# Traumatic Brain Injury (TBI) Assessment and Management Policies & Procedures Manual

Effective Date: 04/27/2018

- I. <u>Purpose:</u> The purpose of this policies and procedures manual is to outline the proper assessment and management of student-athletes suffering from neuropsychological injuries in order to ensure proper care and promote the health and wellness of student athletes at the University of Pittsburgh. Athletics healthcare providers in this manual are empowered to have the unchallengeable authority to determine management and return-to-play of any ill or injured student-athlete, as he or she deems appropriate.
- II. <u>Definition</u>: "A concussion (or mild traumatic brain injury) is a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces secondary to direct or indirect forces to the head. Disturbance of brain function is related to neurometabolic dysfunction, rather than structural brain injury, and is typically associated with normal structural imaging findings (CT Scan, MRI). Concussion may or may not involve a loss of consciousness. Concussion results in a constellation of physical, cognitive, emotional, and sleep-related symptoms. Recovery is a sequential process and symptoms may last from several minutes to days, weeks, months, or even longer in some cases."
  - CDC physician toolkit

#### III. Pre – Season Education

a) NCAA concussion fact sheets or other applicable materials are provided annually to studentathletes, coaches, team physicians, ATCs and Directors of athletics. Each party provides a signed acknowledgement of having read and understood said material.

#### IV. Pre-Season Baseline Testing

- a) Baseline Testing
  - i) All incoming freshmen and transfers participating in sports at the University of Pittsburgh are to have baseline testing on ImPACT.
    - (1) Re-baselining athletes every two years is optimal
  - ii) Any incoming student-athlete with a prior history of concussions will also be baseline tested
  - iii) The baseline assessment will consist of a symptoms checklist, standardized cognitive assessments, VOMS and balance evaluation.
  - iv) The team physician determines pre-participation clearance and/or the need for additional consultation or testing.

#### V. Recognition and Evaluation

- a) On-Field Assessment
  - Rule out emergent life threatening conditions (i.e. spinal cord injury, cranial fracture, etc)
  - ii) Remove athlete from participation
- b) Side Line Assessment (Performed by a certified athletic trainer and/or team physician)
  - (1) Medical personnel with training in the diagnosis, treatment and initial management of acute concussion must be "present" at all NCAA varsity competitions in the following contact/collision sports:
    - i. Basketball
    - ii. Equestrian
    - iii. Field Hockey

- iv. Soccer
- v. Football
- vi. Ice Hockey
- vii. Lacrosse
- viii. Pole Vault
- ix. Rugby
- x. Wrestling

To be present means to be on site at the campus or arena of competition. Medical personnel may be from either team, or may be independently contracted for the event.

- (2) Medical personnel with training in the diagnosis, treatment and initial management of acute concussion must be "available" at all NCAA varsity practices in the following contact/collision sports:
  - i. Basketball
  - ii. Equestrian
  - iii. Field Hockey
  - iv. Football
  - v. Ice Hockey
  - vi. Lacrosse
  - vii. Pole Vault
  - viii. Rugby
  - ix. Skiing
  - x. Soccer
  - xi. Wrestling

To be available means that, at a minimum, medical personnel can be contacted at any time during the practice via telephone, messaging, email, beeper or other immediate communication means. Further, the case can be discussed through such communication, and immediate arrangements can be made for the athlete to be evaluated.

- ii) Recognize Signs
  - (1) Loss of Consciousness
  - (2) Amnesia for recent events
  - (3) Dazed/Confused
  - (4) Posturing
  - (5) Being off balance/Stumbling when getting up
  - (6) Clutching of head
  - (7) Answers questions slowly
  - (8) Vomiting
  - (9) (This list is not all inclusive)
- iii) Recognize Symptoms
  - (1) Physical
    - (a) Headache
    - (b) Dizzy
    - (c) Photophobia
    - (d) Phonophobia
    - (e) Visual Changes
    - (f) Nausea
    - (g) Foggy
    - (h) Fatique

