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Current Concepts in the Office Treatment of the Concussed Athlete

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Objectives

- To give most recent definition of concussion
- To discuss history clues in the office treatment of the concussed athlete
- To discuss the physical examination clues in the office treatment of the concussed athlete
- To discuss new treatment modalities and return to play criteria

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Introduction

- Most common head injury in athletics.
- Fewer than 10 percent result in loss of consciousness.
- Estimated 250,000 to 2.25 million concussions unidentified each year.

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Introduction

- At risk sports include football, boxing, hockey, wrestling, gymnastics, lacrosse, soccer, cheerleading and basketball.
- Once a concussion has occurred, a player is 4 to 6 times more likely to sustain a second concussion.

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History

- Previous definitions of concussion limited in ability to truly define the symptoms of concussion.
- Previous definitions were unable to include minor impact injuries that result in persistent physical and/or cognitive symptoms.

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Definition

- Applicable to children under age five through adulthood.
- "Concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces. Several common features that incorporate clinical, pathological, and biomechanical injury constructs that may be used to define concussive head injury include the following:"

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Definition

1. Caused either by a direct flow to the head, face, neck, or elsewhere on the body with an "impulsive" force transmitted to the head.
2. Typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously.

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Definition

3. May result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than structural injury.
4. Results in a graded set of clinical syndromes that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course.

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Definition

5. Typically associated with grossly normal structural neuroimaging studies.

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Before Exam Begins

- Watch athlete walk to exam room
- CT Scan if done
- Computerized Neurocognitive Test Baseline and any post-tests
- SCAT2 or BESS Scores
- PPE of athlete with complete concussion history
- PHONE NUMBER OF YOUR ATC AT YOUR ATHLETE'S SCHOOL

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Key Historical Points

- Concussion is underreported and often unrecognized
- Do not have to involve loss of consciousness
- Number of symptoms has been associated with worse prognostic recovery
- Headache is most often reported symptom
- The adolescent brain recovers slower than the adult brain
- Emerging female predominence

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Key Historical Points

- If an athlete has had a concussion, they are 4-6 times more likely to have a second
- Subsequent hits, although lesser in nature, may produce worse symptoms
- Thus, a complete history of past concussions, with emphasis on LOC and type of amnesia is critical
- Athletes with co-morbid headache history or associated ADHD may need special consideration

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Key Historical Questions

- How many head injuries has the patient had in the past?
- How did they occur?
- What type of symptoms did they have?
- How long did the symptoms last?
- Were they associated with LOC or amnesia, and what type?

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Key Historical Questions

- Do they have a pressure headache and does it get worse with school or exertion?
- Do they get dizzy with movement?
- Do they get fatigued at a certain point in the day?
- Are they more sensitive to light/noise?
- Are they more distracted?
- Are they have trouble falling/staying asleep?
- Are they more moody/irritable?

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Key Historical Questions

- Do they feel "foggy"?
- How many practices/competitions did they miss?
- Did the symptoms affect classes and their grades?
- How long did it take them to "feel themselves"?
- Did they have any "dings" or hits to chest, neck, or face that radiated to head that were unreported as concussion?

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Signs and Symptoms of Concussion

- Symptoms
  - Somatic
  - Cognitive
  - Emotional
- Physical Signs
- Behavioral Changes
- Cognitive Impairment
- Sleep Disturbance

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Early Symptoms

- Headache
- Dizziness
- Confusion
- Tinnitus
- Nausea
- Vomiting
- Vision Changes

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Late Symptoms

- Memory Disturbances
- Poor concentration
- Irritability
- Sleep Disturbances
- Personality Changes
- Fatigue

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Physical Signs

- LOC/impaired conscious state
- Poor coordination or balance
- Concussive convulsion/impact seizure
- Gait disturbance
- Nausea/vomiting
- Vacant stare/glassy eyed
- Slurred speech
- Significantly decreased playing ability

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Behavioral Changes

- Displaying unusual or inappropriate emotions
- Personality changes
- Inappropriate playing behavior

