
# Concussion Management 2018

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# Disclosures

none

**UNC coach says softening of football could bring down America and military**

- 'Our game is under attack' laments UNC coach Larry Fedora
- Fedora warns softening of football threatens America's future

# Objectives

consensus highlights/topic updates

office evaluation

treatment options

how to refer to sports medicine

non-sports concussions

Epic phrases and GW forms

Practice skills

# Concussion Questions…

**How many Gs?**

**How many is too many?**

**Is too much rest a bad thing?**

**Can they go back in the game?**

**Risk for other injuries?**

**Will I get CTE?**

**How long will my symptoms last?**

**How important is neuropsych testing?**

# Epidemiology

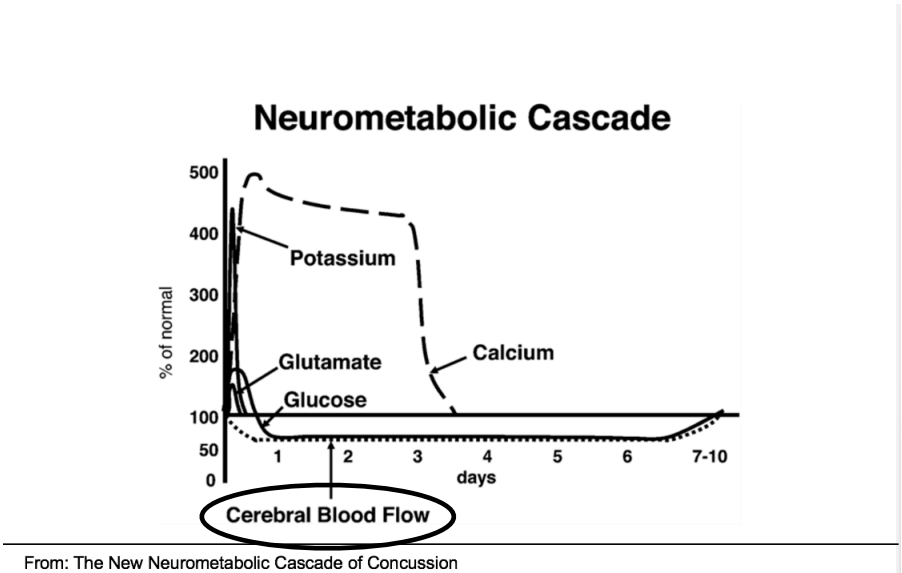
2005-2009 2 million outpatient visits, 3 million ED visits (CDC 2018) - improved recognition/reporting

Prognosis: adults 10-14 days, children 4 weeks (McCrory 2017)

30% experience post-concussive symptoms > 4wks (Babcock 2013, McCrea 2013)

Nelson L, La Roche A, Prospective, Head-to-Head Study of Three Computerized Neurocognitive Assessment Tools (CNTs): Reliability and Validity for the Assessment of Sport-Related Concussion.Journal of the International Neuropsychological Society (2016), 22, 24–37

# Concussion Cascade




From: The New Neurometabolic Cascade of Concussion
Neurosurgery. 2014;75(suppl_4):S24-S33. doi:10.1227/NEU.0000000000000505

## Key Recommendations from the CDC Pediatric mTBI Guideline:

1. Do not routinely image patients to diagnose mTBI.
2. Use validated, age-appropriate symptom scales to diagnose mTBI.
3. Assess evidence-based risk factors for prolonged recovery.
4. Provide patients with instructions on return to activity customized to their symptoms.
5. Counsel patients to return gradually to non-sports activities after no more than 2-3 days of rest.

Lumbra-Brown A., Yeates K. et al. Centers for disease control and prevention guideline on the diagnosis and management of mild traumatic brain injury among children. JAMA Pediatr, September 4, 2018

