



A Targeted Approach to Concussion Management

SANFORD
ORTHOPEDICS
SPORTS MEDICINE

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1

Goals/Objectives of this Discussion

After the session, the audience will be able to:

1. Appreciate the neurometabolic pathway of concussion pathology
2. Describe the basic elements of an office-based assessment
3. Discuss the specific clinical trajectories of a concussion patient
4. Contemplate clinical treatment decisions based on the clinical presentation

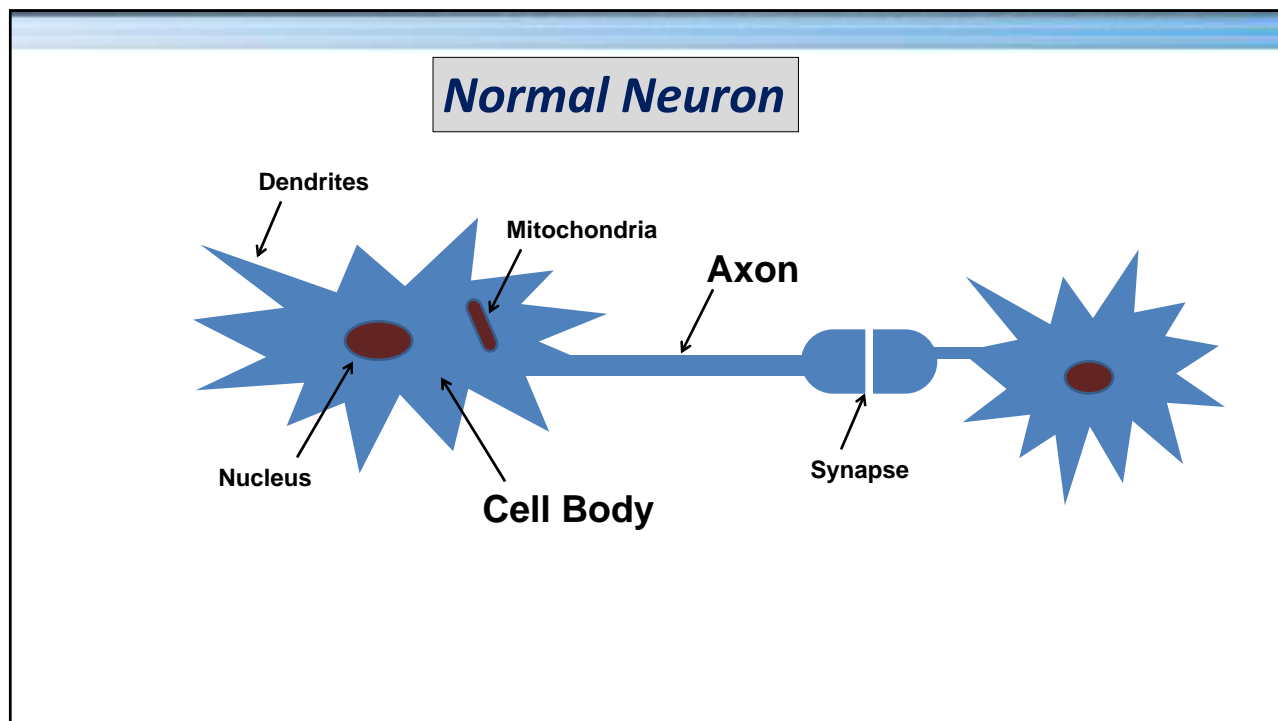
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Concussion Definition

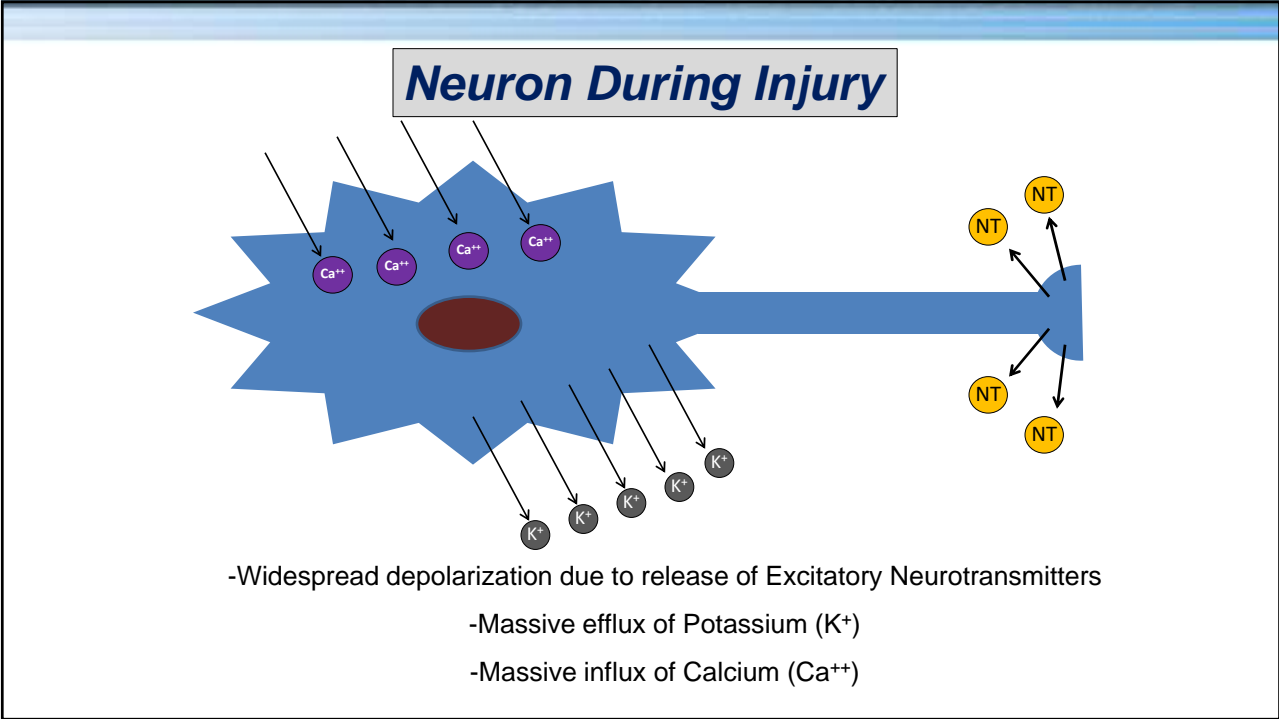
- **Concussion** – a complex patho-physiological process affecting the brain, induced by traumatic biokinetic forces caused either by a direct blow to the head, face, or neck or elsewhere on the body with an impulsive force transmitted to the head.

