

## RSS SESSION SIGN-IN SHEET

Pediatric Care Echo Series  
Caring for Children with Concussions  
May 17, 2018  
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**RSS Global Objective(s): Assess pediatric trauma given the new skills and guidelines determined to be safe for children.  
Identify proper tool and standardized measurement practices to improve diagnosis and treatment of pediatric patients.**

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# Caring for Children with Concussion

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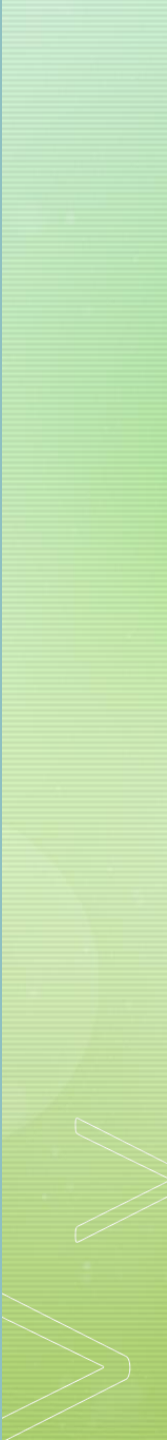
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We have no disclosures.  
Peter and Lynne



▶ In a heartbeat.....The call.....  
..... “Dad, I hit a patch of ice” .....

- 16 year old boy, licensed for 3 months, no premorbid history
- Country road, curve, at night, rolled the car
- Seatbelt on, Air bags deployed
- Brief loss of consciousness, self extricated
- Perseverating when EMS arrived, no visible injury
- Collared and boarded, to the ED

## Level II Trauma Activation at UWHC

- Evaluated in the Emergency room
- Head CT negative
- Spines cleared
- Admitted for observation
- Discharged the next day after OT, PT, rehab evaluations
- Family provided anticipatory guidance and education on TBI and returning to activities
- Follow- up at the Brain Care Clinic (BCC) in 2 weeks

# Traumatic Brain Injury

- Defined by the CDC as a blunt or penetrating injury to the head resulting in any of the following: *decreased level of consciousness, amnesia, neurologic deficits, neuropsychologic abnormality, or intracranial lesion.*
- Leading cause of death and disability in children<sup>1</sup>
  - TBI's contribute to ~ 30% of all injury deaths
  - 153 people a DAY die from injuries that include a TBI

# Traumatic Brain Injury

- TBI severity is commonly stratified based on GCS into severe (GCS  $\leq 8$ ), moderate (GCS 9-12), and mild (GCS  $\geq 13$ )<sup>2</sup>
- Mild injuries can be further classified as complicated or uncomplicated based on presence or absence of an intracranial lesion or displaced skull fracture.