# Computerized Neuropsychological Testing

ANAM, Axon Sports/Cogstate Sport, and ImPACT

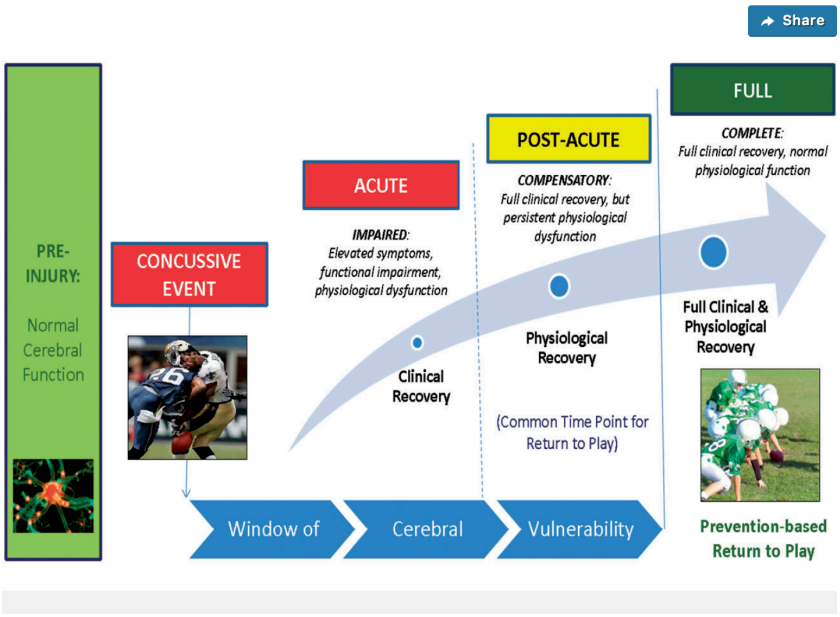
High school and collegiate athletes completed two CNTs each at baseline.

Concussed (n = 165) and matched non-injured control (n = 166) subjects repeated testing within 24 hr and at 8, 15, and 45 days post-injury

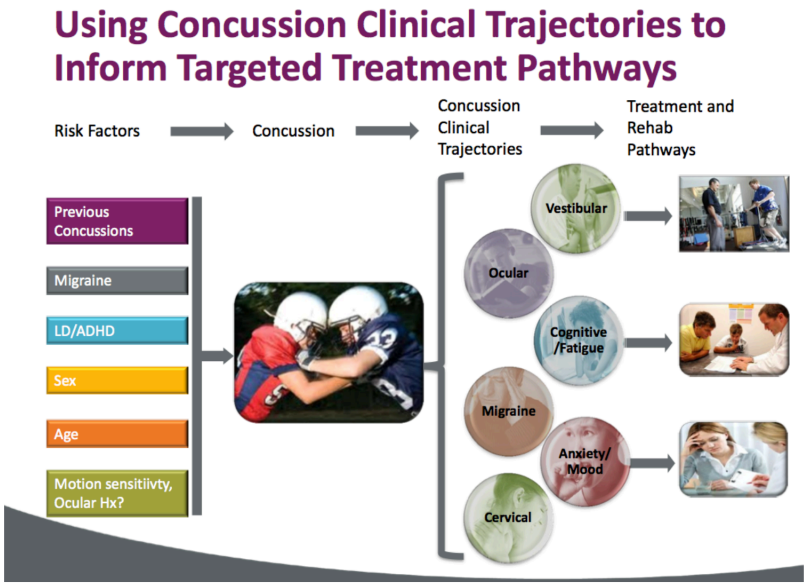
Test–retest reliability was similar among these three CNTs and **below** optimal standards for clinical use on many subtests

Group differences in performance were mostly moderate to large at 24 hr and small by day 8

# Clinical vs Physiologic Recovery




# Concussion Trajectories




Source: "A comprehensive, targeted approach to the clinical care of athletes following sport-related concussion"

# Equipment

**Virginia Tech Helmet Ratings** https://helmet.beam.vt.edu


Mouthguards do not protect against concussion

Skull sensors still unreliable

Q Collar still under testing and not available

# CTE

Degenerative brain disorder

characteristic tau deposition

symptoms develop years after insults

? co-morbidities

addiction, depression

diagnose postmortem

Increased safety of current game

youth changes

# Acute Concussion Evaluation

Epic smartphrase .ACUTECONCUSSION

Post-Concussion Symptom Scale

Standardized Assessment of Concussion (SAC)

Cervical Screen

Balance Screen

Vestibular-Ocular Screen

Youtube - Duke Neurology: Clinical Evaluation of the Athlete with Concussion

# Common Symptoms

**TABLE 1**

**Concussion: Signs, symptoms, and risks[8-10]**

| Common signs and symptoms | Risk factors for concussion or prolonged course |
|---|---|
| • Headache | • Female gender |
| • Dizziness | • History of migraine/chronic headache |
| • Light/noise sensitivity | • Learning disabilities |
| • Difficulty sleeping | • ADHD |
| • Difficulty concentrating | • Mood disorder |
| • Emotional lability | • Prior concussion |
| • Imbalance | • Greater number/severity of symptoms |
| • Amnesia | • Loss of consciousness >1 min |
| • Confusion | • Post-traumatic amnesia |
| • Fatigue | • Younger age |

ADHD, attention deficit hyperactivity disorder.

