Return to Learn: Navigating the Road from Injury to the Classroom

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Objectives

- Definition and Epidemiology
- Concussion Pathophysiology
- Legislation
- Medical Management
- Practical Implementation
Definition

- Mild TBI (traumatic brain injury) is a direct or indirect force to the head that results in immediate short-lived neurologic impairment (e.g., amnesia, loss of consciousness, confusion)

- Transient neurologic impairment quickly resolves, but is often followed by concussion symptoms, which can affect
  - Physical
  - Cognitive
  - Emotional
  - Sleep
Epidemiology

- Approximately 7 million children seek medical attention for a TBI each year
- Over 500,000 visit the Emergency Department
- Concussion rates per 1000 AE (athletic exposures)
  - Football (0.47-0.6)
  - Girls’ Soccer (0.35-0.36)
  - Boys’ Soccer (0.17-0.22)
  - Girls’ Basketball (0.16-0.21)
- Cheerleading unique in that more injuries occur in practice setting than game/competition
Concussion rates among persons aged 5-19 years, by month - Nebraska 2008-2012
Pathophysiology

- **Energy Crisis**
  - Mechanical trauma → neuronal cell membrane stretching → ionic disequilibrium → mitochondrial dysfunction
    - Cells switch from aerobic to glycolytic pathways
    - Extracellular lactate accumulates, causing acidosis

- **Alterations in Cerebral Blood Flow**
  - Hyperperfusion documented in first 1-3 days after injury
  - Hypoperfusion follows in day 4-15 and beyond

- Injury is at the cellular level, affecting function – rarely does cellular death or structural changes occur
Pathophysiology

- Problem is thus with the ‘software’ and not the ‘hardware’ of the brain
- When the brain is challenged, it must operate in a less efficient anaerobic state
- Making demands on the injured brain not only produces symptoms, but it can also delay recovery
- The goal in concussion management is for the student to operate at a sub-symptom threshold
Pathophysiology

- Majority of students have resolution of symptoms in a few days, and ~90% within 3 weeks
- Adults and collegiate athletes tend to recover much quicker (3-7 days) than high school athletes (10-14) days
- Little data on younger aged athletes
In 2011, in both Iowa and Nebraska, legislation was enacted that recognized the impact of concussions and attempted to establish awareness. Contained the 3 tenets of model legislation:

- Education – coaches, parents, student-athletes
- Removal from play
- Clearance by a licensed health practitioner
These Acts have helped to educate and protect athletes and guide return to play decisions.

However, guidance was needed to help manage the academic effects concussions had on students.

In 2014, Nebraska amended the Concussion Awareness Act to require schools to have a Return to Learn protocol in place for students who have sustained a concussion.

- Informal or formal accommodations
- Curriculum modification
Concussion Management

- Early management (0-21 days)
  - Recognize a concussion has occurred
  - Identify all symptoms
  - Educate patient and family
  - Obtain consent to communicate with school
  - Recommend school accommodations/activity restrictions
  - Consider Educational Liaison referral
Imaging

- CT/MRI generally not indicated
- fMRI shows correlation with symptom severity but not recommended
- Red Flags
  - Declining level of consciousness
  - Seizures
  - Focal neurologic findings
  - Intractable vomiting
  - Rhinorrhea/otorrhea
Concussion Symptoms

- **Physical**
  - Headaches
  - Balance difficulty
  - Vision complaints – blurred/double vision, photosensitivity
  - Appetite changes

- **Cognitive**
  - Attention and concentration
  - Memory – retention and working memory
  - Executive function impairments – organization, multi-tasking
Concussion Symptoms

- Emotional
  - Irritability
  - Depression/withdrawal
  - Anxiety
  - Strained family and friend relationships

- Sleep Disturbance
  - Impaired sleep initiation and maintenance
  - Daytime fatigue
Initial Management

- Removal from sports
- Reduce/eliminate screen time
- Relative Rest
- School modification
  - Allow rest breaks when symptoms develop
  - No testing
Initial Management

- Return to Play
  - 1. No activity
  - 2. Light aerobic exercise
  - 3. Sport specific exercise
  - 4. Non-contact training drills
  - 5. Full-contact practice
  - 6. Return to play
Concussion Management

- Late Management ( > 3 weeks)
  - Refer to Mild TBI clinic
    - Neuropsychological testing
    - PT, OT, SLP evaluations
    - Neuro-optometry consultation
  - Educational Liaison referral
  - Pharmacologic Therapy
Concussion Treatment

- Highly individualized – each concussion is unique and any interventions should be made based upon timeline and severity of concussion
- Team approach – involves cooperation between:
  - Student/family
  - School/coaches
  - Medical Team
Concussion Treatment

- Physical Therapy
  - Myofascial release for headache management
  - Improve cervical hypo-mobility
  - Address balance deficits
  - Vestibular evaluation/treatment

- Speech Therapy
  - Address working memory and executive function deficits
  - Assist with academic work and help with organization
  - Develop accommodation strategies for the classroom
Concussion Treatment

- **Neuro-optometry**
  - Evaluate and make vision therapy recommendations
  - Corrective lenses
  - Help with convergence insufficiency
  - Coordinate with occupational therapy

- **Neuropsychology**
  - Identify areas of deficiency
  - Track cognitive recovery
  - Address emotional issues and refer to therapy if needed
Post Concussion Disorder

- Symptoms can be categorized into different subsets of post concussion disorder (PCD)
  - Physiologic
  - Vestibulo-ocular
  - Cervicogenic
- Pathophysiology and treatment are different for each category
Physiologic PCD

- Pathophysiology
  - Persistent alterations in cellular metabolism and cerebral blood flow

- Symptoms
  - Headache exacerbated by physical activity
  - Nausea, photophobia, fatigue, difficulty concentration

- Management
  - Physical and cognitive rest
  - Sub-symptom threshold aerobic training
  - School accommodations
Vestibulo-ocular PCD

- **Pathophysiology**
  - Dysfunction of the vestibular and oculomotor symptoms

- **Symptoms**
  - Dizziness, vertigo, nausea, gait and postural instability
  - Blurred or double vision, trouble with reading

- **Management**
  - Vestibular rehabilitation program
  - Vision therapy, prisms
  - School accommodations
Cervicogenic PCD

- Pathophysiology
  - Muscle trauma, dysfunction of cervical spine proprioception

- Symptoms
  - Neck pain, stiffness, decreased ROM
  - Headaches exacerbated by neck movements and not exercise

- Management
  - Manual therapy to cervical spine
  - Head and neck proprioceptive training
  - Occipital nerve blocks
School Management

- Referral to school liaison
- Formal concussion plan vs. 504 vs. IEP
- Accommodations
  - Reduced school time
  - Decreased homework/tests
  - Limit screen time
  - Sunglasses
  - Handouts
  - Quiet areas to eat, study etc.
Post-Concussive Syndrome

- Different than just post-concussion symptoms
- Symptoms include headaches, dizziness, fatigue, irritability, sleep problems, affect changes, apathy
- Present for > 3 months after injury
- Must experience social problems
- Risk Factors:
  - Low socioeconomic status
  - Female
  - Age > 40
  - Ongoing legal activity
- Injury less likely related to sports
Concussion Treatment

- Pharmacological Interventions
  - NSAIDs – Excedrin
  - TCAs – amitriptyline, nortriptyline
  - AEDs – gabapentin, valproic acid
  - SSRIs – fluoxetine, Zoloft, Lexapro
  - Stimulants – methylphenidate
  - Botox
Thanks and any questions??