The Role of Physical Therapy in Comprehensive Management of Concussion

By: Bianca Vigliante PT, DPT, SCS

Sports Certified Specialist

True Or False

- You should frequently wake someone up after a suspected concussion
  - False
- Kids recover faster than adults
  - False
- You should encourage return to ADL within 24 to 48 hrs
  - True
- You must lose consciousness to have a concussion
  - False

Pediatric Considerations

- Children and adolescents often have a longer recovery time when compared to adults
- First 10 days of recovery is when the athlete is most at risk for re-injury
- Promote Relative Rest which is started within 24-48 hrs
  - Reduce activity just enough to avoid symptoms exacerbation
    - Walking outside if able (use sunglasses if needed), household tasks, limiting screen time
    - Do a little of everything as long as symptoms do not worsen
- Treatment plans should include:
  - Parents, athletic trainers, coaches, and teachers
- Most concussions can self resolve within 7-10 days with a normal recovery period being within 1 month of initial injury

Pediatric Consideration

- UIL Management of concussions
  - Physician clearance required to initiate return to play progression
  - Athlete must be symptoms free for 24 hrs prior to initiating return to play progression
  - Progress continues in 24 hr intervals only if the athlete is symptom free at each level
  - If the athlete experiences post concussion symptoms at ANY point during the return to play protocol, progress is stopped.
    - Athlete must be re-evaluated by a licensed health care professional
    - Athlete returns to previous symptom free phase
- No athlete with a concussion should return to play in <5 days

PHASE 1

1. No Exertional physical activity until student-athlete is symptom-free for 24 hours, and:

SYMPTOM FREE STARTING DATE: _____

2. Receives written clearance from a physician and submission of required documentation following the concussion injury and:

PHYSICIAN'S NOTE: ON FILE WITH TRAINERS _____

3. The student has returned to daily activities, including full school days.

RETURN TO SCHOOL DATE: _____

PHASE 2

	DATE	PASS/FAIL	AT INIT	ST INIT
Step 1: When the athlete completes Phase 1, begin light aerobic exercise: 10 min on exercise bike, strength program, level 3, 60 rpm	_____	_____	_____	_____
No weightlifting, resistance training, or any other exercise	_____	_____	_____	_____
Step 2: Moderate aerobic exercise; 15 min on exercise bike, strength program, level 7, 75 rpm or 15 min of running at moderate intensity in gym or on field without helmet or equipment	_____	_____	_____	_____
	_____	_____	_____	_____
Step 3: Non-contact training drills in full uniform. May begin weight lifting, resistance training, and other exercises.	_____	_____	_____	_____
	_____	_____	_____	_____
Step 4: Full contact practice or training.	_____	_____	_____	_____
	_____	_____	_____	_____
Step 5: Full Game Play	_____	_____	_____	_____

Contributors To Longer Recovery In Athletes

- Under reporting of concussion signs and symptoms due to:
  - Fear of repercussions and removal from paly
  - Lack of understanding of the seriousness of the injury
- Previous hx of concussion and number of previous concussions
- Concussion symptoms that last >7 days
- Anxiety and/or depression
- Continued play post injury
- Migraine history
- High levels of physical and cognitive activity after injury
- Prolonged cognitive rest

Acute Sideline Concussion Management

- Acute sideline management of concussions typically includes the Athletic Training Staff, Sports Medicine Physician and/or a Sports Physical therapist
- Most PTs will not see acute sideline concussion management
  - Typical referral to PT in the outpatient setting occurs at about 2-4 weeks post injury

Sports Related Concussion: Acute Assessment

Box 1: Red Flags

- Neck pain or tenderness
- Seizure or convulsion
- Double vision
- Loss of consciousness
- Weakness or tingling/burning in more than 1 arm or in the legs
- Deteriorating conscious state
- Vomiting
- Severe or increasing headache
- Increasingly restless, agitated or combative
- GCS <15
- Visible deformity of the skull

Sports Related Concussion: Acute Assessment

- Identifying Red Flag symptoms
- Clearing the athlete for any life threatening injuries and then moving on to clearing for any MSK related injuries
- Speaking with the athlete and gathering symptoms and assessing cognition
- Performing Vestibular/Ocular Motor and balance screen
- Decision is made to pull athlete out or allow return to play
  - When is doubt pull them out

Sports Related Concussion: Acute Assessment

- VOMS
  - Smooth pursuit
  - Saccades (horizontal and vertical)
  - Vestibular ocular reflex (horizontal and vertical)
  - Visual motion sensitivity
  - Near point convergence
- Symptoms that are being monitored (0-10 scale) Pre-Post testing
  - Headache
  - Dizziness
  - Vision changes
  - Mental fogginess
- Balance Screen
  - Single leg stance
  - Tandem walking (typically children >5years age are developmentally able)
- Performing SCAT 6 with in 72 hrs