Sprouse, Harris, et al. JFP August, 2016

# Red Flags to Consider ED

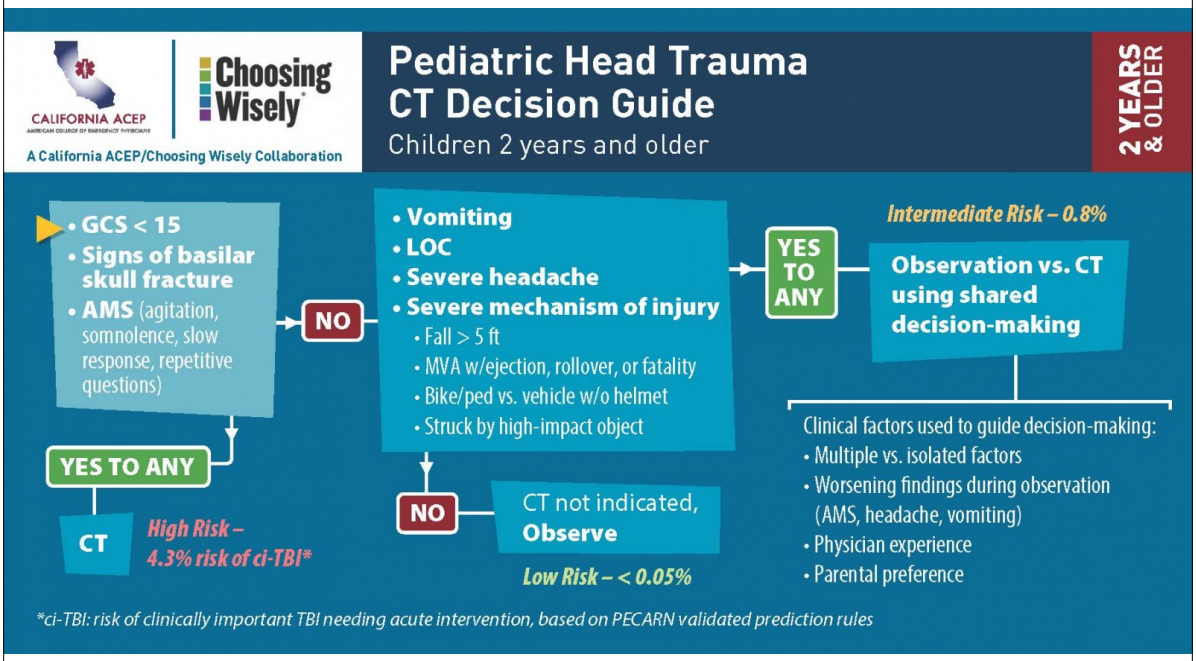
**TABLE 3**

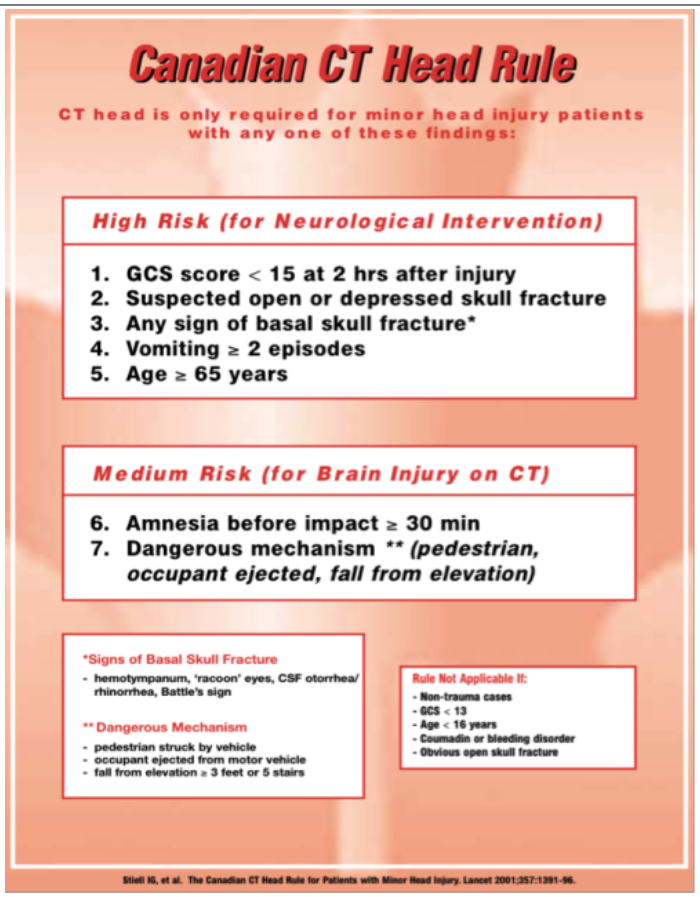
## Red flags that further testing is needed[8-10]