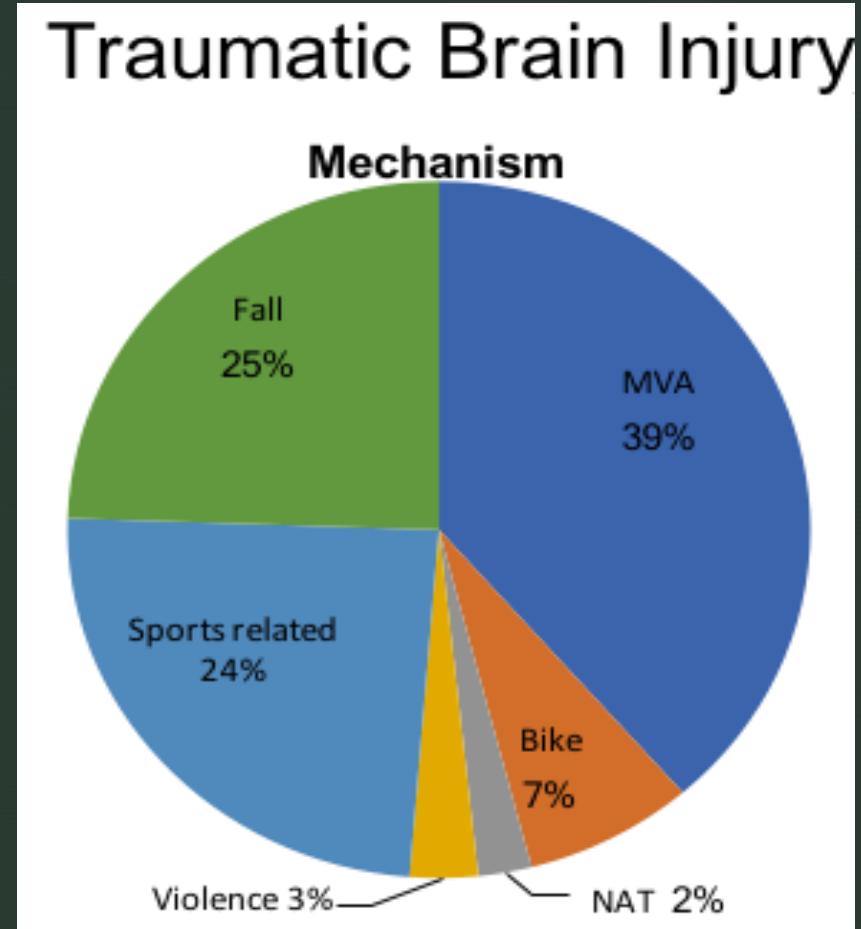
Eye Opening Response		Verbal Response				Motor Response		
> 2 yrs old	< 2 yrs old	> 2 yrs old	< 2 yrs old	> 2 yrs old	< 2 yrs old	> 2 yrs old	< 2 yrs old	
Spontaneous	4	Spontaneous	Oriented	5	Coos/babble	Spontaneous	6	Spontaneous
To voice	3	To voice	Confused	4	Irritable	Localizes to pain	5	Withdraw from touch
To pain	2	To pain	Inappropriate words	3	Cries to pain	Withdraws from pain	4	Withdraw from pain
None	1	None	Incomprehensible sounds	2	Moans to pain	Flexor posturing	3	Flexor posturing
			None	1	None	Extensor posturing	2	Extensor posturing
						None	1	None
<b>Total GCS = 3-15</b>								

# What is a Concussion?

- Often used to describe a TBI that occurs in sports
- Usually on the mild end of the spectrum of TBI
- We prefer the term mild TBI
  - Direct blow to head or transmission of force from bodily impact to the brain
  - Rapid onset of neurologic impairment
  - Functional impairment, usually with no structural brain injury



# Causes of Mild TBI



Cause of injury in patients evaluated in the Pediatric Brain Care Clinic at the University of Wisconsin Waisman Center

# Care of a Child with Suspected TBI

## Prevent Secondary Injury<sup>3,4</sup>

- Airway:
  - Open and maintain, may need intubation
  - Jaw thrust, not head tilt
- Breathing
  - Provide supplemental oxygen, prevent hypoxemia
  - Do not hyperventilate
- Circulation
  - Goal is normotensive, prevent hypotensive
  - Fluid bolus
- Check blood sugar, keep warm and keep calm

# Identification and initial management of Mild TBI

- May occur in absence of obvious head trauma by transmission of biomechanical forces from body to brain
- Signs of mild-TBI: LOC, confusion, balance impairment
- Avoid additional injury: remove from sports play or dangerous environment
- Urgent medical evaluation:
  - Neurologic assessment
  - Identify other causes of altered mental status
  - CT scan if severe mechanism of injury, abnormal neuro exam, GCS $\leq$ 14, or palpable skull fracture (PECARN Guidelines, *Lancet* 2009; 374: 1160–70)

# Common Symptoms after mild TBI

PHYSICAL	COGNITIVE	EMOTIONAL
Headaches	Feeling in a “fog”	Irritability
Dizziness	Cognitive slowing	Sadness
Balance problems	Poor concentration	Increased nervousness
Nausea/Vomiting	Easily distracted	Feeling more emotional
Fatigue or drowsiness	Memory problems	Short fuse/temper
Change in appetite	Trouble problem-solving	Personality changes
Change in sleep	Short term memory	Apathy
Sensitivity to light or noise		Decreased motivation
Numbness or tingling		Lack of awareness

