Concussion Update 2020



Disclosure Statement:

I have no financial disclosures or conflicts of interest.

Robert A Miller MD Columbus Concussion Management Clinic Emergency Room Physician Board Certified American Academy of Family Practice

> Nebraska Brain Injury Alliance Webinar September 2020

It's Friday Night ...







Concussion Management Team:

The Primary Care Provider as the Team Leader



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Robert A. Miller MD



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YOU

as

The Primary Care Provider are the Team Leader

Primary Care Provider Physician Physician Assistant Advanced Registered Nurse Practitioner

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Learning Objectives

Recognize your role as a member of the multidisciplinary team in the management of concussion. Identify key participants in your community as part of the Concussion Management Team.

Develop and utilize strategies to provide effective communication among team members.

Understand the tools available to assist in the diagnosis and management of an individual diagnosed with a concussion.

Review of the current recommendations regarding Return to Learn and Return to Play through case studies.

A brief overview of XLNT brain concussion management system.

Concussion Management Team:

The Primary Care Provider as the Team Leader

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Return to play and return to Learn

Diagnosis of a Concussion

Management of Concussions

What is a Concussion???

Concussion by the numbers

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Build Your Concussion Management Team



Build your toolbox







TOOLBOX-Training

American Academy of Neurology – Bootcamp

Nebraska BIANE and DHHS–Training Modules

CDC-Heads Up Training Modules for Physicians

TOOLBOX-Articles

Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016

<u>View Full Lext</u> http://dx.doi.org/10.1136/bjsports-2017-097699

American Medical Society for Sports Medicine Position Statement on Concussion in Sport (2018) View Full Text

http://dx.doi.org/10.1136/bjsports-2018-100338

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Introducing





J Athlete!!







Concussion Management Team:

Simplest

Physician/PCP

Patient

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Field of Play/Sideline Assessment



Field of Play/Sideline Assessment ATHLETIC TRAINER





Concussion Management Team:

Medical

Physician/PCP

Patient/Parent(s)

Athletic Trainer

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TOOLBOX-Sideline Assessment

- SCAT5 and Child SCAT5
- BESS
- Maddocks *
- KD (King-Devick)
- Vestibular/Ocular Motor screening (VOMS)
- Convergence distance
- Computerized Balance test
- EEG

WHEN IN DOUBT SIT IT OUT

- You maybe dealing with a serious head injury
- Symptoms may appear very minor but could be much more serious
- Second impact syndrome

CONCUSSION: WHEN TO SEEK MEDICAL ATTENTION



Historical Red Flags!

A motor vehicle accident
Falling from three or more feet off the ground
Falling down five or more stairs
Falling off a bicycle without a helmet

Anticoagulant therapy



Physical Red Flags!

- GCS < 13
- Severe, incapacitating headache
- Worsening condition
- Focal neurologic findings
 - Cranial nerve
 - Focal weakness/numbness
 - Loss of consciousness > 1 minute
 - Confusion/lethargy > 30 minutes
 - Neck pain
 - Skull tenderness
 - Fluid from ears
 - Racoon eyes
 - "Something is just not right"



NOW WHAT??







Primary Care Office

Concussion Clinic/Neurology Clinic

Relative Rest 24-48 hours

No same day return to play!!!

Take helmet away.

Remove from possible reinjury



TOOLBOX-Office Assessment

- Confirm Diagnosis
- Other potential causes of symptoms
- CT or MRI scan usually not indicated

TOOLBOX-Other Tests

- Functional MRI
- Diffusion tensor imaging
- Quantitative susceptibility imaging
- MR spectrography
- Arterial Spin Labeling
- Cerebral Blood Flow
- EEG

Evaluation and Management

- 90% of the diagnosis comes from
 - The history!
 - The examination should include:
 - Palpation of the head and neck
 - Neurological exam
 - Mental status
 - Cranial nerves
 - Motor/sensory
 - Balance
 - Vestibulo-ocular reflex
 - Convergence testing



TOOLBOX-Office Visit

- Date of Injury
- Sport/Position
- History of prior concussions, migraines, ADHD or LD
- Sleep
- Meds for concussion
- What percent of normal do you feel
- Neuro, with gaits, VOMS, Near point convergence, BESS

TOOLBOX: Return to Learn Models

NE Department of Education: Bridging the Gap...