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Cognitive Impairment

- Unaware of period, opposition, or game score
- Confusion
- LOC
- Unaware of time, date, or place
- Slow to answer questions or follow directions
- Easily distracted or poor concentration
- Slow reaction time

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Cognitive Impairment

- Amnesia
  - Ten times more predictive value than loss of consciousness in predicting severity of concussion
  - Post-traumatic amnesia used to be biggest key in measuring severity
  - Now it is the number of concurrent symptoms with "fogginess" being the symptom of critical concern

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Sleep Disturbance

- Drowsiness
- Insomnia

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UPMC Symptom Categorization

- Somatic:
  - Headache
  - Visual Problems
  - Dizziness
  - Noise/Light Sensitive
  - Nausea

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UPMC Symptom Categorization

- Emotionality
  - More emotional
  - Sadness
  - Nervousness
  - Irritability

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UPMC Symptom Categorization

- Cognitive Symptoms
  - Attention Problems
  - Dysfunction
  - Fogginess
  - Fatigue
  - Cognitive Slowing

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UPMC Symptom Categorization

- Sleep Disturbance
  - Difficulty falling asleep
  - Sleeping less than usual

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Physical Examination

Vitals

Speech

Gait analysis

DTRs

MS UE and LE b/l

Sensation UE and LE b/l

Cranial Nerve Examination

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Physical Examination

- Romberg Test (Balance and Motor Coordination)
- Pronator Drift Test (Upper Motor Neuron Testing)
- Tandem Walk (Coordination)
- Heel to Shin (Balance and Coordination)
- Finger to Nose (Point to Point Coordination)

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Physical Examination

Vestibular Testing

Extraocular Muscle Testing

Smooth Pursuit - Vertical Gaze/Reverse Gaze – Look for nystagmus/saccades

Smooth Pursuit - Horizontal Gaze/Reverse Gaze – Look for nystagmus/saccades

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Physical Examination

Vestibular Testing

Figure of 8 Test - Focus on thumb as moves in varying planes - Object focusing circumferentially

Gave vs. Convergence Dysfunction Test - Focus on writing on pen 6 cm from nose bridge – should have no diplopia up to this point.

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Classification

- Panel adopted that 80-90% of all concussions resolve in short 7-10 day period

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Imaging

- Vienna conference recognized that conventional neuroimaging is usually normal.
- Use in cases where there is suspicion of cerebral bleed, prolonged disturbance of conscious state, focal neurological deficit, seizure activity or persistent clinical or cognitive symptoms.

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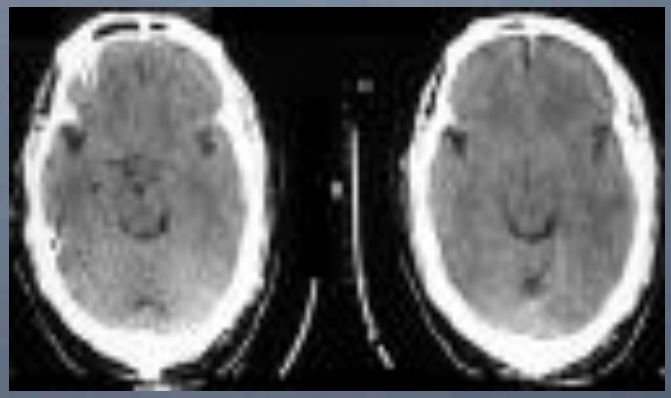
Imaging

- CT usually test of choice as it will rule out an acute epidural or subdural hemorrhage.
- Athletes with concussion usually have normal CT scans and MRI scans.