Latin Word: ***CONCUSSUS*** - “to shake violently”

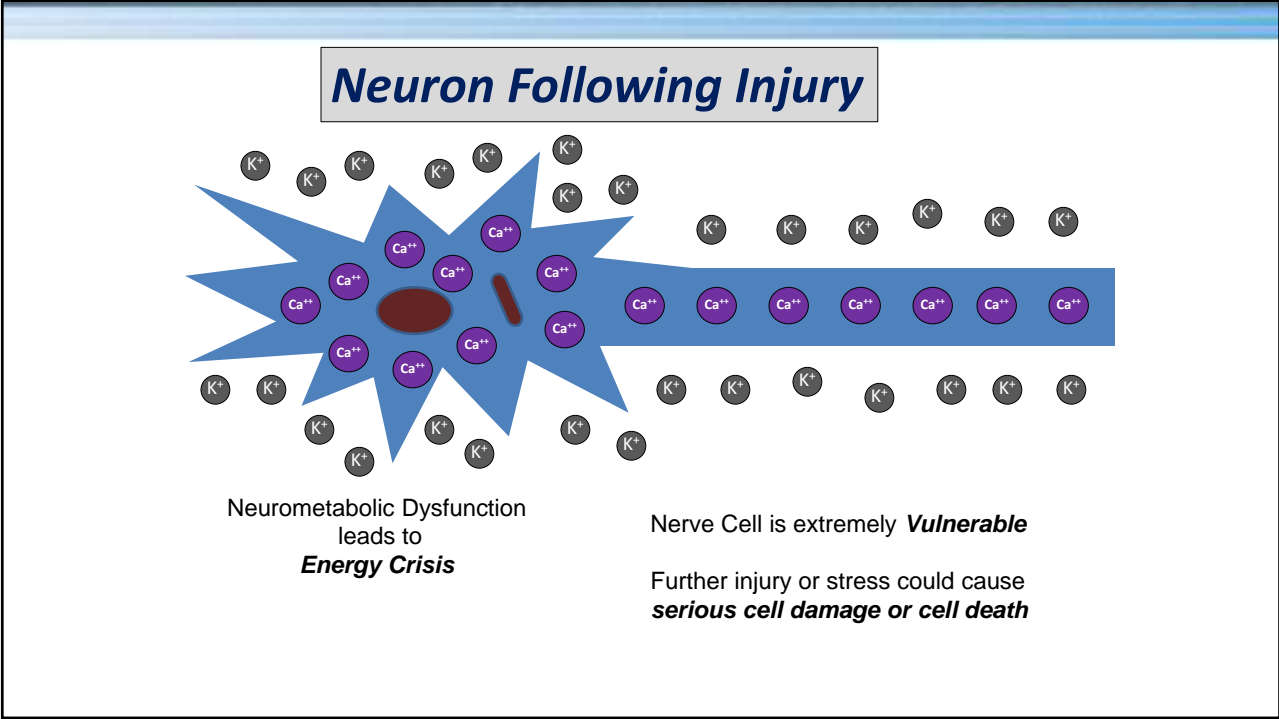
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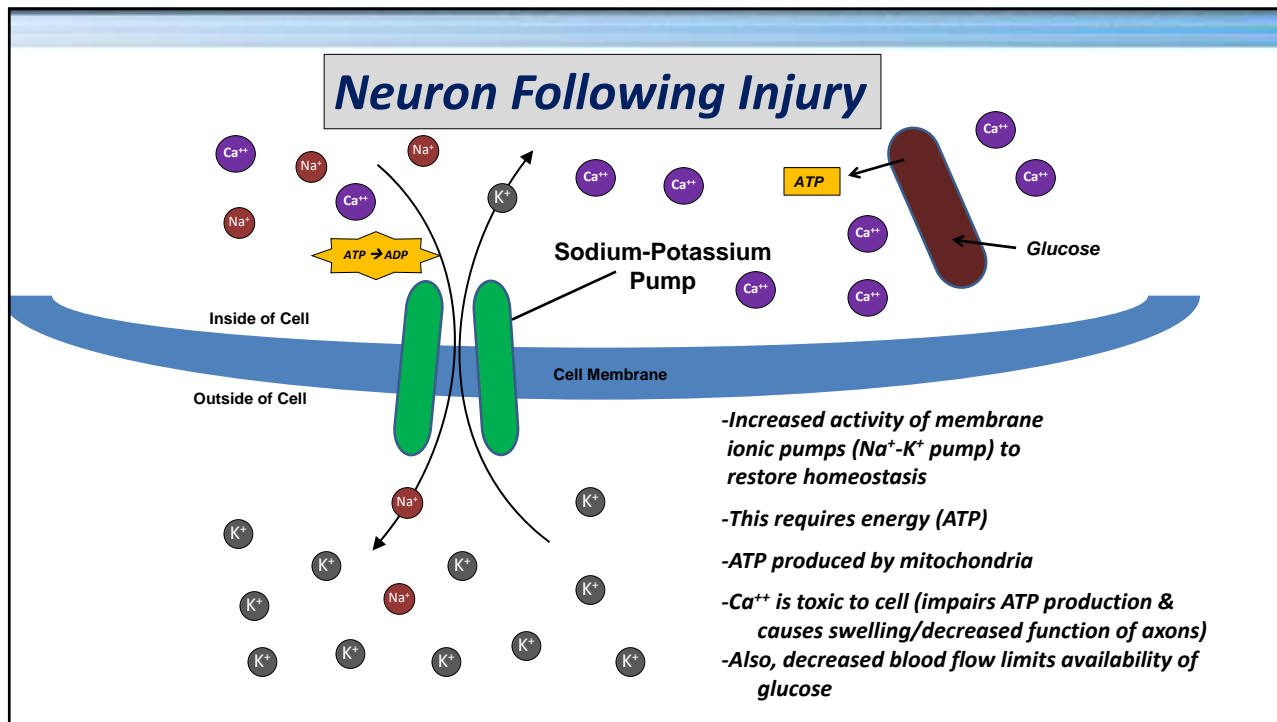
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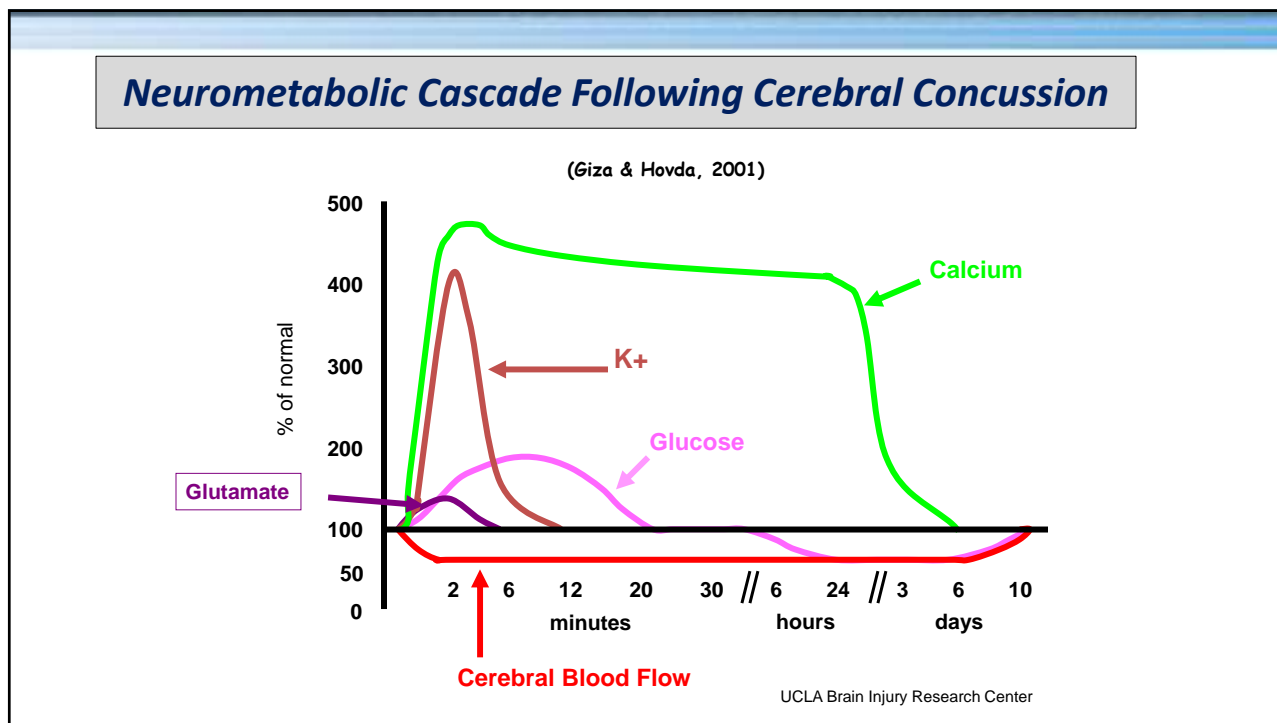
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6