Return to Learn

 Students first, athletes second! Return to normal activity as quickly as possible to avoid further psychological distress of missing academic work and becoming socially isolated

 Adjustments in the academic environment should be tailored to the unique patient's presentation of signs and symptoms

Not all students are athletes but all athletes are students

Response to Intervention/Multi-Tier System of Support

Return to Learn - Communication

Accommodations not modifications! No PE May walk during PE class Requires frequent rest breaks No participation in sports Limited screen time No Band/Choir Allow student to wear sunglasses, adjust brightness May attend practice to observe only. No participation.

Concussion Management Team: Build your Team

Most Common:

<u>MEDICAL:</u> Physician/PCP Athletic Trainer Nurse

Patient/Parent

S

ACADEMIC: School CMT Athletic Trainer Teachers School Nurse Coach

TOOLBOX-Neurocognitive Testing

- Computerized Neurocognitive testing is most common
- Formal neurocognitive testing is an option – not commonly practiced
- ImPact test is most common
- XLNTBrain Neurocog
- Headminders
- Cogsport

Neuropsychological (NP) assessment:

- Important component in overall assessment and RTP
- Should NOT be sole basis of management decisions, but an aid to clinical decision making
- Included as part of clinical neurological assessment by treating physician often with computerized NP screening tools
- Formal NP testing not required for all but, if so, interpretation should be performed by trained neuropsychologist.
- Best done when asymptomatic but may be advantageous at other stages in particular situations
- Baseline testing not mandatory. May be helpful in test interpretation and for education opportunity

Concussion Management Team: Build your Team

More Complex:

MEDICAL: **Patient/Parent** Physician/PCP S Athletic Trainer **Office Nurse Physical Therapist Occupational** Therapist **Speech Pathologist** Neurologist **Physical Medicine & Rehabilitation Neuro-optometry** Neuropsychologist

ACADEMIC: School CMT Athletic Trainer Teacher School Nurse Principal Coach Athletic Director

CONCUSSION MANAGEMENT: Multidisciplinary Approach

- Athletes/Students
- Teammates

COMMUNICATION IS KEY!!

- Parents
- Coaches
- Teachers
- Athletic Trainers/School CMT
- Physical Therapists
- Medical Team

CONCUSSION MANAGEMENT: Multidisciplinary Approach

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COMMUNICATION IS KEY!!



Graduated RTP Protocol

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Symptom limited physical and cognitive rest.	Recovery
2.Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity < 70% MPHR No resistance training.	Increase HR
3.Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities.	Add movement
4.Non-contact training drills	Progression to more complex training drills e.g. passing drills in football and ice hockey. May start progressive resistance training	Exercise, coordination, and cognitive load
5.Full contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6.Return to play	Normal game play	

24 hours per step (therefore about 1 week for full protocol) If recurrence of symptoms at any stage, return to previous asymptomatic level and resume after further 24 hr period of rest

TOOLBOX-Persistent

symptoms

Occupational Therapy:

- Gaits Balance or BESS
- Vestibular/Ocular Motor screen test (VOMS)
- Physical Therapy:
- Cervical Neck pain
- Vestibular symptoms
- Speech Therapy
- Words from SCAT5
- Symptoms of trouble with recall and concentration

TOOLBOX-Referrals

- Neurology
- Physical Medicine and Rehabilitation
- Neuro-optometrist
- Madonna Outpatient, Nebraska Medicine, Children's Hospital & Medical Center



New Concussion Management Tools!!!

