTA clearance
• Lack of compliance with NCAA guidelines
• Inadequate ED discharge instructions regarding activity restrictions

Effectiveness of RTA Progression

• No studies specifically evaluated the effectiveness of graded RTA progressions in improving patient outcomes
  – 4 studies evaluated aspects of Zurich statement

• Zurich guidelines + BCTT may provide a useful paradigm for making safe RTA decisions (Darling, 2014)

• Use of a SFWP did not improve clinical outcomes or decrease the risk of a same-season repeat concussion (McCrea, 2009)
Comprehensive Concussion Management

RETURN TO PLAY

RETURN TO LEARN

BEFORE
ATSU-CHC Concussion Collaboration

• Community-based youth concussion management
  – Development of ATSU Concussion Toolkit
  – Assessment of concussion knowledge
    • CHC providers
    • SBHC personnel
  – Educational Intervention
  – Post-educational assessment
Community Health Center BAKPAC Project
Dr. Joy Lewis
Dr. Cailee Welch Bacon
Ms. Kate Whelihan
Dr. Aaron Allgood
Dr. Isaac Navarro
Dr. Tamara Valovich McLeod

Information Sheets and Sample Correspondence for Providers, Patients and Families
## ATSU Concussion Toolkit

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<td>Academic Adjustments -- Full Letter (Provider Information)</td>
</tr>
<tr>
<td>3a - 3b</td>
<td>Academic Adjustments -- Generic Letter (Provider Information)</td>
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<td>4</td>
<td>Physical Rest &amp; Return-to-Activity (Provider Information)</td>
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<tr>
<td>5</td>
<td>Return-to-Activity Progression -- Full Letter (Provider Information)</td>
</tr>
<tr>
<td>6</td>
<td>Return-to-Activity Progression -- Generic Letter (Provider Information)</td>
</tr>
<tr>
<td>7</td>
<td>Return to Full Practice -- Full Letter (Provider Information)</td>
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<td>Return to Full Practice -- Generic Letter (Provider Information)</td>
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<td>9a</td>
<td>Mild Head Injury &amp; Concussion -- Patient &amp; Family Information Sheet #1</td>
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<tr>
<td>9b</td>
<td>Mild Head Injury &amp; Concussion -- Patient &amp; Family Information Sheet #2</td>
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<td>9c</td>
<td>Mild Head Injury &amp; Concussion -- Patient &amp; Family Information Sheet #3 (Return-to-Learning)</td>
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<td>9d</td>
<td>Mild Head Injury &amp; Concussion -- Patient &amp; Family Information Sheet #4 (Return-to-Activity)</td>
</tr>
<tr>
<td>10</td>
<td>Workout Diary (Patient and Family)</td>
</tr>
</tbody>
</table>
Physical rest and return-to-activity

Information for the Provider

Six-step return-to-activity protocol

As the student’s symptoms improve, he/she will be able to begin the six-step return-to-activity protocol.

The return-to-activity protocol is a medically supervised stepwise process which involves a gradual increase in activity intensity and duration over the course of several (4-6) days.

The six-step protocol may begin with complete rest until the symptoms subside, or you may clear the patient to begin starting at Stage 2. The student requires full return to school before he/she can start the return-to-activity protocol. As symptoms improve and he/she is able to increase the amount of activity without symptoms worsening, he/she then may progress through the next steps. This will include a gradual increase in physical demands, sports-specific activities and eventually physical contact. The final stage is clearance to return to full-contact sports activities and then normal game play. Medical clearance is required for a child to move from stage 4 to stage 5.

It is recommended that children do not return to full-contact activity until they are:

- Completely symptom free
- Remain symptom free after resuming a full school day
- Remain symptom free after progressing through Steps 1 through 4 of the return-to-activity protocol
- Return to baseline on adjunct assessment tools, if applicable
- Receive written clearance from a qualified medical provider, as dictated by your state’s concussion laws

Sample clearance letters can be found on the following pages: "Return-to-Activity Progression" and "Return to Full-Contact Practice." You may use these for your patients to provide to their school administration.

The six steps involved in the return-to-activity protocol are:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Functional Exercise</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No activity</td>
<td>Complete physical &amp; cognitive rest</td>
<td>Recovery</td>
</tr>
<tr>
<td>2. Light aerobic exercise</td>
<td>Walking, swimming or stationary cycling keeping intensity &lt;70% maximum predicted heart rate. No resistance training</td>
<td>Increase heart rate</td>
</tr>
<tr>
<td>3. Sport-specific exercise</td>
<td>Skating drills in ice hockey, running drills in soccer. No head impact activities.</td>
<td>Add movement</td>
</tr>
<tr>
<td>4. Non-contact training drills</td>
<td>Progression to more complex training drills, e.g. passing drills in football and ice hockey. May start progressive resistance training.</td>
<td>Exercise, coordination and cognitive load</td>
</tr>
<tr>
<td>5. Full contact practice</td>
<td>Following medical clearance, participate in normal training activities</td>
<td>Restore confidence and assess functional skills by coaching staff</td>
</tr>
<tr>
<td>6. Normal game play</td>
<td>--</td>
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</tbody>
</table>

Note: Each step should take a minimum of 24 hours. If symptoms return at any stage, the student should drop back to the previous level and progress after 24 hours of symptom-free rest.

For additional information please visit: http://www.atsconcussion.com

Reference:
RETURN-TO-ACTIVITY PROGRESSION

Date:
RE:
DOB:

To whom it may concern:

____________________ is under my care for medical condition which requires him/her to be monitored prior to returning to activity.

On this date, he/she met the following required criteria for return to activity:

☐ Has returned to school full time without the need for continued academic adjustments.

☐ Has no symptoms at rest or during the school day.

Additional information, if baseline assessment tests are available:

☐ Adjunct assessment tools (e.g. neurocognitive, balance, oculomotor function) have returned to baseline levels or above.

He/she may start at Stage _____ (of 6) on the attached Return-to-Activity document. To advance to the next stage, he/she must be able to do activities required at that stage of the progression at 100 percent without symptoms or problems for 24 hours. If any symptoms return, it means the brain is not ready for the next stage. He/she can try the activities at the next stage again when he/she has had no symptoms for 24 hours.

This letter does not provide clearance to return to full contact practice or competition. He/she needs to follow up with me as needed and to determine appropriate final clearance for competition.

Please contact me if you have any questions.

Sincerely,
Return to the Classroom

BEFORE

Return to Sports
Take Home Points

• Clinicians need to balance rest and activity
• Policies should include management of academics and return to school
• Delineation of roles and responsibilities should be written in policy
• Concussion management should be collaborative
• Patients should follow a gradual return to school protocol