7



8

Signs of Concussion

(Things that are observed)

- Appears dazed or stunned
- Is confused about assignments
- Forgets plays
- Is unsure of game, score, or opponent
- Moves clumsily
- Answers questions slowly
- Loses consciousness
- Shows behavior or personality changes
- Can't recall events prior to hit
- Can't recall events after hit

9

Four Symptom Categories

(Things reported by the athlete)

Physical Symptoms

- Headache
- Fatigue
- Dizziness
- Sensitivity to light and/or noise
- Nausea
- Balance problems

Cognitive Symptoms

- Difficulty remembering
- Difficulty concentrating
- Feeling slowed down
- Feeling mentally foggy

Emotional Symptoms

- Irritability
- Sadness
- Feeling more emotional
- Nervousness

Sleep Symptoms

- Drowsiness
- Sleeping less than usual
- Sleeping more than usual
- Trouble falling asleep

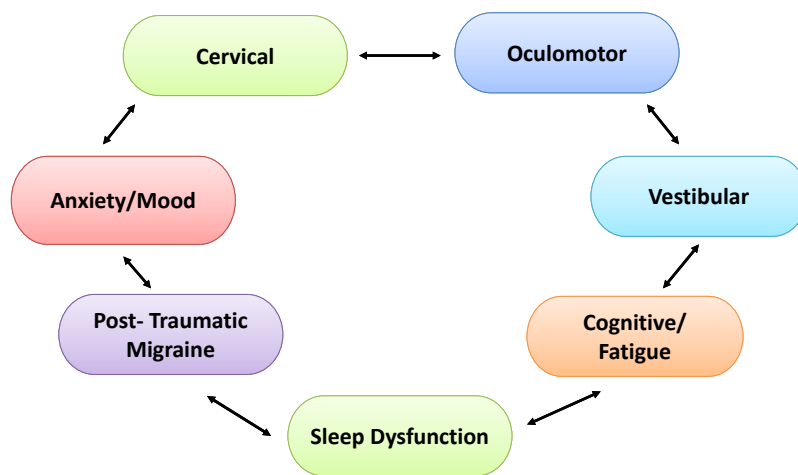
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Principles and Techniques of Concussion Evaluation – In the Office Based Setting

11

Clinical Profiles & Recovery Trajectories



12

Office-Based Evaluation

Aspects of the Evaluation

1. **Clinical Interview**
 - Symptom Evaluation
 - Pertinent Medical History
2. **Balance-Vestibular-Ocular Screening**
 - Balance Testing
 - VOMS Screen
 - King-Devick (KD) Test
3. **Computerized Neurocognitive Testing**