TOOLBOX: Managing Concussion Available Online at Brain Injury Alliance of NE



concussion awareness and management in Nebraska How every family, school and medical professional can implement a Community-Based Concussion Management Program

REAP[®] The Benefits of Good Concussion Management



Remove/Reduce Educate Adjust/Accommodate Pace

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SERIOUS MEDICINE. FXTRAORDINARY CARF

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Jake Snakenberg Fund Dedicated to the Memory of Jake Snakenberg April 19. 1990 – September 19. 2004

In the fall of 2004, Jake Snakenberg passed away from "Second Impact Syndrome" As a result of Jake's death, with the support of Jake's family and a team of dedicated health professionals, REAP exists today. The Jake Snakenberg Fund is a program of Rocky Mountain Children's Health Foundation.

working to enhance the quality of life for pediatric patients in

the Rocky Mountain region. To ensure the ongoing efforts to

educate coaches, teachers and parents on concussion recog-

nition, please consider a gift to the Jake Snakenberg Fund.



5394 Marshall Street, Suite 400 | Arvada, CO 80002 | 303.839.6782 | Visit us at www.rmchildren.org

TOOLBOX-Biomarkers

- UCH-L1-Ubiquitin carboxy-terminal hydrolase
- S100Beta S100
 Calcium-binding protein
- SBDP150, IL-6, IL-1RA
- Other biomarkers being studied including blood, saliva, and CSF

Not clinically helpful at this time.

Biomarkers

• GFAP/UHCL-1 cleared by the FDA for prediction of abnormal CT scan within 12 hours of head injury



Protein Biomarkers for mTBI

Zetterberg, Smith, Blennow. Nature Rev Neurol, 2013





- Baseline testing neurocognitive
- Post Injury testing neurocognitive unlimited number of tests
- Concussion incident reports sideline
- Symptom checklist daily or every 3rd day...
- Integrated Academic Care Plan based on symptom checklist.
- Concussion Recovery Tracker with 5 step progressive exertion – The Dashboard

Dr. Harry Kerasidis



Concussion Incident Report

submitted on 11/07/2019 reported by Robert Miller

PDF

SPORT: Not specified **POSITION:** Not specified

 DATE OF REPORT:
 11/07/19

 DATE OF INJURY:
 11/07/19 2:31 PM

INJURY DESCRIPTION: head_to_object

ADDITIONAL INFORMATION: Not specified

GLASGOW COMA SCALE:

BEST EYE RESPONSE: O 1 DOES NOT OPEN EYES AT ALL O 2 OPENS EYE TO PAINFUL STIMULUS O 3 OPENS EYES ON COMMAND **O 4 OPENS EYES SPONTANEOUSLY** BEST VERBAL RESPONSE: O 1 NO VERBAL RESPONSE O 2 INCOMPREHENSIBLE WORDS **O 3 INAPPROPRIATE WORDS** O 4 CONFUSED O 5 ORIENTED AND APPROPRIATE BEST MOTOR RESPONSE: O 1 MAKES NO MOVEMENT **O 2 EXTENSION RESPONSE TO PAINFUL STIMULI O 3 ABNORMAL FLEXION RESPONSE TO PAINFUL STIMULI** O 4 NORMAL FLEXION OR WITHDRAWAL TO PAINFUL STIMULI O 5 LOCALIZES PAINFUL STIMULI O 6 OBEYS COMMANDS