Assessment Tools

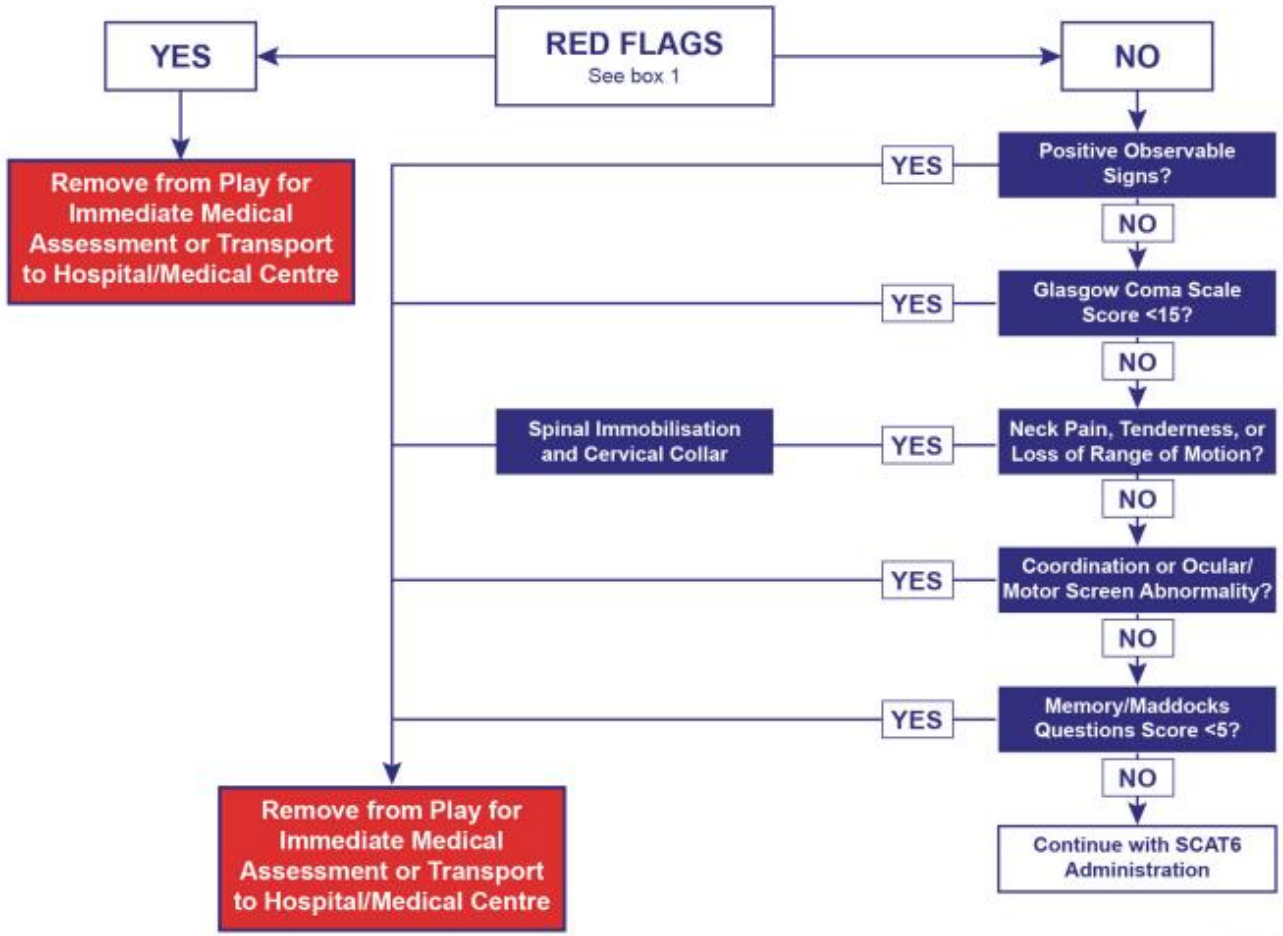
SCAT 6

- Age 13+
- <72 hrs up to 1 week
- Return to learn/play
- Return to work

Child SCAT 6

- Ages 8-12
- <72 hrs up to 1 week
- Parent report
- Return to learn
- Return to play