13

Symptom Evaluation

Post Concussion Symptom Score

-22 question symptom assessment
 - 7 point Likert scale (0-6)

	never	rarely	sometimes	often			
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Head pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6
Trouble falling asleep (if applicable)	0	1	2	3	4	5	6


14

Post Concussion Symptom Score with Reordering of Questions

PHYSICAL (10)		COGNITIVE (4)		SLEEP (4)	
Headache	0 1	Feeling mentally foggy	0 1	Drowsiness	0 1
Nausea	0 1	Feeling slowed down	0 1	Sleeping less than usual	0 1 N/A
Vomiting	0 1	Difficulty concentrating	0 1	Sleeping more than usual	0 1 N/A
Balance problems	0 1	Difficulty remembering	0 1	Trouble falling asleep	0 1 N/A
Dizziness	0 1	COGNITIVE Total (0-4) _____		SLEEP Total (0-4) _____	
Visual problems	0 1	EMOTIONAL (4)		Exertion: Do these symptoms worsen with: Physical Activity ___ Yes ___ No ___ N/A Cognitive Activity ___ Yes ___ No ___ N/A Overall Rating: How different is the person acting compared to his/her usual self? (circle) Normal 0 1 2 3 4 5 6 Very Different	
Fatigue	0 1	Irritability	0 1		
Sensitivity to light	0 1	Sadness	0 1		
Sensitivity to noise	0 1	More emotional	0 1		
Numbness/Tingling	0 1	Nervousness	0 1		
PHYSICAL Total (0-10) _____		EMOTIONAL Total (0-4) _____			
(Add Physical, Cognitive, Emotion, Sleep totals)					
Total Symptom Score (0-22)					

15

A new approach to symptom evaluation CP Screen



RESEARCH—HUMAN—CLINICAL STUDIES

**Concussion Clinical Profiles Screening (CP Screen)
Tool: Preliminary Evidence to Inform a
Multidisciplinary Approach**

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16

CP Screening Questions

Symptom	
1. Feeling sad	15. Feeling or sensation of slow wavy dizziness (i.e., lightheadedness)
2. Headache when you wake up	16. Neck pain or stiffness
3. Difficulty or headache when looking at a phone or computer screen	17. Sleeping more than usual
4. Dizziness when you move your head	18. Sleeping less than usual
5. Difficulty turning off your thoughts (e.g., rumination)	19. Eye strain (eyes feel tired) during visual activities
6. Headache with nausea or upset stomach	20. Visual aura (e.g., flashes, stars, spots, flickering light) with or without headache
7. Trouble focusing your eyes while reading	21. Feeling or sensation of fast spinning dizziness (i.e., vertigo)
8. Frontal headache	22. Difficulty falling asleep
9. Difficulty or discomfort in busy environments	23. Difficulty staying asleep
10. Constantly thinking about your symptoms	24. Trouble remembering things (e.g., what you completed today or having to re-read information)
11. Headache with sensitivity to light or noise	25. Difficulty moving your neck
12. Feeling motion sick ("sea or car sick")	26. Feeling nervous or anxious
13. Feeling more tired at the end of the day	27. Increased headache following physical activity
14. Blurry or double vision	28. Increased headache following cognitive activity
	29. Feeling more stressed than usual

17

CP Screen Scoring Sheet

None= 0, Mild= 1, Moderate= 2, Severe= 3

	RAW	AVERAGE
PROFILE SCORES:		
ANXIETY/MOOD (Items 1, 5, 10, 26, 29)=	_____	+5= _____
COGNITIVE/FATIGUE (Items 13, 24, 28)=	_____	+3= _____
MIGRAINE (Items 2, 6, 11, 20, 27)=	_____	+5= _____
OCULAR (Items 3, 7, 8, 14, 19)=	_____	+5= _____
VESTIBULAR (Items 4, 9, 12, 15, 21)=	_____	+5= _____
MODIFIER SCORES:		
	RAW	AVERAGE
SLEEP (Items 17, 18, 22, 23)=	_____	+4= _____
NECK (Items 16, 25)=	_____	+2= _____
CP SCREEN TOTAL RAW SCORE=	_____	

18

Ocular Questions

None= 0, Mild= 1, Moderate= 2, Severe= 3

PROFILE SCORES:		RAW	AVERAGE
ANXIETY/MOOD (Items 1, 5, 10, 26, 29)=	_____	+5=	_____
COGNITIVE/FATIGUE (Items 13, 24, 28)=	_____	+3=	_____
MIGRAINE (Items 2, 6, 11, 20, 27)=	_____	+5=	_____
OCULAR (Items 3, 7, 8, 14, 19)=	11	+5=	2.2
VESTIBULAR (Items 4, 9, 12, 15, 21)=	_____	+5=	_____

MODIFIER SCORES:		RAW	AVERAGE
SLEEP (Items 17, 18, 22, 23)=	_____	+4=	_____
NECK (Items 16, 25)=	_____	+2=	_____
CP SCREEN TOTAL RAW SCORE=		_____	

- Difficulty or HA when looking at a phone or computer screen **(2)**
- Trouble focusing your eyes while reading **(2)**
- Frontal HA **(1)**
- Blurry or double vision **(3)**
- Eye strain (eyes feel tired) during visual activities **(3)**

19

Vestibular Questions

None= 0, Mild= 1, Moderate= 2, Severe= 3

PROFILE SCORES:		RAW	AVERAGE
ANXIETY/MOOD (Items 1, 5, 10, 26, 29)=	_____	+5=	_____
COGNITIVE/FATIGUE (Items 13, 24, 28)=	_____	+3=	_____
MIGRAINE (Items 2, 6, 11, 20, 27)=	_____	+5=	_____
OCULAR (Items 3, 7, 8, 14, 19)=	11	+5=	2.2
VESTIBULAR (Items 4, 9, 12, 15, 21)=	3	+5=	0.6

MODIFIER SCORES:		RAW	AVERAGE
SLEEP (Items 17, 18, 22, 23)=	_____	+4=	_____
NECK (Items 16, 25)=	_____	+2=	_____
CP SCREEN TOTAL RAW SCORE=		_____	