- Focal neurologic deficits
- Loss of consciousness >1 minute
- Neck pain/injury
- Persistent disorientation
- Persistent nausea/vomiting
- Seizure
- Worsening headache

Sprouse, Harris, et al. JFP August, 2016

# PECARN






# Differential Diagnosis

Intracranial injury

skull fracture

hypoglycemia

heat illness

cervical injury

seizure

syncope

migraine

psychiatric illness

malingering

dehydration

# Clinical Examination

- Cognitive
- Cranial Nerves
- Cervical
- Balance
  - **Timed Tandem Gait**
  - Sway app
  - BESS
- VOMS
  - King-Devick
  - Smooth Pursuit
  - Saccades
  - Convergence
  - VOR
  - Visual Motion Sensitivity

# Cognitive - SAC

- Orientation
- Immediate recall
- Concentration (Digits backwards)
- Months backwards
- Delayed Recall
- WORLD backwards
- Serial 7s


"You'd better sit out the rest of the game. You might have a concussion."

# Cervical

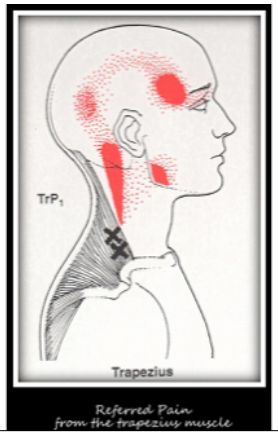
pain, weakness, paresthesia

Palpation **midline** and for referred pain and headaches possible from trigger points in upper trap, SCM, etc