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Imaging

- Additional Neuroimaging Considerations
  - MRI
    - Use of gradient echo, perfusion and diffusion weighted images better choice to distinguish structural brain abnormalities
  - PET Scan
    - Used often in concussion research but not yet standard of care
  - Diffusion tensor imaging
  - Magnetic resonance spectroscopy
  - Functional connectivity

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Imaging

- MRI
  - Administration of MRI while patient undergoes cognitive challenge
  - See signaling in dorsolateral pre-frontal cortex corresponding to memory centers of brain
  - These areas often correspond with areas with altered brain metabolism seen with concussion research studies

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Balance Assessment

- May provide useful management strategy if symptoms contain a balance issue.
- May be tested clinically, Balanace Error Scoring System, or with computerized platforms, force plate technology

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Balance Assessment

- Traditional Balance Platforms are often expensive to obtain
- BESS (Balance Error Scoring System) most often used clinically
  - Tests 6 different balance conditions lasting 20 seconds

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Balance Assessment

- BESS
  - 3 stance settings – double leg, single leg, and tandem done on three surfaces – stable/firm and unstable/foam.
  - Score determined by amount of errors recorded during different balance conditions – one point for each error
  - Increased error reflect increased problems with balance and coordination post concussion

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Neuropsychological Assessment

- Most often done in asymptomatic athletes to aid in return to return to play decisions.
- Acceptable to do in symptomatic child and adolescent athletes to determine management.
- Should not be sole basis for management or return to play decisions but aid in clinical decision making.

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Neuropsychological Assessment

- Should test cognitive domains of information processing, planning, memory, and switching mental set.
- Examples of tests include pen and paper tests, comprehensive protocols administered by neuropsychologists, and computerized test platforms.
- Ideally, there should be baseline pre-season testing followed by postinjury serial follow-up, especially true of elite athletes.

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Treatment Goals

- Prevent Second Impact Syndrome
- Prevent cumulative effects of concussion
- Prevent Post Concussion Syndrome
- Alleviate symptoms

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First Line Overall Treatment

- Athlete should be placed at complete mental and physical rest
  - Includes
    - NO PE
    - NO tests/quizzes/projects
    - No video games
    - No texting
    - Limited computer
    - No concerts
    - No loud indoor events
    - No long TV watching or reading

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Pharmacological Treatment

- Should be performed by those experienced in treating concussion.
- Should be done in one of two of following instances:
  - Control of specific symptoms in concussion.
  - To modify the underlying pathophysiology of concussion to shorten the symptom duration.

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Pharmacological Treatment

- NSAIDs should be avoided as they can cause rebound headache. Use Acetaminophen only in those under 18.
- Ultracet can be used in those over 18 and without co-morbid seizure disorder.
- Consider the use of vitamin therapy
  - B2
  - Mg
  - Coenzyme Q
  - Vitamin E

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Somatic Symptoms

- Vestibular Therapy
- Headache Prophylaxis
  - Propranolol (OLU)
  - Verapamil (OLU)
  - Amitriptyline (OLU)
  - Lexapro
  - Zoloft

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Emotional Symptoms

- SSRIs
  - Lexapro
  - Zoloft
- Psychotherapy

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Cognitive Symptoms

- Amantiadine (Symmetrel) (OLU)
- Concerta (OLU)
- Strattera (OLU)

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Sleep Symptoms

- Melatonin
- Trazodone

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Vestibular Therapy

- Helps with dizziness, vertigo and imbalance associated with concussion
- Uses current PT and OT maneuvers
- May be used alone or as adjunct therapy

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Vestibular Therapy

- Maneuvers
  - Epley Maneuver
    - Treats positional vertigo
  - Oculomotor Exercises
    - Increases coordination between eyes, brain and vestibular system
  - Balance Retraining
    - Improves balance by having brain use all systems affecting balance
  - Motion Tolerance Exercises
    - Retrains brain to adapt to specific movements without dizziness

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Psychological Treatment

- May have application in concussion.
- May have benefit to treat affective symptoms such as depression often associated with concussion.