- Dizziness when you move your head **(0)**
- Difficulty or discomfort in busy environments **(1)**
- Feeling motion sick (“sea or car sick”) **(1)**
- Feeling or sensation of slow moving wavy dizziness (i.e. lightheadedness) **(1)**
- Feeling or sensation of fast spinning dizziness (i.e. vertigo) **(0)**

20

None= 0, Mild= 1, Moderate= 2, Severe= 3

Migraine Questions

- HA when you wake up (0)
- HA with nausea or upset stomach (1)
- HA with sensitivity to light or noise (1)
- Visual aura with or without HA (0)
- Increased HA following physical activity (2)

PROFILE SCORES:		
	RAW	AVERAGE
ANXIETY/MOOD (Items 1, 5, 10, 26, 29)=	_____ +5=	_____
COGNITIVE/FATIGUE (Items 13, 24, 28)=	_____ +3=	_____
MIGRAINE (Items 2, 6, 11, 20, 27)=	4	0.8
OCULAR (Items 3, 7, 8, 14, 19)=	11	2.2
VESTIBULAR (Items 4, 9, 12, 15, 21)=	3	0.6

MODIFIER SCORES:		
	RAW	AVERAGE
SLEEP (Items 17, 18, 22, 23)=	_____ +4=	_____
NECK (Items 16, 25)=	_____ +2=	_____

CP SCREEN TOTAL RAW SCORE= _____

21

None= 0, Mild= 1, Moderate= 2, Severe= 3

Cognitive/Fatigue Questions

- Feeling more tired at the end of the day (1)
- Trouble remembering things (i.e. What you completed today or having to re-read information) (1)
- Increased HA following cognitive activities (1)

PROFILE SCORES:		
	RAW	AVERAGE
ANXIETY/MOOD (Items 1, 5, 10, 26, 29)=	_____ +5=	_____
COGNITIVE/FATIGUE (Items 13, 24, 28)=	3	1
MIGRAINE (Items 2, 6, 11, 20, 27)=	4	0.8
OCULAR (Items 3, 7, 8, 14, 19)=	11	2.2
VESTIBULAR (Items 4, 9, 12, 15, 21)=	3	0.6

MODIFIER SCORES:		
	RAW	AVERAGE
SLEEP (Items 17, 18, 22, 23)=	_____ +4=	_____
NECK (Items 16, 25)=	_____ +2=	_____

CP SCREEN TOTAL RAW SCORE= _____

22

None= 0, Mild= 1, Moderate= 2, Severe= 3

Anxiety/Mood Questions

- Feeling sad (0)
- Trouble turning off your thoughts (i.e. rumination) (1)
- Constantly thinking about your symptoms (1)
- Feeling nervous or anxious (0)
- Feeling more stressed than usual (2)

PROFILE SCORES:		
	RAW	AVERAGE
ANXIETY/MOOD (Items 1, 5, 10, 26, 29)=	<u>4</u>	+5= <u>0.8</u>
COGNITIVE/FATIGUE (Items 13, 24, 28)=	<u>3</u>	+3= <u>1</u>
MIGRAINE (Items 2, 6, 11, 20, 27)=	<u>4</u>	+5= <u>0.8</u>
OCULAR (Items 3, 7, 8, 14, 19)=	<u>11</u>	+5= <u>2.2</u>
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MODIFIER SCORES:		
	RAW	AVERAGE
SLEEP (Items 17, 18, 22, 23)=	_____	+4= _____
NECK (Items 16, 25)=	_____	+2= _____
CP SCREEN TOTAL RAW SCORE=	_____	

23

None= 0, Mild= 1, Moderate= 2, Severe= 3

Sleep Questions

- Sleeping more than usual (0)
- Sleeping less than usual (1)
- Difficulty falling asleep (1)
- Difficulty staying asleep (0)

PROFILE SCORES:		
	RAW	AVERAGE
ANXIETY/MOOD (Items 1, 5, 10, 26, 29)=	<u>4</u>	+5= <u>0.8</u>
COGNITIVE/FATIGUE (Items 13, 24, 28)=	<u>3</u>	+3= <u>1</u>
MIGRAINE (Items 2, 6, 11, 20, 27)=	<u>4</u>	+5= <u>0.8</u>
OCULAR (Items 3, 7, 8, 14, 19)=	<u>11</u>	+5= <u>2.2</u>
VESTIBULAR (Items 4, 9, 12, 15, 21)=	<u>3</u>	+5= <u>0.6</u>
MODIFIER SCORES:		
	RAW	AVERAGE
SLEEP (Items 17, 18, 22, 23)=	<u>2</u>	+4= <u>0.5</u>
NECK (Items 16, 25)=	_____	+2= _____
CP SCREEN TOTAL RAW SCORE=	_____	

24

Neck Questions

None= 0, Mild= 1, Moderate= 2, Severe= 3

- Neck pain or stiffness (2)
- Difficulty moving your neck (2)

PROFILE SCORES:		
	RAW	AVERAGE
ANXIETY/MOOD (Items 1, 5, 10, 26, 29)=	<u>4</u>	+5= <u>0.8</u>
COGNITIVE/FATIGUE (Items 13, 24, 28)=	<u>3</u>	+3= <u>1</u>
MIGRAINE (Items 2, 6, 11, 20, 27)=	<u>4</u>	+5= <u>0.8</u>
OCULAR (Items 3, 7, 8, 14, 19)=	<u>11</u>	+5= <u>2.2</u>
VESTIBULAR (Items 4, 9, 12, 15, 21)=	<u>3</u>	+5= <u>0.6</u>

MODIFIER SCORES:		
	RAW	AVERAGE
SLEEP (Items 17, 18, 22, 23)=	<u>2</u>	+4= <u>0.5</u>
NECK (Items 16, 25)=	<u>4</u>	+2= <u>2</u>

CP SCREEN TOTAL RAW SCORE= 31

25

CP Scoring

None= 0, Mild= 1, Moderate= 2, Severe= 3

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    graph TD
      Cervical <--> Oculomotor
      AnxietyMood[Anxiety/Mood] --> Cervical
      PostTraumaticMigraine[Post-Traumatic Migraine] --> AnxietyMood
      SleepDysfunction[Sleep Dysfunction] --> PostTraumaticMigraine
      Vestibular --> Oculomotor
      CognitiveFatigue[Cognitive/Fatigue] --> Vestibular
      SleepDysfunction --> CognitiveFatigue
    