Severity of initial symptoms correlates with duration of symptoms

# Pediatric Brain Care Clinic Waisman Center

- Interdisciplinary clinic for infants, children, and adolescents with, or at risk for, developmental and/or behavioral disabilities associated with an acquired brain injury
- Goals of the BCC
  - Early recognition and treatment of behavioral, development or learning deficits from a brain injury
  - Symptom management of post-concussion headaches
  - Provide counseling regarding subsequent brain injuries
  - Use a multidisciplinary team to meet each child's needs
  - Facilitate access to community resources and services
  - Support and advocate for the patient and family



## Pediatric Brain Care Clinic Waisman Center

- Clinic evaluations include a physical exam, neurologic assessment, and neuropsychologic testing
  - IMPACT computer based testing for >10
  - Neurocognitive “mini-battery” for children 4-10
  - Bayley’s Scales of Infant Development for children <4

# Pediatric Brain Care Clinic Meet the Team



Peter Ferrazzano, MD  
Clinic Director  
Critical Care



Lynne Sears, CPCP  
Clinic Coordinator  
Nurse Practitioner



Alanna Kessler-Jones PsyD  
Pediatric Neuropsychologist



Karen Carpenter  
Certified Rehab Counselor



Cassie Meffert, PA  
Pediatric Neurology

# Return-To-Learn

STAGE	ACTIVITY	OBJECTIVE
No Activity “Brain Rest” Begins during hospitalization	Complete cognitive rest – no school, homework, reading, texting, video games, or computers	Recovery
Gradual re-introduction of cognitive activity	Relax previous restrictions on activities and add back for short periods of time (5-15 minutes)	Gradual controlled increase in sub-symptom threshold cognitive activities
Homework at home	Homework in longer increments (20-30 minutes)	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
Gradual re-integration 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

If increase in cognitive activity worsens symptoms, cut back to previously tolerated activity level for 24-48 hours and then resume gradual increase



# Pediatric Brain Care Clinic Waisman Center

## Symptom Score

Headache	0-6	Sensitivity to light	0-6
Balance problems	0-6	Sadness	0-6
Trouble falling asleep	0-6	Numbness/tingling	0-6
Drowsiness	0-6	Difficulty concentrating	0-6
Irritability	0-6	Vomiting	0-6
Feeling more emotional	0-6	Fatigue	0-6
Feeling mentally foggy	0-6	Sleeping less than usual	0-6
Visual problems	0-6	Sensitivity to noise	0-6
Nausea	0-6	Nervousness	0-6
Dizziness	0-6	Feeling slowed down	0-6
Sleeping more than usual	0-6	Difficulty remembering	0-6
TOTAL			

Post-Concussion Scale, Lovell and Collins 1998

# Recovering from mild TBI

- Gradual recovery is expected over the course of 2-4 weeks
- Sub-symptomatic light physical activity may improve recovery
- Return to full physical activity / competitive sports should not precede return to full cognitive activity