Check ROM and isometric strength

Upper extremity neuro exam

R/O cervical instability


# Balance

Timed Tandem Gait

quick screen

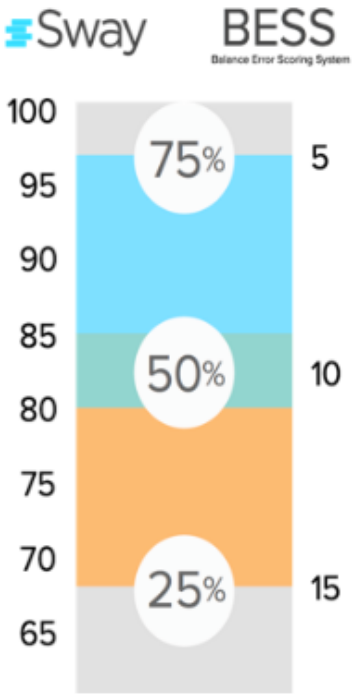
Sway balance app

uses iPhone accelerometer

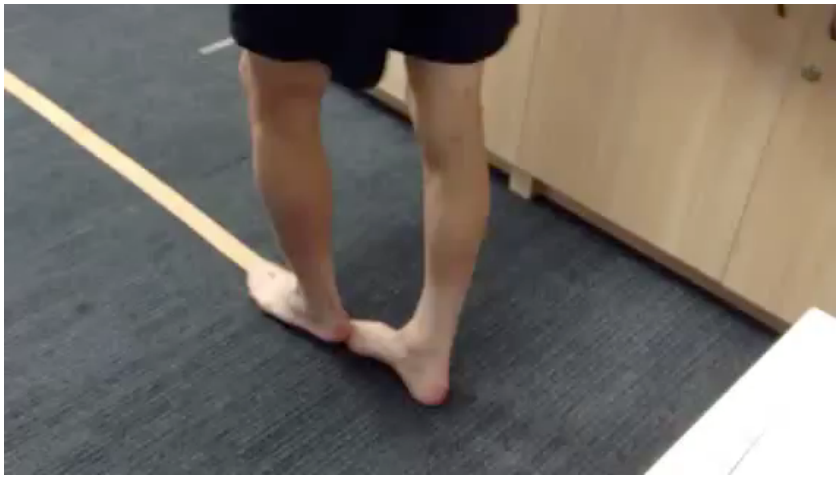
has reaction time component

Balance Error Scoring System

rater experience may affect score



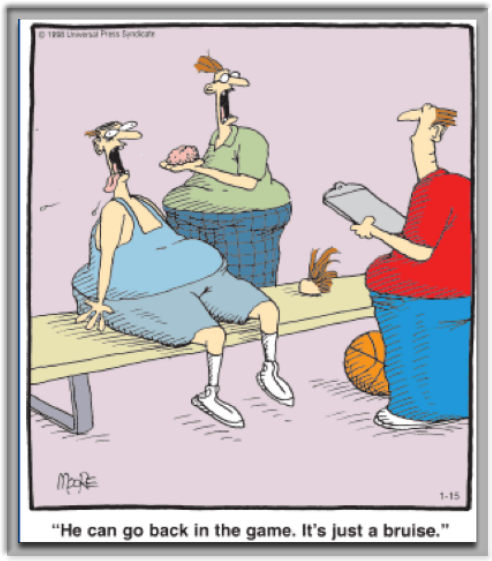
# Timed Tandem Gait



3m line, hands on hips, <14 seconds, no errors

# Vestibular-Oculomotor Screen (VOMS)

- Smooth Pursuit
- Saccades
- Convergence
- VOR
- Visual Motion Sensitivity



Smooth Pursuit

Horizontal Saccades

# Vertical Saccades

# Near Point of Convergence

Patient focuses on target as you bring object closer to nose. Report when double vision

Greater than 6cm = abnormal

May have difficulty with focusing on targets and reading

# Horizontal/Vertical VOR and Visual Motion Sensitivity

# Post-Concussion Care Recommendations

Early Home Care Instructions

Return to Learn Recommendations

Return to Work Recommendations

Referrals for Sports Related Concussions

Referrals for Non-Sports Related Concussions

# Early Home Care Instructions

## What to Do After a Suspected Concussion?

**Physical Activity:** Should be limited immediately following a concussion. Returning to activity too soon can cause symptoms to worsen or last longer. Consult with a concussion specialist to determine when you can safely return to activity.

**Schoolwork:** If reading and schoolwork cause increased symptoms, these activities should be limited. Student-athletes may also need to stay home from school to avoid busy and noisy environments.

**Screen Time:** Limit the use of phones, computers, tablets, or televisions to avoid a potential increase in symptoms.

**Sleep:** You may need more sleep immediately after a concussion. However, it is recommended to try to get on a normal sleeping routine within a few days. (Generally it is better to allow concussed individuals to sleep rather than waking them up frequently.)

**Medicines:** Use of medicines is NOT recommended following a concussion. If medicine must be used for MILD pain/headache, acetaminophen may be given. Do not give ibuprofen or aspirin. Consult with your physician for questions about additional medicines.

**Driving:** Do not drive until cleared by physician.

**Supervision:** Individuals with suspected concussions should **not** be left alone.

*If athlete complains that headache is worsening in severity, has uncontrolled vomiting, or begins to have difficulty recognizing familiar people or places, call 9-1-1 or take them directly to the Emergency Room for immediate evaluation.*

# Symptom Management

**TABLE 4**

## Managing symptoms[8-10]

| Symptom | Management |
|---|---|
| Headache | Acetaminophen (<3 days) |
| Nausea | Ondansetron (<3 days) |
| Dizziness | Vestibular rehabilitation |
| Insomnia | Sleep hygiene, melatonin |
| Neck pain | Ice, heat, massage |
| Light sensitivity | Sunglasses |
| Noise sensitivity | Ear protection |

Sprouse, Harris, et al. JFP August, 2016

# Questions?

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# NC State Laws/Requirements

Gfeller-Waller Concussion Awareness Act

Department of Public Instruction (DPI) - Concussion Monitoring and Management in Public Schools