```

PROFILE SCORES:		
	RAW	AVERAGE
ANXIETY/MOOD (Items 1, 5, 10, 26, 29)=	<u>4</u>	+5= <u>0.8</u>
COGNITIVE/FATIGUE (Items 13, 24, 28)=	<u>3</u>	+3= <u>1</u>
MIGRAINE (Items 2, 6, 11, 20, 27)=	<u>4</u>	+5= <u>0.8</u>
OCULAR (Items 3, 7, 8, 14, 19)=	<u>11</u>	+5= <u>2.2</u>
VESTIBULAR (Items 4, 9, 12, 15, 21)=	<u>3</u>	+5= <u>0.6</u>

MODIFIER SCORES:		
	RAW	AVERAGE
SLEEP (Items 17, 18, 22, 23)=	<u>2</u>	+4= <u>0.5</u>
NECK (Items 16, 25)=	<u>4</u>	+2= <u>2</u>

CP SCREEN TOTAL RAW SCORE= 31

26

Office-Based Evaluation – Pertinent Medical Information

C. Risk Factors for Protracted Recovery (check all that apply)

Concussion History? Y ___ N ___	Headache History? Y ___ N ___	Developmental History	Psychiatric History
Previous # 1 2 3 4 5 6+	Prior treatment for headache	Learning disabilities	Anxiety
Longest symptom duration Days ___ Weeks ___ Months ___ Years ___	History of migraine headache ___ Personal ___ Family	Attention-Deficit/ Hyperactivity Disorder	Depression
If multiple concussions, less force caused reinjury? Yes ___ No ___		Other developmental disorder ___	Sleep disorder
Other psychiatric disorder			

List other comorbid medical disorders or medication usage (e.g., hypothyroid, seizures)

27

Office-Based Evaluation – Balance Testing

Balance Error Scoring System (BESS)

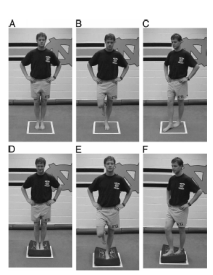
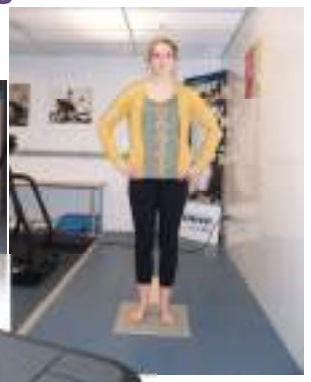


Figure 3. Balance Error Scoring System (BESS) performed on the firm surface (top, A-C) and foam surface (bottom, D-F).



“NeuroCom”

Sensory Organization Testing

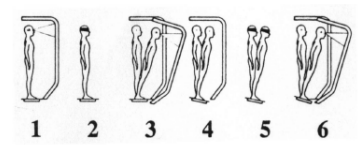




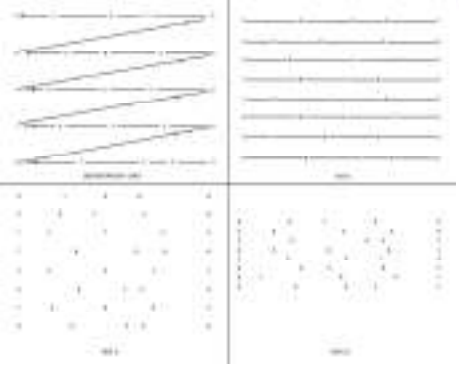
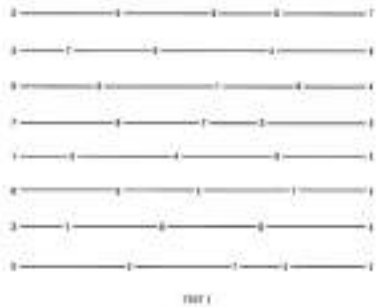

Figure 2. Six testing conditions for Sensory Organization Test used with NeuroCom’s Smart Balance Master System.



28

Office-Based Evaluation – Ocular Motor Assessment

The King-Devick (KD) Test

29

2. **VOMS**

UPMC Vestibular Ocular Motor Screening Examination

- The VOMS consists of brief assessments in the following five domains
 - 1) Smooth Pursuits (H-Test)
 - 2) Horizontal & Vertical Saccades
 - 3) Near Point Convergence
 - 4) Horizontal & Vertical Vestibular Ocular Reflex (VOR) – (*aka-Gaze Stabilization*)
 - 5) Visual Motion Sensitivity (VMS)
- Following each aspect of the VOMS assessment, patients rate changes in: (HA, dizziness, nausea & foginess)
- Convergence is assessed by both symptom provocation and distance (> 5 cm)
- Should take less than 5 minutes

*Mucha, Collins, Elbin, Furman, Troutman-Enseki, DeWolf, Marchetti, Kontos, AJSM, 2014
*Bloom, Athletic Training & Sports Health Care, 2013

30

Office-Based Evaluation - Computerized Neurocognitive Testing

Measures such things as:

- 1. Verbal Memory**
- 2. Visual Memory**
- 3. Visual Motor Speed**
- 4. Reaction Time**

ImPACT is the most commonly used neurocognitive testing software in US.

31



Principles of Treatment Planning following Concussion Evaluation

32

Treatment Planning: *Behavioral Regulation*

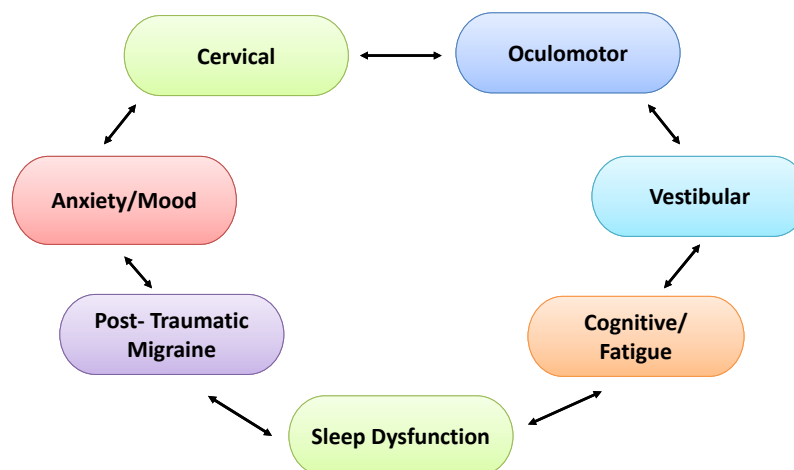
RELATIVE Cognitive & Physical Rest should be included within a Behavioral Regulation Plan that includes gradual progression back to daily Cognitive and Physical Activities

- **SLEEP** - Regulated sleep schedule, with similar bed time and wake time each day, including weekends. Dysregulated sleep can lead to fatigue, headache/migraine, and emotional distress. Avoid naps unless napping was part of their typical daily schedule.
- **DIET** - Follow a routine eating schedule, eating at the same time every day. No skipping meals, especially breakfast, and aim for a well balanced diet.
- **HYDRATION** - Dehydration can lead to fatigue, headaches, dizziness, and weakness.
- **PHYSICAL ACTIVITY** - Get some physical activity every day, even if it is just a light walk. Take a break if any symptoms increase by more than 3/10 in severity. It is also important to remain in social activities, in moderation, while using breaks for symptom management.
- **STRESS MANAGEMENT** - Both physical and emotional stress can cause and/or increase symptoms. Utilize work or academic accommodations to minimize stress. It is important to be mindful of situational or environmental stressors. Psychotherapy may be useful in some situations.

33

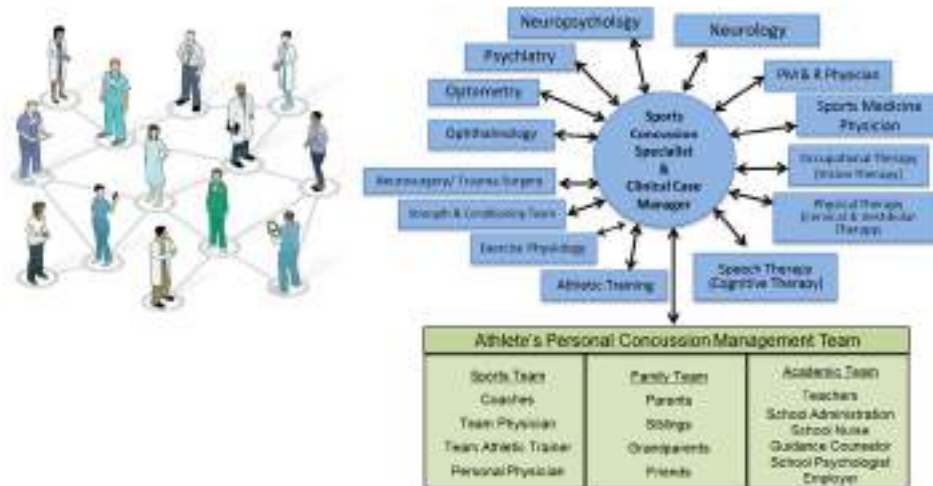
