Hard Hitting Evidence Regarding Concussion

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Introduction

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Objectives

The participants will:

- Define the pathophysiology of concussion
- Understand current evidence of prognosis and recovery
- Understand the differences between pediatric, adult, and geriatric concussions
- Evidence for medical management that optimizes rehab outcomes for pediatric, adult, and geriatric concussions
- Recognize when to refer to the NRBC concussion therapy team
- Recognize the roles of the concussion therapy team

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Introduction

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Diagnoses served

- Stroke
- Traumatic Brain Injury
- Spinal Cord Injury
- Brain tumor resection
- Guillain Barre
- ALS
- Bell's Palsy
- Subtypes of Dementia
- Mild Cognitive Impairment
- Vestibular Disorders
- Balance disorders
- Parkinson's Disease
- Multiple Sclerosis
- Progressive Supranuclear Palsy
- Multiple Systems Atrophy
- Primary Progressive Aphasia

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Introduction

- Concussion stats
  - 3.8 million concussions occur in the U.S. per year during competitive sports and recreational activities. Many concussions may go unreported.

*American Medical Society for Sports Medicine position statement: concussion in sports. Br J Sports Med. 2013 Feb

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What is concussion?

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Definition of Concussion

Consensus statement on concussion in sport November 2012

- Concussion is a brain injury and defined as a complex pathophysiological process affecting the brain induced by biomechanical forces
- May be caused either by a direct blow to the head, face, neck or elsewhere on the body with an "impulsive " force transmitted to the head
- Typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However in some cases, symptoms and signs may evolve over a number of minutes to hours. Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport Zurich November 2012

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Definition of Concussion

Consensus statement on concussion in sport November 2012

- May result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.
- Results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course. However, it is important to note that in some cases symptoms may be prolonged.
- Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport Zurich November 2012

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Pathophysiology

- Blow to the head or body – direct impact not necessary
- May be due to a blast
- Acceleration/deceleration cause temporary deformation of axon (axonal stretching)- microtubule damage
- Neurometabolic changes result w/o visible abnormalities (normal imaging)
- Physiologic changes at cellular level
- Neurons are "dysfunctional" not destroyed

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Pathophysiology

- Increase in energy requirements
- Occurs in a setting of post traumatic decrease in cerebral blood flow
- Disrupted neuro metabolism in brain results in Energy Crisis with ↑d demand for glucose with ↓d supply.

Giza, Hovda 2014

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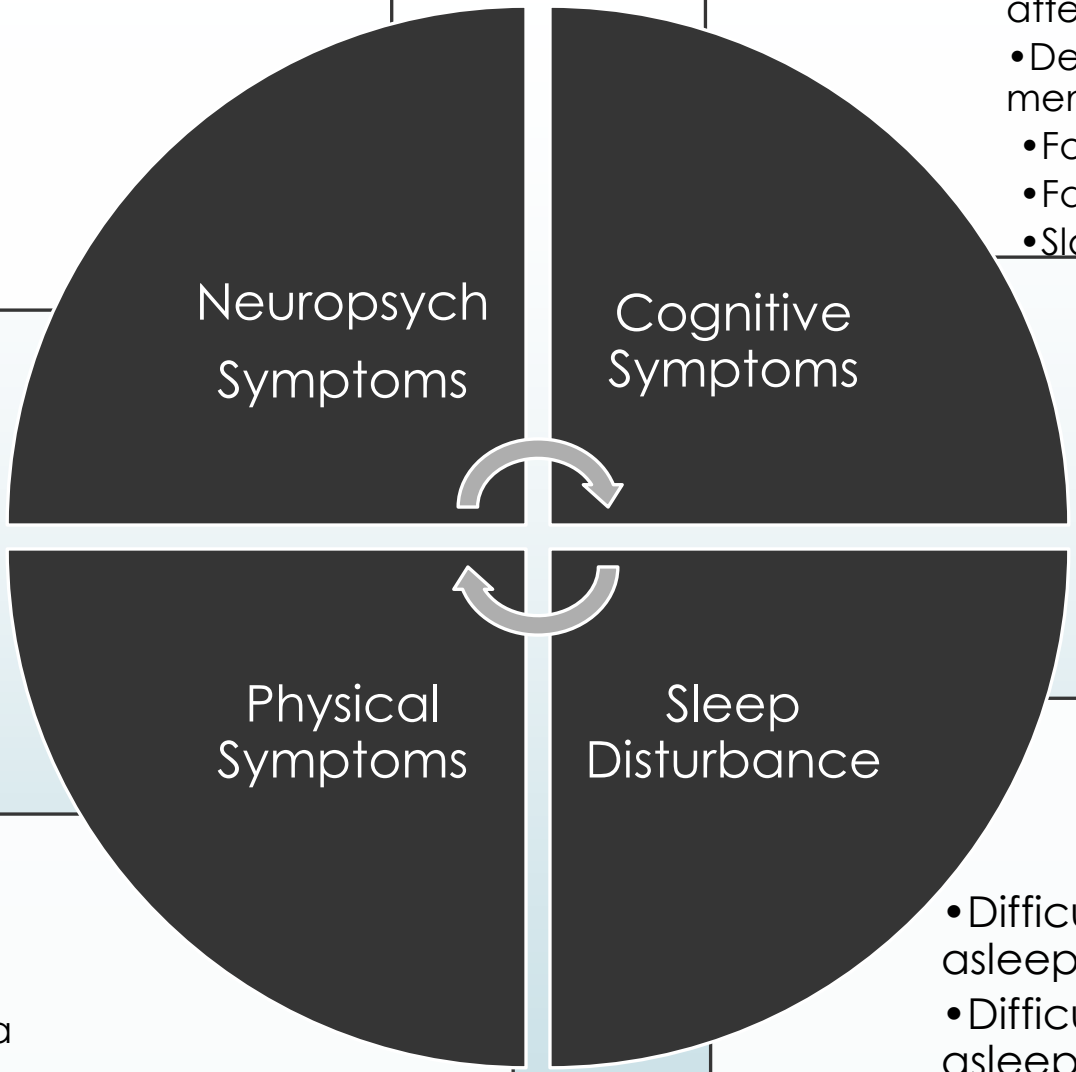