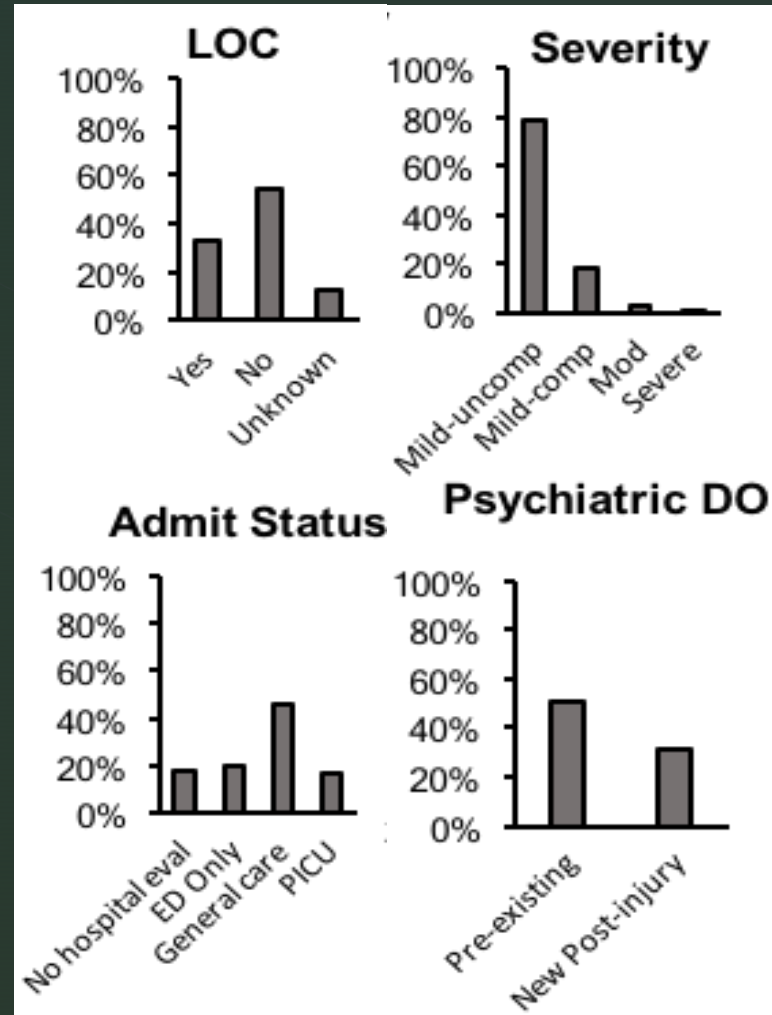
## Factors Associated with Slower Recovery

Loss of consciousness	Presence of mild bleed or skull fracture
History of ADHD, depression, anxiety	History of learning or behavior disorder
Lower level of premorbid functioning	History of headaches or migraines
History of developmental delays	History of one or more concussions
Family psychiatric history	Family history of learning disabilities
Familial instability	Lower socioeconomic status

# School Accommodations after TBI

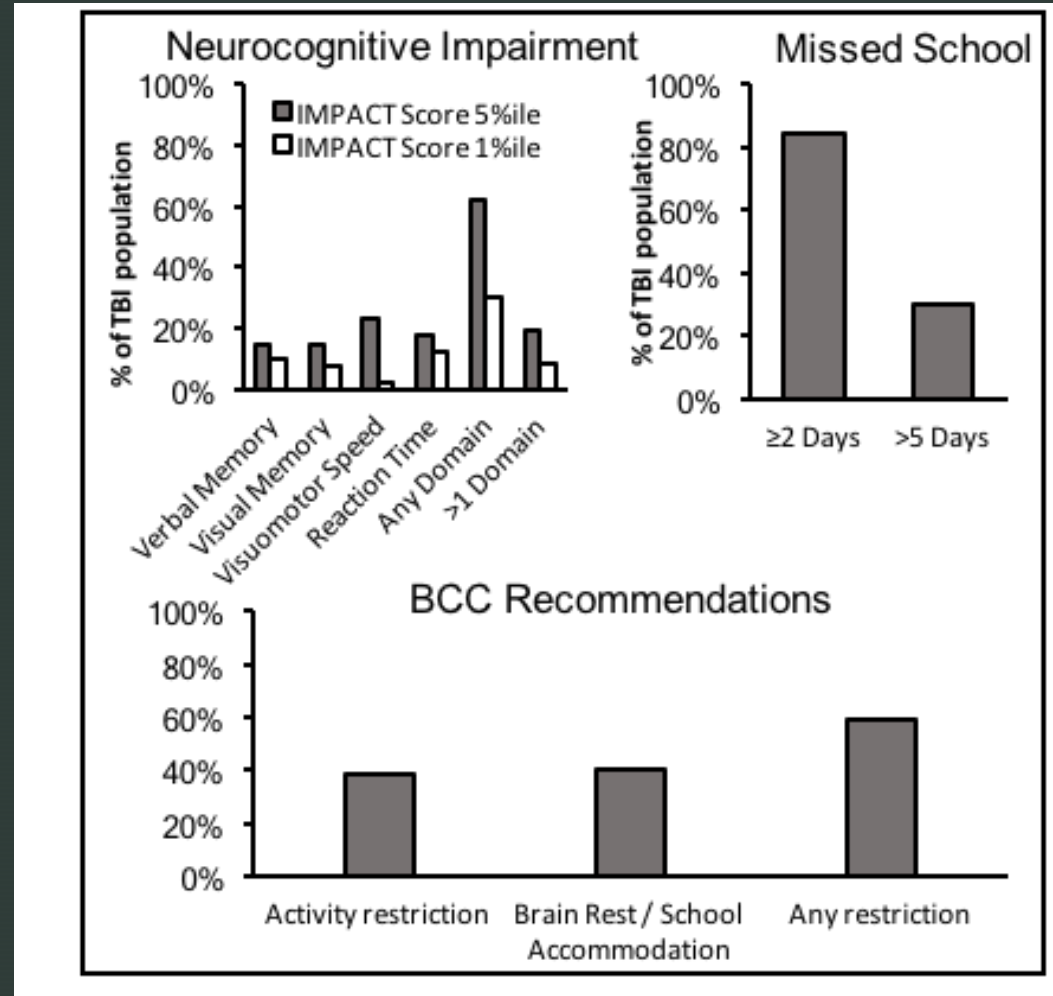
- Breaks as needed in a quiet place
- Preprinted class notes
- Additional time for assignments
- Excuse non-essential work
- Avoid double workload of make-up plus new work
- Additional help and tutoring as needed
- No testing until tolerating full day of school
- First testing untimed