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Cognitive Therapy

- Written as last part of neuropsychological assessment
- Can be done in out-patient or school setting
- Breaks cognition into component parts and uses cues and retraining to assist and reteach learning
- May assist in shaping IEP or 504 plans

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Ophthalmologic Treatment

- May need assistance from Ophthomology to distinguish gaze vs. convergence dysfunction
- Treatment may be intra-office or via home computer retraining

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Ophthalmologic Treatment

- Ophthalmologic Issues
  - Convergence Insufficiency
    - Important for reading
    - Inability to use two eyes together as a team
  - Oculomotor Dysfunction
    - Permits accurate visual scanning and exploration
    - Important for reading and copying from board
    - Inability for eyes to together track a moving target and switch fixation from one target to another

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Ophthalmologic Treatment

- Ophthalmologic Issues
  - Accommodative Infacility
    - Important for academic efficiency and comfort to focus on an object – i.e. copy from blackboard
    - Inability to allow rapid and accurate shifts of attention from one distance to another with instantaneous clarity
    - Inability to allow student to maintain focus at reading distance

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Ophthalmologic Treatment

- Ophthalmologic Issues
  - Visual Intake-Visual Memory
    - Allows for optimal academic and athletic performance as affects proficiency in reading comprehension and spelling
    - Inability to obtain maximum visual information in the shortest possible time
    - Inability to retain this information over an adequate period of time

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Educational Component

- No or adaptive PE as conditions warrant
- Education assistance
  - Extra Help
  - Extra Time
  - 504 Plans/IEP
  - Change in class difficulty level
  - Alternative testing
  - Important to differentiate comprehensive vs. computational dysfunction (i.e. inability to focus or converge vs. true cognitive dysfunction)

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Return to Play

- Never return player who still has concussive symptoms.
- Patient requires physical and cognitive rest
- This includes activities that require concentration and attention
  - School Work
  - Video Games
  - Text Messaging
- If symptoms have resolved with rest, test patient with exertion.

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Return to Play

- Player should proceed stepwise.
- If post-concussive symptoms recur, the athlete should drop back to previous asymptomatic level and attempt progression again in 24 hours.
- Should not be taking any pharmacological agents that may effect or change symptoms of concussion.
- Should have neuropsychological testing return to baseline

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Return to Play

- No activity
  - Complete rest
  - Recovery Phase
- Once asymptomatic for 24 hours, proceed to step 2

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Return to Play

- Light aerobic exercise
  - Walking
  - Swimming
  - Stationary Cycling
    - All Less Than 70 % MPHR
    - No Resistance Training
- – Increase HR

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Return to Play

- Sport-specific training
  - Skating drills in ice hockey
  - Running in soccer
  - No head impact activities
  - Add movement

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Return to Play

- Noncontact training drills
  - Progression to more complex training drills
    - Passing drills in football
    - Passing drills in hockey
    - May begin progressive resistance training
  - Exercise, coordination, and cognitive load

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Return to Play

- Full-contact training after medical clearance
  - Restore confidence and assess functional skills by coaching staff
- Return to game play

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Return to Play

- No child or adolescent athlete, including the collegiate athlete, no matter the skill level, should return to play on the same day.
- Some NFL studies have shown no risk of recurrence or sequelae with same day RTP in presence of physicians with experience and rapid neurocognitive assessment.
  - However, full clinical and cognitive recovery must occur before consideration of RTP

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Concussion PPE

- ATHLETES OFTEN DO NOT RECOGNIZE PRESENT AND/OR PAST CONCUSSIONS!
- Inquiry about concussive history should be part of the standard Pre-Participation Physical Examination.
- Ask about previous symptoms of concussion and not just perceived number of past concussions.

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Concussion PPE

- Ask about past trauma to head, face, or neck.
- Ask if concussion symptoms, if elicited, have increased progressively with each progressive impact.
- Coaching and teammate perception of concussion have been unreliable in study.

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Concussion PPE

- Previous incidents of LOC, amnesia, and post-concussive symptoms are all key data in establishing the existence and extent of concussion.
- Further research is being carried out now to see how these interact and relate to severity of concussion.
- PPE is also a good time for concussion counseling.