- More emotional
- Sadness
- Nervousness
- Irritability

- Decreased attention
- Decreased memory
- Fogginess
- Fatigue
- Slowed processing

- Headaches
- Visual problems
- Dizziness/nausea
- Noise/Light

- Difficulty falling asleep
- Difficulty staying asleep
- Less sleep

Pardini, Lovell, Collins et al 2004

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Prognosis for Recovery

- On Field Symptoms which may predict protracted recovery Lau B, Kontos A, Lovell MR, Collins MW, 2011
  - Dizziness
- 90% of athletes recover within a month of injury
- Good recovery if initial symptom burden is lower
- More initial symptoms – longer recovery
  - Meehan et al

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How to assess Concussion symptoms

- CDC Acute Concussion Evaluation ACE www.cdc.gov/.../ace_ed-a.pdf
- Sport Concussion Assessment Tool 3 http://www.scat3.ca/sclogin/
- http://physicians.cattonline.com/scat/
- Concussion Grading Scale
  - From ImPACT

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Differences across the lifespan

- Pediatric – developing brain with possible prolonged recovery time
  - Goals – successful return to academics, social and physical demands for their age.
- Adult – fully developed brain but issues with staying employed, driving, managing household and family.
  - Goals – successful return to gainful employment, driving, family demands, and ongoing wellness.

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Differences across the lifespan

- Geriatric (>65 y/o) need longer observation when on anticoagulants – deterioration can happen from 9 hours to 3 days after the head injury. Papa et al.
  - Goals – safety, sustain independence, and meaningful social/leisure interaction

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Evidence for Medical Management that Optimizes Rehab outcomes.

- Summary of evidence based guidelines update: evaluation and management of concussion in sports: American Academy of Neurology (2013) –
- Pharmacologic treatments usually begin approximately 10 days after injury. Meehan WP 3rd[1]. Medical therapies for concussion. Clin Sports Med. 2011 Jan;30(1):115-24,
  - Cognitive fatigue
  - Sleep disturbance
  - Headache/Post traumatic Migraine
  - Anxiety and mood issues

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Evidence for Medical Management that Optimizes Rehab outcomes.

- Strict rest after concussion no longer recommended
  Thomas, DG et al

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What does this mean to my practice?

- Because of metabolic issues – systems that demand a lot of energy from the brain show changes
  - Vision
  - Vestibular system
  - Cognition
  - Emotional/behavioral issues
  - Autonomic issues – orthostatic hypotension
- Because of the metabolic issues – symptoms will worsen as the day progresses.
- Headache is often worse in the afternoon.

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What does this mean to my practice?