SCAT 6



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Transition To Clinic

- PTs have a role in addressing vestibular, cervical, and exertional impairments post concussion
- Evaluation includes:
  - ROM: Cervical, Thoracic, and Upper extremities
    - Gross screen of LE and lumbar spine
  - Palpation
  - Joint mobility
  - Strength testing
  - Impairment based outcome measures used to complement physician medical management
- PTs provide Individualized care that addresses movement and neurosensory deficits that may be under addressed
  - 30% of concussion patients have symptoms beyond 10-14 days
- PTs are looking to categorize the patient into a domain which can be more than one
  - Vestibular/oculomotor, headache/migraine, anxiety/mood, physiologic/autonomic, cognitive, and cervicogenic impairments

Tools We Use

- Post Concussion Symptoms Scale (PCSS)
- Graded Symptoms Check List
- Rivermead Post Concussion Symptoms Questionnaire
- Neck Disability Index (NDI)
- Modified Clinical Test of Sensory Interaction on balance (mCTSIB)
- Heart Rate Threshold (HRt) from BCTT/BCBT
- VOMS
- Dizziness Handicap Inventory (DHI)
- Balance Error Scoring System (BESS)
- Functional Gait Assessment (FGA)
- Dynamic Gait Index (DGI)
- 6 Minute Walk Test

SCOAT 6 And Child SCOAT

SCOAT 6

- Ages 13+
- Used in sub acute setting
- >72 hrs post injury

Child SCOAT 6

- Ages 8-12 yrs
- Used in the sub acute setting
- >72 hrs post injury

BCTT

- Buffalo Concussion Treadmill Test – handout
- https://www.youtube.com/watch?v=N_zdwERSQrc

Concussion Domain Classifications

Vestibular And Oculomotor Dysfunctions

- Signs and symptoms
  - Dizziness, imbalance, motion sensitivity, spatial disorientation
  - Blurred and/or double vision, difficulty with tracking and /or convergence
  - Eye pain, frontal headaches
  - Difficulty reading, screen time, driving, and transitioning vision from near to far
- Assessment
  - VOMS, dynamic visual acuity, and balance testing
- Interventions
  - Gaze stabilization
  - Balance progressions
  - Habituation
  - VOR x1 and x2
  - Motion desensitization

Cervicogenic Impairments

- Sign and symptoms
  - Neck pain
  - Headache
  - Dizziness with head motion
  - Weakness to cervical paraspinal and upper extremities
  - Paresthesia
- Assessment
  - Cervical/thoracic ROM and manual assessment for joint dysfunction
  - Deep Neck Flexor and Upper Extremity strength
- Interventions
  - Manual therapy
  - Deep neck flexor training
  - Cervical proprioception retraining
  - Strength training

Headache / Migraine

- ***Most Common subtype reported in children and adults***
- Signs and Symptoms
  - Nausea
  - Vomiting
  - Sensitivity to light, sound, or smell
  - If the athlete has a headache history they may be at increase risk for higher intensity and severity of headaches
- Interventions
  - Graded aerobic exercise
  - Relaxation and sensory desensitization
  - Address any concurrent cervicogenic dysfunctions

Physiologic/ Autonomic

- Sign and symptoms
  - Exertion intolerance
  - Heart rate dysregulation
  - Fatigue
- Assessment
  - BCTT / BCBT
    - Resting heart rate, RPE, VAS, blood pressure
  - Orthostatic hypotension
    - Heart rate in supine, sitting, and standing positions
- Interventions
  - Graded exposure
  - Sub-Symptoms threshold aerobic exercise (buffalo protocol)

Cognitive Fatigue

- Signs and Symptoms
  - Mental fogginess/difficulty concentrating
  - Impaired reaction time
  - Memory recall/storage
  - Organizational deficits
- Interventions
  - Gradual mental stimulation: timed reading or puzzles
  - Memory and problem solving: give the athlete a recipe, can they follow instructions?
  - Cognitive load management
  - Mindfulness and relaxation techniques
  - Sleep hygiene
  - Dual tasking
- Referral
  - Additional health care provider needed: speech therapy

Anxiety/Mood

- Sign and symptoms
  - Nervousness
  - Hypervigilance
  - Sleep disturbance
  - Emotional lability
  - Irritability
  - Fatigue: low energy
- Interventions
  - Graded exposure to physical activity
  - Symptoms control: breathing and autonomic regulation
- Referral
  - Multidisciplinary team: MD, DO, NP, Neurophysiologist, Behavioral specialist

Why Classify

- Guides individualized programs
- Identify need for referral to other health care providers
- Support interprofessional collaboration
- Tracks recovery