TOTAL GLASGOW COMA SCALE SCORE (Sum of eye, verbal, & motor responses): 0

WAS THERE LOSS OF CONSCIOUSNESS? NO O LESS THAN A MINUTE O MORE THAN A MINUTE



Concussion Incident Re WAS THE ATHLETE LETHARGIC? • NO ■ submitted on 11/07/2019 O LESS THAN 30 MINUTES reported by Robert Miller **O MORE THAN 30 MINUTES** PDF WAS THE ATHLETE DAZED OR CONFUSED? NO SPORT: Not specified **O LESS THAN 30 MINUTES** POSITION: Not specified O MORE THAN 30 MINUTES **DATE OF REPORT:** 11/07/19 OBSERVED SYMPTOMS DATE OF INJURY: 11/07/19 2:31 PM □ MEMORY PROBLEMS □ SLURRED SPEECH INJURY DESCRIPTION: head_to_object □ LOSS OF BALANCE PARALYSIS: ADDITIONAL INFORMATION: RIGHT ARM Not specified LEFT ARM GLASGOW COMA SCALE: **RIGHT LEG** BEST EYE RESPONSE: LEFT LEG O 1 DOES NOT OPEN EYES AT ALL ATHLETE REPORTED SYMPTOMS (CHECK ALL THAT APPLY): **O 2 OPENS EYE TO PAINFUL STIMULUS** □ HEADACHE O 3 OPENS EYES ON COMMAND □ NAUSEA / VOMITING O 4 OPENS EYES SPONTANEOUSLY □ BLURRED VISION BEST VERBAL RESPONSE: □ LOSS OF BALANCE **O 1 NO VERBAL RESPONSE** NECK PAIN O 2 INCOMPREHENSIBLE WORDS **DOUBLE VISION O 3 INAPPROPRIATE WORDS** WEAKNESS: O 4 CONFUSED C RIGHT ARM **O 5 ORIENTED AND APPROPRIATE** LEFT ARM BEST MOTOR RESPONSE: O 1 MAKES NO MOVEMENT **RIGHT LEG O 2 EXTENSION RESPONSE TO PAINFUL STIMULI** LEFT LEG **O 3 ABNORMAL FLEXION RESPONSE TO PAINFUL STIMUL** NUMBNESS: O 4 NORMAL FLEXION OR WITHDRAWAL TO PAINFUL STI DRIGHT ARM O 5 LOCALIZES PAINFUL STIMULI LEFT ARM O 6 OBEYS COMMANDS **RIGHT LEG** LEFT LEG TOTAL GLASGOW COMA SCALE SCORE (Sum of eye, verbal, SIDELINE PERFORMANCE TESTING WAS THERE LOSS OF CONSCIOUSNESS? DOES THE ATHLETE KNOW WHAT THE DATE IS TODAY? NO **O YES O LESS THAN A MINUTE** NO O MORE THAN A MINUTE



O YES

DOES THE ATHLETE KNOW WHAT THE DATE IS TODAY?

Concussion Incident Re WAS THE ATHLETE LETHARGIC?

submitted on 11/07/2019 reported by Robert Miller PDF	NO O LESS THAN 30 MINUTES O MORE THAN 30 MINUTES WAS THE ATHLETE DAZED OR CO		
SPORT: Not specified POSITION: Not specified	● NO ○ LESS THAN 30 MINUTES ○ MORE THAN 30 MINUTES		
DATE OF REPORT: 11/07/19 DATE OF INJURY: 11/07/19 2:31 PM	OBSERVED SYMPTOMS O MEMORY PROBLEMS SLURRED SPEECH		
ADDITIONAL INFORMATION: Not specified	LOSS OF BALANCE PARALYSIS: RIGHT ARM LEFT ARM		
GLASGOW COMA SCALE: BEST EYE RESPONSE: O 1 DOES NOT OPEN EYES AT ALL O 2 OPENS EYE TO PAINFUL STIMULUS O 3 OPENS EYES ON COMMAND O 4 OPENS EYES SPONTANEOUSLY BEST VERBAL RESPONSE: O 1 NO VERBAL RESPONSE O 2 INCOMPREHENSIBLE WORDS O 3 INAPPROPRIATE WORDS O 4 CONFUSED O 5 ORIENTED AND APPROPRIATE BEST MOTOR RESPONSE: O 1 MAKES NO MOVEMENT O 2 EXTENSION RESPONSE TO PAINFUL STIMULI O 3 ABNORMAL FLEXION RESPONSE TO PAINFUL STIMUL O 4 NORMAL FLEXION OR WITHDRAWAL TO PAINFUL STI O 5 LOCALIZES PAINFUL STIMULI O 6 OBEYS COMMANDS	 RIGHT LEG LEFT LEG ATHLETE REPORTED SYMPTOMS HEADACHE NAUSEA / VOMITING BLURRED VISION LOSS OF BALANCE NECK PAIN DOUBLE VISION WEAKNESS: RIGHT ARM LEFT ARM LEFT LEG NUMBNESS: RIGHT ARM LEFT ARM LEFT ARM LEFT ARM LEFT ARM LEFT ARM RIGHT LEG NUMBNESS: RIGHT ARM LEFT ARM 		
TOTAL GLASGOW COMA SCALE SCORE (Sum of eye, verbal,	□ LEFT LEG		
WAS THERE LOSS OF CONSCIOUSNESS?	DOES THE ATHLETE KNOW WHAT		