NCHSAA - Forms and guidance for implementation of state laws

# Gfeller-Waller Concussion Awareness Act

Signed into law June 16, 2011, effective 2011-2012 school year

1. Education

2. Emergency action and post-concussion protocol implementation

3. Clearance/RTP or practice following concussion

# Gfeller-Waller Paperwork

***All NCHSAA member school student-athletes diagnosed with a concussion are STRONGLY RECOMMENDED to have input and signature from a physician (MD/DO who is licensed under Article 1 of Chapter 90 of the General Statutes and has expertise and training in concussion management) before being cleared to resume full participation in athletics.*** *Due to the need to monitor concussions for recurrence of signs & symptoms with cognitive or physical stress, Emergency Room and Urgent Care physicians should not make clearance decisions at the time of first visit.* All medical providers are encouraged to review the CDC site if they have questions regarding the latest information on the evaluation and care of the scholastic athlete following a concussion injury. *Providers should refer to NC Session Law 2011-147, House Bill 792 Gfeller-Waller Concussion Awareness Act for requirements for clearance, and please initial any recommendations you select.* (Adapted from the Acute Concussion Evaluation (ACE) care plan (http://www.cdc.gov/concussion/index.html) and the NCHSAA concussion Return to Play Protocol.) The recommendations indicated below are based on today's evaluation.

RETURN TO SCHOOL:

PLEASE NOTE

1. The North Carolina State Board of Education approved "Return-To- Learn after Concussion" policy to address learning and educational needs for students following a concussion.
2. A sample of accommodations is found on the **LHCP Concussion Return to Learn Recommendations** page.

SCHOOL (ACADEMICS):
(LHCP identified below should check all recommendations that apply.)

- ☐ Out of school until _____/_____/20_____ (date). LHCP Initial: _____ Date: _____
- ☐ Return for further evaluation on _____/_____/20_____ (date). LHCP Initial: _____ Date: _____
- ☐ May return to school on _____/_____/20_____ (date) with accommodations as selected on the **LHCP Concussion Return to Learn Recommendations** page. LHCP Initial: _____ Date: _____
- ☐ May return to school now with no accommodations needed. LHCP Initial: _____ Date: _____

RETURN TO SPORTS:

PLEASE NOTE

A step-by-step progression of physical and cognitive exertion is widely accepted as the appropriate approach to ensure a concussion has resolved, and that a student-athlete can return to athletics safely. The **NCHSAA Concussion Return to Play (RTP) Protocol**, therefore, has been designed using a step-by-step progression and is **REQUIRED** to be completed in its entirety by any concussed student-athlete before they are released to full participation in athletics.

SPORTS & PHYSICAL EDUCATION:
(LHCP identified below should check all recommendations that apply.)

- ☐ Not cleared for sports at this time.
- ☐ Not cleared for physical education at this time.
- ☐ May do light physical education that poses no risk of head trauma such (i.e. walking laps).
- ☐ May start RTP Protocol under appropriate monitoring and may return to PE activities after completion.
- ☐ Must return to the examining LHCP for clearance before returning to sports/physical education.
- ☐ May start the RTP Protocol under monitoring of **First Responder**. The examining LHCP must review progress of student-athlete through stage 4 and before beginning stage 5 either electronically, by phone, or in person and an additional office visit is not required unless otherwise indicated by the LHCP. If the student-athlete has remained free of signs/symptoms after stage 5 is completed, the LHCP must then sign the **RETURN TO PLAY FORM** before the student-athlete is allowed to resume full participation in athletics.
- ☐ May start the RTP Protocol under monitoring of **LHCP** and progress through all five stages with no office contact necessary unless required by examining LHCP. If student-athlete remains free of signs/symptoms the LHCP must sign the **RETURN TO PLAY FORM** before the student-athlete is allowed to resume full participation in athletics.

Comment: _____

# Concussion Monitoring and Management in Public Schools

October 2015, NC State Board of Education approved policy HRS-E-001, titled *Return-to-Learn After Concussion*

Wider reaching - all students not just student-athletes

Focused on academic supports following concussion

Became effective in 2016-2017 academic year

# Concussion Monitoring (cont.)

Each Local Education Agency (LEA) and charter school must develop a plan addressing needs for students suffering concussions (pre-school to 12th)

- Guidelines for removal from activity (physical or mental)
- Notification procedure to education staff regarding removal
- Expectations regarding updates to medical care plan/school accommodations
- Delineation of requirements for safe RTL/RTP

Annual staff training on concussion and brain injuries

Include question related to head injury/concussion on student health history and emergency medical information

# Recommendations

Recommendations/Supports —> Accommodations —> Modifications

Accommodations level the playing field.
Modifications change the field you are playing on.