Interventions

Sub-Symptoms Threshold Exercise

- Individualized aerobic exercise that is below the symptoms threshold can help shorten recovery and lower risk of persistent symptoms when compared to prolonged rest
- Signs/symptoms can be resolved at rest but autonomic dysregulation and exercise intolerance can persist post concussion
- Test
  - BCTT / BCBT
- Exercise at 80% HRt x20min per day for non athletes and up to 90% for athletes

Dual Task And Sensorimotor Rehab

- Assessment
  - What happens when cognitive load is applied?
- Treatment:
  - Balance + visual task + movement tasks
    - Neurocognitive agility drills
- Tools we use
  - Blaze pods
    - 5 Drills to Improve Brain Power – BlazePod

Vestibular And Oculomotor

- Foundational concepts
  - Smooth pursuit
  - Saccades
  - Gaze stabilization
  - Convergence
- Level up
  - Balance activities
- Functional movements

Return To Play

- Assessment
  - Hop testing
  - Reactive agility
  - Dynamic stability when fatigued
- Neuromuscular deficits that continue post concussion can lead to increased risk of MSK injury

When To Refer To PT

- When signs/symptoms are present for >10 days
- Balance, vestibular, and visual dysfunction is present
- Presence of neck pain, stiffness, or headache
- Poor exercise tolerance due to concussion signs and symptoms
- Athlete has high functional demands and requires a structured return to play and learning program

Why Refer To PT?

- PTs can play a vital role in active concussion recovery
  - Assist in getting athlete back on the field safely
- We are here to compliment medical management
- The more persistent the symptoms the more difficult the recovery process
  - Early referral = help us and helps them

11 R's of Sports Related Concussions

- Recognize
- Reduce
- Remove
- Refer
- Re-evaluate
- Rest (relative)
- Rehabilitate
- Recover
- Return to Learn / Return to Sport
- Reconsider
- Residual effects

Putting it all together

- What Concussion Physical Therapy looks like

Case: Acute Assessment

- Pt is a 17 y.o high school soccer player who had a head to head collision while contesting a ball in the air
- Signs/symptoms
  - Immediate onset of headache, dizziness, and feeling "foggy"
  - Brief unsteadiness attempting to stand up
- Actions: Removed from play and referred to sports medicine same day

Case: Medical Assessment

- Medical evaluation:
  - Headache 7/10
  - Sensitivity to light
  - Dizziness with head movement
  - Cognitive testing showed mild deficits in concentration and processing with SCAT 6
  - Loss of balance during tandem stance unable to hold 30 seconds
- Diagnosis: Sport related concussion
- Day 0-2 relative rest: limited school work and screen time
  - no sports or high risk activity
- Follow up in 5-7 days
  - At follow up he was found to have prolonged s/s and he had not returned to baseline
- Medical team referred athlete to PT

Case: PT eval

- Subjective: headache and neck pain, worsening with reading, and screen time, dizziness with looking up and turning quickly and busy environments. He is unable to complete full school days
- Objective:
  - Decreased cervical ROM , tenderness and increased tone in cervical muscle groups
  - Impaired DNF endurance test
  - VOR x1 dizziness from 2/10 to 6/10
  - Convergence abnormal
  - Smooth pursuit increased headache and eye strain
  - Balance and gait with dual task increase in s/s provocation
  - BCTT: baseline 3/10 increase to 6/10 at 120 bpm (abnormal)
- PT found athlete to have:
  - cervicogenic impairments, vestibular oculomotor dysfunction with balance impairments, and exertion intolerance

Case: Plan Of Care

- Frequency 1-2x/week + daily HEP
- Cervical spine
  - Manual therapy / DNF training
- Vestibular ocular rehab
  - Gaze stabilization
  - Saccades and smooth pursuit with graded speed and complex background
  - Convergence training (pencil pushup)
- Balance and dual tasks
  - Surface: firm to foam and eyes open to eyes closed
- Sub-symptoms threshold exercise
  - HRt 120 bpm exercise at 80-90% of HRt
    - TM or bike 15-20 min at 100-110 bpm
    - Daily walking program
  - Progress every 2-3 days as tolerated (symptoms increase 2pt or less and return to baseline within 1 hr)
- Education on sleep hygiene, hydration, and educational accommodations

Case: Outcomes

- After 2 weeks
  - Headache 1-2/10 that comes and goes
  - Improved cervical ROM
  - BCTT HRt increased to approx. 150 bpm
- After 4 weeks:
  - Symptoms free at rest
  - VOMS normal
  - Passed BCTT without symptoms
  - Completed return to play progression
- Returned to competitive sports

Q and A

Thank you!

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