- Patients will respond to rehab better when they have
  - Less sleep disturbance – better quality of sleep
  - Headache/Post traumatic migraine management
  - Assessment for binocular vision dysfunction (recognize tropia, convergence insufficiency, phorias)

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Clinical Interview

- *Do you have a pressure in your head or head pain that increases as the day progresses?*
- *Are you more sensitive to lights and noises than normal?*
- *Do you become dizzy when looking up/down, turning head, standing quickly?*
- *Do you feel more fatigued/tired than normal at the end of the day?*
- *Do you have blurred or fuzzy vision while reading or difficulty reading?*

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Clinical Interview

- *Do you feel more distractible in school/work than normal?*
- *Do you feel a sense of fogginess during the day?*
- *Do you have difficulty falling asleep/staying asleep (how long does it take to fall asleep?)*
- *Have you or your family noticed that you are more irritable than normal?*

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When to refer

- Early referral to therapy coinciding with medical management of head pain and sleep disturbances has better outcomes
  - 2 weeks post injury if still symptomatic
- Referral can be made months after diagnosis if patient's Post Concussion Syndrome (PCS) persists or at any stage during recovery

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When to refer

- Symptoms impacting function
  - Exertion headaches/head pressure
  - Dizziness, light headedness
  - Motion sensitivity
  - Light/noise sensitivity
  - Vision issues
  - Fatigue
  - Emotional (irritability, anxiety, anger, depression)
  - Cognitive changes that affect success in school, work, home management, independence

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When to refer

- Due to these symptoms client is working harder to just maintain baseline status.
- Even when client no longer reports physical symptoms, functional issues may still occur impacting return to and achieving success in school/work.

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Role of Concussion Team

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Role of concussion team

Occupational Therapy

- Evaluate functional visual deficits and screen for tropia, phoria, binocularity issues.
- Evaluate and treat cognitive deficits and identify how these impact daily living skills, return to school and work.
- Collaborate with SLP and academic team to identify strategies to return to school successfully
- Work with employer to identify strategies to successfully return to gainful employment.
- Teach energy conservation techniques to allow client to function throughout day without severe head pain.
- Teach relaxation techniques, mental imagery to decrease head pain and/or anxiety.

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Role of concussion team

Physical Therapy

- Evaluate and treat vestibular function both vestibular postural responses and vestibulo ocular responses
- Assess and treat for possible orthostatic sensitivity.
- Teach energy conservation in regards to physical activities and activities that use the vestibular system.
- Teach relaxation and settling strategies for headache and dizziness.
- Evaluate and treat Cervical issues and Cervicogenic headache
- Evaluate the graded return to exertional activities

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Role of Concussion Team-

Speech Language Pathology

- To administer standardized assessments of cognition, language, and social communication to determine deficits affecting academic or work success.
- To educate patients, parents, and school officials the effects of concussions on everyday life and academics.
- To assist in establishing academic accommodations and a plan for return to school for concussed students.
- Collaborate with OT and academic team to identify strategies to return to school successfully
- To provide ongoing assessments and monitoring of progress.
- To teach strategies for improved memory, attention, test-taking , cognitive endurance, and more.

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Role of Concussion Team

Social Worker

- Liaison between patient and team, and funding sources including Worker's Compensation, as well as general coordination of services

Neuropsychologist

- Perform comprehensive neuropsychological testing (as tolerated) to identify cognitive and perceptual strengths and areas of deficits to guide team on most effective approach to rehabilitation

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Adult Case Study
61 y/o female
History

- Slipped and hit her head while walking her dog.
- Patient had 1 previous concussion as a child (was hospitalized).
- After fall was hospitalized and rehab in a skilled nursing facility
- Referred to NRBC <u>after she had returned to work.</u>

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Adult case study -PCS Symptoms

positional dizziness

impaired gait – used cane

headache as least 2 days a week

visual problems

fatigue

numbness/tingling

fogginess

feeling slowed down

difficulty concentrating

difficulty remembering

drowsiness

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Adult case study
PT, OT, Speech findings

- Cognitive
  - Difficulty concentrating at work
  - Difficulty with remembering names
- Physical
  - Left shoulder labral tear
  - Abnormal convergence
  - Cleared for BPPV but had motion sensitivity
- Acute concussion eval score 12/22, decreased balance confidence 42.5%

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Adult case study – treatment goals

- Improved dizziness and motion sensitivity
- Normal balance
- Normal gait
- improved to normal vision with head moving
- Pt will demonstrate normal cognitive-linguistic skills for complete independence in her daily home and work life as evidenced by formal and informal assessments, clinician and patient judgment and patient's satisfaction with treatment outcomes.
- Independent in management of concussion symptoms
- Decreased fatigue, improved memory and selective attention for decreased interference with ADLS

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Adult case study – treatment outcomes

"This was the key to it all." "I feel more like myself now."