O LESS THAN A MINUTE

O MORE THAN A MINUTE

O YES

NO

INFUSED?	O YES NO
	DOES THE ATHLETE REMEMBER WHERE HE/SHE IS OR WHAT THE EVENT IS? O YES ● NO
	CAN HE/SHE REPEAT ALL 5 WORDS IMMEDIATELY WITHOUT ASSISTANCE? O YES ● NO
	CAN THE ATHLETE RECITE THE NAMES OF THE DAYS OF THE WEEK BACKWARDS WITHOUT ERROR? O YES ● NO
(CHECK ALL TH/	CAN THE ATHLETE RECALL THE 5 WORDS AFTER ONE MINUTE? O YES ● NO
	CAN THE ATHLETE RECALL THE 5 WORDS AFTER 3 MINUTES? O YES • NO
	CRANIAL NERVE ASSESSMENT (OPTIONAL BASED ON TRAINING. CHECK ALL THAT APPLY.) CASS OF SMELL LOSS OF VISION: RIGHT EYE LEFT EYE LOSS OF ALIGNMENT OF THE EYES NUMBNESS OF THE FACE: RIGHT SIDE LEFT SIDE FACIAL DROOP: RIGHT SIDE LOSS OF HEARING: RIGHT EAR
THE DATE IS TO	LEFT EAR TONGUE DEVIATION: RIGHT EAR LEFT EAR



Concussion Incident Report for John Smith

submitted on 11/07/2019 reported by Robert Miller

Sport: Not specified Position: Not specified

Date of Report: 11/07/19 Date of injury: 11/07/19 2:31 PM

INJURY DESCRIPTION: head_to_object

Additional Information:

GLASGOW COMA SCALE:

BEST EYE RESPONSE: Not specified

BEST VERBAL RESPONSE: Not specified

BEST MOTOR RESPONSE: Not specified

TOTAL GLASGOW COMA SCALE SCORE (Sum of eye, verbal, & motor responses):0

WAS THERE LOSS OF CONSCIOUSNESS? No

WAS THE ATHLETE LETHARGIC? No

WAS THE ATHLETE DAZED OR CONFUSED? No

OBSERVED SYMPTOMS: Not specified

PARALYSIS:

Not specified



We have created a clear guide to map an athlete's road to recovery

CONCUSSION	POST-INJURY TESTING	SYMPTOM CHECKLIST STATUS	5-STEP PROGRESSIVE EXERTION			SIVE	REPEAT	CLEARED
		POST-INJURY TEST STATUS	1	2	3	4	5	TESTING

Post Injury Testing

Baseline comparisons provide clinical-caliber post-concussion evaluations to monitor severity and the recovery progress.

5 Step Progressive Exertion

Each step involves increased exertion and movement to the next step halts if any concussion symptoms return.

Daily Symptom Checklists

Recovering athletes fill out our Daily Symptom Checklists to monitor their symptoms improvement.

Clearance for Gameplay

The final step has a medical professional review all the data and sign off on an athlete's return to gameplay.