Clinical Profiles & Recovery Trajectories

These Clinical Profiles often Overlap



34

Interdisciplinary Team is Essential For Coordinated Care



35

Clinical Trajectory

Vestibular

Presentation

- ❖ Symptoms of include dizziness, motion discomfort, fogginess, unstable vision, difficulty focusing, difficulty in busy visual environments, and imbalance.
- ❖ They may also feel detached or feel anxiety
- ❖ More common in patient with personal or family history of motion sensitivity
- ❖ Balance testing such as BESS and/or force plate testing may be normal as they do not address the dynamic aspects of the vestibular system, including vestibulo-ocular control.
- ❖ Symptoms with horizontal or vertical VOR testing (gaze stabilization) or Visual Motion Sensitivity sections of the VOMS test
- ❖ Neurocognitive test data may include overall deficits in processing speed (visual motor speed) and reaction times, with relatively intact memory performance.

36

Clinical Trajectory

Vestibular

Treatment & Rehabilitation

- ❖ The cornerstone of treatment for the vestibular trajectory is comprehensive vestibular therapy, by a vestibular therapist trained specifically in neuro-rehabilitation (includes environmental exposures, VOR, VMS focused therapies, retraining and re-habituation)
- ❖ In rare cases may need to use medication to treat secondary anxiety
- ❖ It is possible for the vestibular dysfunction to trigger migraine symptoms or sleep dysregulation



37

Clinical Trajectory

Oculomotor

Presentation

Can involve issues with smooth pursuits, convergence, and/or accommodation

Symptoms may include localized, frontal based headache, blurred vision, diplopia, difficulty reading, eyestrain, headache, loss of place when reading, and difficulty with visual scanning. Symptoms may increase with prolonged reading or time on computer and may be less on weekends

VOMS test may reveal issues with convergence, pursuits, or saccadic motion

More common in patient with history of Strabismus, Nystagmus, or Lazy Eye

Neurocognitive test scores most likely to be abnormal in areas of visual memory and reaction time

38

Clinical Trajectory

Oculomotor

Treatment & Rehabilitation

- ❖ Vision Therapy done by a trained vision therapist or specialized neuro-optometrist
- ❖ Vestibular therapy is often needed as vestibular issues may co-exist/overlap
- ❖ Most will be able to tolerate aerobic exertion and this should be included to treat other aspects of the concussion syndrome



39

Clinical Trajectory

Anxiety/Mood

Presentation

- ❖ Symptoms: increase in anxiety, ruminative thoughts, feelings of being overwhelmed, sadness, and/or hopelessness.
- ❖ Vestibular part of VOMS test may be mildly provocative in patients in the anxiety/mood trajectory
- ❖ Neurocognitive testing often shows no deficits
- ❖ More common in patient with personal or family history of anxiety or mood related symptoms



40

Clinical Trajectory

Anxiety/Mood

Treatment & Rehabilitation

- ❖ Anxiety frequently co-exists with vestibular symptoms, so you must treat the vestibular component
- ❖ Exertion (a prescribed physical activity plan) is an essential part of treatment of anxiety or depression
- ❖ Stress Behavioral Regulation (Sleep, Diet, Hydration, Stress, Daily Exercise)
- ❖ Cognitive Behavioral Therapy - Psychotherapy
- ❖ Medications:
 - SSRIs:
 - Sertraline (Zoloft)
 - Escitalopram (Lexapro)
 - Citalopram (Celexa)
 - Fluoxetine (Prozac)
 - Tricyclics:
 - Amitriptyline
 - Nortriptyline

41

Clinical Trajectory

Post-Traumatic Migraine

Presentation

- ❖ Moderate to severe intensity headache, often unilateral
- ❖ Often has a pulsating quality
- ❖ Associated symptoms: nausea, photosensitivity, phono-sensitivity and is often exacerbated by: physical activity, increased stress, sleep dysregulation, anxiety or emotional changes, and dietary triggers such as caffeine.
- ❖ Often have a personal or family history of migraine
- ❖ VOMS test normal unless other contributing factors (Ocular motor or Vestibular)
- ❖ Neurocognitive testing may often indicate verbal or visual memory deficits

42

Clinical Trajectory

Post-Traumatic Migraine

Treatment & Rehabilitation

- ❖ Stress Behavioral Regulation (Sleep, Diet, Hydration, Stress, Daily Exercise)