# Our experience with children with mild TBI



Patient and injury characteristics in children evaluated in the Pediatric Brain Care Clinic after a mild TBI

# Our experience with children with mild TBI



Clinical evaluations and return to activity recommendations in children evaluated in the Pediatric Brain Care Clinic after a mild TBI

Back to our patient.....  
..... Two weeks since crash

- Had been going to school full days but needs frequent breaks
- Complains of daily headaches
  - Triggered by math class and band practice
- Complains of difficulty falling and staying asleep
- Complains of extreme fatigue, naps everyday after school
- Physical/neuro exam normal

# Neuropsych Testing Results

- Symptom Severity Score is 26
  - Headaches, feeling mentally foggy, difficulty concentrating, fatigue, feeling slowed down and difficulty remembering.
- ImPACT
  - Demonstrated slowed processing speed and reaction time
  - Low memory scores

# Our Recommendations

- Return to school half days, increase as symptoms decrease
  - No band class
- School accommodations
- Limit after school napping to 20-30 minutes only
- Encourage physical activity like walking
- Discussed “Sleep Hygiene” and recommended melatonin
- Return to BCC in 2 weeks, where he was much improved.





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# References

1. Traumatic Brain Injury & Concussion, Centers for Disease Control and Prevention, April 27, 2017
2. Zafonte R, Hammond F, Mann N, Wood D, Black K, Millis S. Relationship between Glasgow coma scale and functional outcome. *American journal of physical medicine & rehabilitation / Association of Academic Physiatrists.* 1996;75(5):364-369.
3. Bledsoe, B., Porter, R., Cherry, R., *Paramedic Care, Principles and Practice, Trauma Emergencies.* Third Edition 2009
4. Asensio, J., Trunkey, D., *Current Therapy of Trauma and Surgical Critical Care,* Mosby Elsevier, 2008
5. Kupperman et al (PECARN Investigators). Identification of children at very low risk of clinically-important brain injuries after head trauma: a prospective cohort study *Lancet* 2009; 374: 1160–70
6. Lovell MR, Collins MW. Neuropsychological assessment of the college football player. *Head Trauma Rehabilitation.* 1998;13(2):9–26.

# Additional Resources

- CDC “HEADS UP” Website: <https://www.cdc.gov/HeadsUp/>
  - Concussion assessment tools, patient information, etc
- Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016.  
*McCrory P, et al. Br J Sports Med 2017;0:1–10.*
  - Guidelines for evaluation and management of sports-related concussion
  - Concussion Recognition Tool (CRT5)
  - Sport Concussion Assessment Tool (SCAT5 and Child SCAT5)



THANK YOU

Questions?