**Return to school with the following supports:**

**Length of Day**

__ Shortened day. Recommended ____ hours per day until re-evaluated or (date) _____.
__ ≤ 4 hours per day in class (consider alternating days of morning/afternoon classes to maximize class participation)
__ Shortened classes (i.e. rest breaks during classes). Maximum class length of _____ minutes.
__ Use _____ class as a study hall in a quiet environment.
__ Check for the return of symptoms when doing activities that require a lot of attention or concentration.

**Extra Time**

__ Allow extra time to complete coursework/assignments and tests.
__ Take rest breaks during the day as needed (particularly if symptoms recur).

**Homework**

__ Lessen homework by _____ % per class, or _____ minutes/class; or to a maximum of _____ minutes nightly, no more than _____minutes continuous.

# Recommendations (cont.)

**Testing**

__ No significant classroom or standardized testing at this time, as this does not reflect the patient's true abilities.
__ Limited classroom testing allowed. No more than _____ questions and/or _____ total time.
    __ Student is able to take quizzes or tests but no bubble sheets.
    __ Student able to take tests but should be allowed extra time to complete.
__ Limit test and quiz taking to no more than one per day.
__ May resume regular test taking.

**Vision**

__ Lessen screen time (SMART board, computer, videos, etc.) to a maximum _____ minutes per class AND no more than _____ continuous minutes (with 5-10 minute break in between). This includes reading notes off screens.
__ Print class notes and online assignments (14 font or larger recommended) to allow to keep up with online work.
__ Allow student to wear sunglasses or hat with bill worn forward to reduce light exposure.

**Environment**

__ Provide alternative setting during band or music class (outside of that room).
__ Provide alternative setting during PE and/or recess to avoid noise exposure and risk of injury (out of gym).
__ Allow early class release for class transitions to reduce exposure to hallway noise/activity.
__ Provide alternative location to eat lunch outside of cafeteria.
__ Allow the use of earplugs when in noisy environment.
__ Patient should not attend athletic practice
__ Patient is allowed to be present but not participate in practice, limited to ___ hours

TABLE 1.

## Return-to-Learn Plan

| Stage | Activity | Objective |
|---|---|---|
| No activity | Complete cognitive rest — no school, no homework, no reading, no texting, no video games, no computer work. | Recovery |
| Gradual reintroduction of cognitive activity | Relax previous restrictions on activities and add back for short periods of time (5-15 minutes at a time). | Gradual controlled increase in subsymptom threshold cognitive activities. |
| Homework at home before school work at school | Homework in longer increments (20-30 minutes at a time). | Increase cognitive stamina by repetition of short periods of self-paced cognitive activity. |
| School re-entry | Part day of school after tolerating 1-2 cumulative hours of homework at home. | Re-entry into school with accommodations to permit controlled subsymptom threshold increase in cognitive load. |
| Gradual reintegration into school | Increase to full day of school. | Accommodations decrease as cognitive stamina improves. |
| Resumption of full cognitive workload | Introduce testing, catch up with essential work. | Full return to school; may commence Return-to-Play protocol (see Step 2 in Table 2). |

*Source: Master CL, Gioia GA, Leddy JJ, Grady MF*

**TABLE 4** Graduated progression of return to play

| Stage | Activity | Object |
|---|---|---|
| No activity | None | Recovery |
| Light aerobic exercise | Walking, swimming, stationary bike. No resistance training. | Increase heart rate |
| Sport-specific exercise | Running soccer drills. No head impact activities (ie, skating). | Movement |
| Noncontact training drills | More complex training. Progressive resistance training (ie, shooting drill, noncontact plays). | Exercise, coordination, cognitive load |
| Full contact practice | After medical clearance. Full activities (ie, full scrimmage in practice). | Assess function |
| Return to play | Normal play (ie, full game play). | Assess function |

Information from McCrory P, et al.[5]

# Duke Sports Concussion Clinic

Established 2014

Initial clinic evaluation performed by PCSM physician

Mission Statement: To extend world class care of SRC through innovative research, education, baseline testing, rapid access, evidence-based evaluations, and multi-disciplinary treatment.