Comprehensive Report

John Smith - OTKYNGIWO

Information

Email	sevenmillers@mac.com
Phone Number	XXXXXXXXXXXXX
Age	15 - 03/05/05
Gender	MALE
Handedness	R
Years of education	10
History of Learning Disability	No
Special Education	No
History of Attention Deficit Disorder	No
History of Concussion	Yes

Status as of 2019-11-07





CASE #1

14 year old football player was returning a kickoff and hit helmet to helmet by the opposing player. He stayed on the ground for a short period of time and then got up and walked slowly to the sideline. He did not lose consciousness but developed a headache and was removed by the coach for the remainder of the game. He becomes nauseated and has balance problems over the next several hours but can clearly recall the event. He comes to your clinic the following day. His school requires baseline neurocognitive testing prior to all sports participation each year and you have a copy of this year's results.

Which one of the following would be the most appropriate recommendation at this time?

- A) CT of the head
- B) Return to practice when the symptoms are relieved by medication.
- C) Neurocognitive testing at this visit
- D) Physical and cognitive rest
- E) Removal from all sports for the remainder of the school year.

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Case #1 question 2

The same 14 year old male returns to see you the following week. He reports he still has some headaches but not everyday. He does experience phonophobia. His headaches resolve with the use of acetaminophen 500mg. Patient reports he is taking the acetaminophen twice a day.

Which one of the following would not be a recommendation at this time?

- A) Patient may begin light aerobic exercise as long as it does not make his symptoms worse.
- B) Return to practice when the symptoms are relieved by medication
- C) Neurocognitive testing at this visit
- D) Physical and cognitive rest
- E) Removal from band and choir

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Case #2

13 year old goalkeeper dives for a save during a soccer game and strikes her head on the goalpost. She did have a brief loss of consciousness. She did not have a headache initially but developed a headache after getting to the sideline. Over the next two hours she becomes nauseated and has onset of vomiting. She has had four episodes of vomiting. She reports her headache is getting worse. Her parents report she seems more confused. She denies cervical neck pain.

Which one of the following tests would be the most appropriate recommendation at this time?

- A) CT of the head
- B) Glial Fibrillary Acidic Protein.
- C) Ubiquitin Carboxy-Terminal Hydrolase L1 (UCHL1)
- D) S100 calcium-binding protein Beta (S100Beta)
- E) Spinal tap

Case #3

A 16 year old male patient was involved in a motor vehicle accident five days ago. Patient was a restrained driver of a vehicle travelling approximately 35 miles per hour. The vehicle ran into a pole. There was airbag deployment of airbags. There was a star pattern on the windshield. Patient was evaluated in the emergency department. Patient had a CT scan of his head and neck which were negative. Patient complains of a constant headache since the accident. Patient reports he has been sleeping excessively. Patient complains of dizziness. You are seeing patient in the clinic for follow-up. He has several questions regarding what he can expect.

Which statement is true regarding his symptoms?

- A) He does not have a concussion because he did not have loss of consciousness
- B) If he has prolonged symptoms a multidisciplinary team should be considered
- C) He has an increased risk of developing CTE
- D) He has an 80-90% chance his symptoms will be gone in 10 days.
- E) He is safe to return to driving.

Case #4

An 18 year old male patient presents to your office stating he is wanting to return to practice tonight so he can play in the state football championship game in three days. He was injured two weeks ago when he was knocked unconscious for a short period of time. He had intermittent headaches for three days. He has not had a headache for 9 or 10 days. He has not had any symptoms for the past 8 days. He has been in school for the past week. He completed a computerized neurocognitive test and performed equal to or better than baseline in all areas tested. He is not taking any medication for concussion symptoms. He has progressed through a return to play protocol and has been participating in noncontact training drills for the past 2 days without symptoms. He can perform hard exertional activity without any symptoms.

What advice do you give this patient?

- A) He is not able to play because loss of consciousness is associated with prolonged recovery.
- B) He is not able to play because he had a Grade III concussion and should be removed from all contact and collision sports for 3 months due to his high risk for second impact syndrome.
- C) He has an increased risk of developing CTE because he had loss of consciousness.
- D) He should get a helmet with a higher impact rating to prevent him from getting another concussion.
- E) He may progress to full contact practice for the next practice and would be allowed to return to football without restriction in two days if he remains without symptoms.