- ❖ Physical Exertion (a prescribed physical activity plan) – If they don't have co-existing vestibular issues, this is well tolerated and highly effective
- ❖ Trigger Modification – Cognitive Behavioral Therapy
- ❖ Medications
 - Amitriptyline
 - Topiramate
 - Propranolol – B Blocker
 - Verapamil – Ca⁺⁺ Channel Blocker
 - Valproic Acid
 - Triptans

 - Escitalopram (Lexapro)
 - Sertraline (Zoloft)



43

Clinical Trajectory

Cognitive/Fatigue

Presentation


Symptoms: difficulty with concentration, increased headache with cognitive activity, fatigue, and potential sleep disruption, symptoms may increase toward the end of the day

Computerized neurocognitive testing typically reveals mild global deficits across memory, processing speed, and reaction time.

More common in patient with history of learning disability

Often occurs in athlete who initially played through injury and gets reinjured

This is the least common profile



44

Clinical Trajectory

Cognitive/Fatigue

Treatment & Rehabilitation

- ❖ Reduce Cognitive & Physical Demands – Structured Rest/Breaks during the day
- ❖ Stress Behavioral Regulation (Sleep, Diet, Hydration, Stress, Daily Exercise)

- ❖ Medications:

For Cognition:

Neurostimulants

Amantadine

Methylphenidate (Ritalin)

Atomoxetine (Strattera)

For Sleep:

Melatonin, Trazadone, etc.



45

Clinical Trajectory

Cervical

Presentation

- ❖ When assessing symptoms of concussion, pay attention to the type of HA, any neck related symptoms, etc.
- ❖ If cervicogenic aspect is suspected, include neck evaluation: palpation, ROM, strength, stability, etc.



46

Clinical Trajectory

Cervical

Treatment & Rehabilitation

- ❖ Management:
 - ROM exercises
 - manual cervical and thoracic mobilization
 - soft tissue mobilization
 - posture re-education
 - biofeedback
 - modalities
- trigger point injections
- analgesics
- anti-inflammatories
- muscle relaxants



47

Clinical Trajectory

Sleep Dysfunction

Presentation

- ❖ Symptoms of difficulty with initiation or maintenance of sleep
- ❖ May also have unusual pattern of sleep
- ❖ Often may have a history of sleep disturbance prior to concussion



48

Clinical Trajectory

Sleep Dysfunction

Treatment & Rehabilitation

- ❖ Stress Behavioral Regulation (Sleep, Diet, Hydration, Stress, Daily Exercise)
- ❖ Sleep Hygiene
- ❖ Physical Exertion (a prescribed physical activity plan)
- ❖ Supplements or Medications:
 - Melatonin
 - Trazodone
 - Benzobiazepams - **NO**
 - Zolpidem (Ambien)
 - Tricyclics



49

Conclusion

- **Stress ACTIVE recovery – Exercise as part of treatment plan**
- **Emphasize Behavioral Regulation**
- **Use Clinical Trajectories to Target appropriate treatment plan**
- **An Interdisciplinary Team is need to manage complex concussions**

50



Thank You

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51

References

- Kontos. Concussion clinical profiles screening (CP screen) tool: preliminary evidence to inform a multidisciplinary approach. *Neurosurgery*. 2020;87(2):348-356.
- McCrory. Consensus statement on concussion in sport: the 5th international conference on concussion in sport held in Berlin, October 2016. *British Journal of Sports Medicine*. 2018;51:838-847.
- Harmon. American Medical Society for Sports Medicine position statement on concussion in sport. *British Journal of Sports Medicine*. 2019;53:213-225.
- Patel. Contributions of PCSS, CISS, and VOMS for identifying vestibular/ocular motor deficits in pediatric concussions. *Sports Health*. 2121;13(6):565-572.
- Bezherano. Practical management: prescribing sub symptom threshold aerobic exercise for sport-related concussion in the outpatient setting. *Clinical Journal of Sport Medicine*. 2021;31(5):465-468.
- Leddy. Early subthreshold aerobic exercise for sport-related concussion. *JAMA Pediatrics*. 2019;173(4):319-325.
- Reynolds. Establishing a clinical service for the management of sports-related concussions. *Neurosurgery*. 2014;75(4):S71-S81.
- Henry. Examining recovery trajectories following sport-related concussion using a multi-modal clinical assessment approach. *Neurosurgery*. 2016;78(2):232-241.
- Mucha. A brief vestibular/ocular motor screening (VOMS) assessment to evaluate concussions. *American Journal of Sports Medicine*. 2014;42(10):2479-2487.
- Giza. The neurometabolic cascade of concussion. *Journal of Athletic Training*. 2001;36(3):228-235.

52