Collaborations with outreach schools in DPS, OCS, WCS as well as local sports clubs/organizations

# Assessments

Post-Concussion Symptom Scale

Cervical Screen

Standardized Assessment of Concussion (SAC)

King-Devick

Vestibular-Ocular Motor Screen (VOMS)

Sway Balance assessment (with reaction time)

Senaptec Visual screening

Neurocognitive Testing (if indicated)

Cardiovascular (if indicated)

# Multi-Disciplinary Team - Medical

Physical Therapy

Vision Clinic/Rehabilitation

Neuropsychology

Neurology

Occupational Therapy

Speech-Language Pathology

Audiology


# Return to Learn Difficulties

Neuropsychology: Behavioural changes, depression, anxiety - formalized testing to identify neurocognitive deficits

Occupational Therapy: Difficulty with environmental factors - lights, noises, busy environments, schedule management, planning/organizing

Speech-Language Pathology: Learning and processing difficulty, cognitive fatigue - Attention, memory, comprehension

# Vision Correlates

Abnormal vision findings may contribute to:

- headaches with persistent reading/focusing
- attention difficulties
- difficulty with comprehension

Consider referral to Eye Center for vision evaluation

# Support Team - Academic

Athletic Trainers

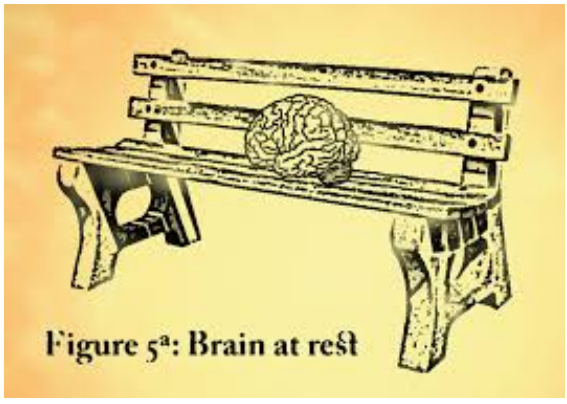
Guidance Counselors

Athletic Directors

Coaches

First Responders

Parents/Family



# Referrals for Sports-Related Concussions

Contact Duke Sports Injury and Concussion Hotline **@919-660-4117**

if voicemail, be sure to leave message

Required information: Patient Name, DOB, contact phone number

If available, include MRN

If Medicaid, need contact info for patient's PCP/pediatrician to get authorization for appointment

# Non-Sports Related Concussion Referrals

For acute pediatric cases (up to 18yo): referral to pediatrician for follow-up management

For pediatric cases (up to 18yo) ***with symptoms greater than 2 weeks***: referral to Pediatric Neurology

For adult cases: referral to either patient's PCP or General Neurology scheduling center (919)668-7600 *oftentimes next available appt is 2-3 months

For patients with symptoms of neck pain, headaches, dizziness, imbalance, exercise intolerance: Referral to Outpatient PT for concussion evaluation (usually can be seen within 2-3 weeks)

For patients with cognitive processing, memory, communication deficits, referral to Speech Language Pathology for speech therapy

# Speech Referrals

Please consider **Referral to Speech Pathology Following Concussion** if your patient demonstrates difficulties with any of the following:

| | |
|---|---|
| Language | • Word finding<br>• Engaging in conversation<br>• Writing<br>• Reading |
| Cognition | • Remembering things<br>• Paying attention<br>• Concentrating/ focusing<br>• Learning new information |
| Executive Function | • Planning<br>• Organizing assignments, tasks<br>• Solving problems<br>• Starting and finishing activities |
| Pragmatics/ Social Interaction | • Interacting with peers, parents, teacher, spouse<br>• Irritability<br>• Fatigue with tasks such as reading, typing/ writing<br>• Inefficiency, poor performance<br>• Acting out inapropriately (e.g., in classroom)<br>• Not understanding jokes, humor<br>• Withdrawing<br>• Frustration with tasks being more difficult than before |

# Speech Referrals

**PROCESS**

**1. Place order**

- Ambulatory Referral to Speech Pathology
- Preferred location: Duke
- Sched Inst: Hit F2, Select:
  -This order is for: Eval and Treat
  -Speech Lang Dx: Cogn comm s/p TBI

**2. Tell patient**

- Speech clinic will call you to schedule the appointment
- If symptoms have resolved at that time, you do not have to make the appointment

**3. Remind patient**

- If symptoms return/ worsen after return to work or school call to make an appointment: 919-684-3859

# Epic Smartphrases

.NCHSAACONCUSSIONEVALUATION —> Gfeller Waller Required Concussion Evaluation Form

.NCHSAARTLFORM —> NCHSAA RTL Recommendations

.CONCUSSIONINFO —> informational handout “What is a concussion?”

.CONCUSSIONFAQ —> FAQ about concussion (Duke form)

.CONCUSSIONRTL —> RTL info/guidelines (Duke form)

# Thank you - Questions?

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