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Concussion PPE Questions

- Have you ever had a head injury or concussion?
- Have you ever had a hit or blow to the head that caused confusion, prolonged headache, or memory problems?
- Do you have a history of seizure disorder?
- Do you have headaches with exercise?

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Modifiers of Concussion Management

- Loss of Consciousness
  - LOC of greater than one minute is a factor that may modify management
  - Less than one minute of LOC not noted as a measure of concussion severity
- Amnesia
  - Post-traumatic rather than retrograde amnesia greater modifier of concussion management

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Modifiers of Concussion Management

- Motor and Convulsive Phenomena
  - Generally benign and require no specific management
- Depression
  - May be long term consequence of sports related concussion
  - May reflect abnormality with limbic-frontal model of depression and may need concurrent treatment

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Education

- Imperative that coaches, players and parents understand the medical issues involved in concussion.
- Athletes must know of consequences of premature return of play.
- Athletes must also know that not every concussion results in automatic removal from sports.

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Heads Up Concussion Kits

http://www.cdc.gov/ncipc/tbi/Coaches_Tool_Kit.htm

CDC Concussion Tool Kit

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Education

- http://www.thinkfirst.ca
- http://www.bianj.org
- http://impacttest.com
- Good sites for athletes to check for understanding of concussion.

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Medicolegal Aspects of Concussion

- Currently 40 states have some kind of concussion legislation
- Several more currently have initiatives before their state house on concussion legislation or management
- Washington state was first state with an official concussion law

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NJ Concussion Law

- Law P.L., 2010, Chapter 94 signed into law on December 7, 2010, by Governor Chris Christie
- Law does the following:
  - "Mandates measures to be taken to ensure the safety of kindergarten through grade 12 student athletes who participate in Interscholastic Athletics in New Jersey."

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Law Components

- Necessitates the creation of an interscholastic athletic head injury safety training program
- Necessitates school districts to develop a written policy concerning prevention and treatment of concussion due to sports
- Sets rules for removal of athlete from practice and contests and establishes rules for RTP.
- Provides immunity from liability for school districts and non-public schools
- Sets requirements for CME for ATCs

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Interscholastic Athletic Head Injury Program

- The Department of Education has created an interscholastic athletic head injury training program to be put in place by the 2011-12 school year.
- School physicians, ATCs and coaches must complete the training
- The program components include:
  - Recognition of signs and symptoms of injuries to the head and neck as well as second impact syndrome
  - Discussion of time course for RTP

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Interscholastic Athletic Head Injury Program

- The DOE will update training as current diagnosis and treatment modalities are released
- The DOE has created a concussion fact sheet that must be reviewed by athletes and their parents/guardians and must be signed that it has been received

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School District Policy for Prevention and Treatment of Sports Related Head Trauma

- Each school district in NJ must establish a written policy for prevention and treatment of sports related head injuries
- The policy must clearly dictate the procedure to follow if an athlete has sustained a concussion or other head injury
- School districts should review the policies of the NJSIAA, NCAA, BIANJ, ATSNJ, and other organizations with expertise in concussion management

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Removal of Student Athletes with Sports Related Head Injury and RTP

- Any student who sustains, or is suspected of having sustained, a concussion shall be immediately removed from competition or practice
- S/he cannot return until the following occurs:
  - S/he is evaluated by a physician or other licensed healthcare provider trained in diagnosis and treatment of concussion
  - S/he receives written clearance from the above to return to competition or practice

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Immunity for Liability

- School districts or non-public schools will not be held liable for death or injury of athletes using school grounds who are part of youth sports team organizations
  - These groups must have insurance policies of not less than 50,000 per person, per occurrence insuring the organization against liability for any injury
  - They must also agree to comply with district or school policy for management of head injuries and concussion

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CME for ATCs

- NJ BOME will require licensed ATCs to have 24 credits of CME
- This will include CME hours on head injury and concussion as determined by the NJ BOME
- The NJ BOME will determine subject and course of study and will accredit these programs or national or state organizations that may accredit educational programs

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Thank You