Patient demonstrated

- Improved cognitive linguistic skills for daily living, full time employment and independence
- Resolution of her motion sensitivity with testing
- Improved balance confidence
- Improved gait – able to walk without the cane.

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Case Study of a Student Athlete

- D.R.,a high school sophomore, straight A student,
- History: Pt's third concussion occurred 10/12/13 during a football game. First concussion was in 6th grade, 2nd concussion was as a freshman.
- Initial symptoms at the scene:

- UE & LE numbness
- Confusion
- Dizziness and imbalance
- Questionable SCI
- 4 day hospital stay

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Case Study of a Student Athlete

After Discharge from hospital:

- excessive sleepiness
- Nausea
- weakness of LE's affecting his ambulation
- Inability to return to school (received home instruction 3days/week)
- light and noise sensitivity
- Head pressure and chronic headache

Medical Management: Benadryl 25 mg at one night; Topomax 25mg b.i.d.

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Case Study of a Student Athlete

Evaluated by PT/SP/OT 5-6- weeks post

PCS symptoms at the time of the initial evaluations:

- sleep disturbance
- daily morning headaches /pressure and throbbing in right parietal/temporal area
- noise and light sensitivity
- Cervical discomfort
- Oculomotor dysfunction
- Pulsatile tinnitus
- excessive irritability after one hour of home instruction
- increased headaches upon mental exertion
- inability to read for any length of time to complete assignments
- inability to dual task
- distractibility

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Case Study of a Student Athlete

P.T/S.T/O.T FINDINGS:

Concussion Grading Scale score 77

Physical

- increased headache from 5/10 to 6/10 by end of evaluation session due to mental exertion/cognitive load (at best 2/10; at worst 9/10)
- inability to manage post concussive symptoms of head pain
- Positional dizziness and vertigo with rolling in bed
- Vibratory pulsatile tinnitus
- Symptoms produced by oculomotor use
- Neck pain
- Positional dizziness
- Decreased visual scanning skills and convergence insufficiency

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Case Study of a Student Athlete

P.T/S.T/O.T FINDINGS:

Cognitive

- decreased auditory processing and recall of lecture-like academic material
- impaired new learning
- impaired recall for names and verbal instructions
- impaired ability to read for extensive length of time and to recall/retain reading material
- mildly impaired complex sustained and alternating attention
- decreased working memory skills to be able to complete academic workload
- decreased ability to manage school tasks successfully

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Treatment goals

- To establish and Implement academic accommodations and plan for return to school
- To remediate cognitive deficits (reading comprehension, memorization skills, attention, etc.) and teach compensatory strategies
- Demonstrate and verbalize understanding of rest, pacing and activity modification to allow healing for his concussion
- Decrease dizziness
- Improve leg strength
- Improve ability to see clearly with head moving (DVA)
- Improve balance
- Improve gait

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PHYSICAL TREATMENT OUTCOMES

- Initial positional testing showed motion sensitivity but no BPPV
- C-S pain initially treated at NRBC and then cervicogenic headache symptoms resolved with orthopedic PT
- Gradual increase in physical activity with specific HR/exertion guidelines.
- Remained with motion sensitivity in moderate range. Patient was not able to do habituation exercises regularly due to academic load and time constraints

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Cognitive/Academic Treatment Outcomes:

- Gradual return to school
- Gradual return to social activities and going to noisy, crowded public places
- Implementation of academic accommodations, compensatory strategies (e.g. sunglasses worn in the presence of fluorescent lights, allowance of increased time to complete tests) and 504 plan

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Cognitive/Academic Treatment Outcomes

- Pt kept a journal of symptoms and academic success
- Improved concentration for completing quizzes/tests
- Improved sustained attention for completing homework for lengthier periods of time
- Successful implementation of strategies to prevent increase of headache with mental exertion
- Decrease in Concussion Grading Scale to 31

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Conclusion

- Early referral – better outcomes
- No strict bed rest
- Team approach
- Recognition of ongoing symptoms
- Impact on everyday life

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Questions?

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Thank you

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