- (i) Numbness/tingling
- (j) Lightheaded
- (k) Not feeling "right"
- (2) Cognitive
  - (a) Concentration/focus
  - (b) Memory
  - (c) Foggy
  - (d) Slowed down
- (3) Emotional Changes
  - (a) Irritable
  - (b) Anger
  - (c) Mood Lability
  - (d) Inappropriate emotion
- (4) (This list of symptoms is not all inclusive)
- c) Cranial Nerve Assessment
  - i) Olfactory Assess sense of smell
  - ii) Optic Visual fields, pupillary reflex
  - iii) Oculomotor, Trochlear, Abducens Nystagmus, PERRLA, visual tracking (H test)
  - iv) Trigeminal Facial sensation, jaw clench
  - v) Facial Smile/Grimace
  - vi) If the athlete has significant deficiencies in any of the above cranial nerves, a possible intercranial hematoma is to be suspected, the athlete's pulse and blood pressure is to be assessed, and transportation to the local emergency room is to be advised by the certified athletic trainer.
- d) Clinical assessment for cervical spine trauma, skull fracture and intracranial bleed
- e) Assess and Calculate Glascow Coma Scale as defined Appendix A
- f) Upper Quarter Dermatome/Myotome Assessment
  - i) Cognitive Functioning
    - (1) 3 Word Recall
    - (2) Serial 7s
    - (3) Months in Reverse Order
    - (4) Serial Testing
  - ii) Balance exam/VOMS
  - iii) Symptom Assessment
- g) Serial testing will be ongoing to assess any deterioration of long term and short term memory.
- h) Athlete is to undergo an initial evaluation on the side line and to undergo subsequent reevaluation every 5 minutes post-injury or until symptoms resolve
- i) Any student- athlete with signs/symptoms/behaviors consistent with concussion:
  - i) Must be removed from practice or competition
  - ii) Must be evaluated by an athletic trainer or team physician with concussion experience
  - iii) Must be removed from practice/play for that calendar day if concussion is confirmed until cleared by appropriate clinician
- j) Any student athlete with signs or symptoms concerning for more serious intracranial injury, which may include but are not limited to, a Glasgow Coma Scale of ≤ 13, prolonged loss of consciousness, persistent and/or escalating frequency of emesis, persistently diminished/worsening mental status or other concerning focal neurologic deficits, including

possible spinal injury, should be immediately transported via EMS to the nearest emergency facility for further evaluation and treatment.

# VI. Physician Referral

- a) Emergency Room Evaluation
  - Any student athlete displaying any of the following conditions should be immediately referred by the team physician and/or certified athletic trainer and transported to the closest emergency room for evaluation
    - (1) Deterioration of neurological function
    - (2) Decreases or irregularity in breathing
    - (3) Unequal, dilated, or un-reactive pupils
    - (4) Seizure Activity
    - (5) Changes in mental status
    - (6) Spine Injury
    - (7) Glascow coma scale less than or equal to 13
    - (8) Decreasing level of consciousness
    - (9) Decreases or irregularity in pulse
    - (10)Any sign of blood or CSF
    - (11)Drastic changes in BP
    - (12)Repetitive Emesis

# b) Same Day Referral

- Any student athlete that does not qualify for the criteria listed for emergency room evaluation, but displays the following signs and/or symptoms will be evaluated by a physician on the day of initial injury.
  - (1) LOC on the field
  - (2) Any amnesia or significant confusion
  - (3) Increase in BP
  - (4) Cranial Nerve deficits
  - (5) Vomiting
  - (6) Motor, sensory, balance deficits subsequent to on-field evaluation
  - (7) Post-concussion symptoms worsen
  - (8) Increase in the number of symptoms
  - (9) Athlete has reoccurrence of symptoms after returning to play

# VII. Return to Play

- a) Same Day/Event
  - i) When a student-athlete shows any signs, symptoms or behaviors consistent with a TBI, the athlete shall be removed from practice or competition for that day and evaluated by a certified athletic trainer and/or team physician with experience in the evaluation and management of concussion.
  - ii) After a student-athlete is diagnosed with a TBI he/she shall be withheld from the competition or practice and not return to activity for the remainder of that day.
- b) Monitoring Over Time
  - A team physician will be responsible for determining when it is safe for a student athlete to return to participation, meeting international guidelines, suffering from neuropsychological injuries.

- (1) This will be determined by the physician's judgment based upon symptom presentation, clinical evaluation and neurocognitive data.
- ii) A physician will evaluate student-athletes with prolonged recovery in order to consider additional diagnoses and best management options. Additional diagnoses include, but are not limited to: post-concussion syndrome, sleep dysfunction, migraine or other headache disorders, mood disorders such as anxiety and depression, ocular or vestibular dysfunction.
- iii) Each student athlete has limited physical and cognitive activity until he/she has returned to baseline, then progresses with each step as outlined in attached Appendix B, UPMC Sports Medicine Concussion program guidelines for post-concussion rehab, without worsening or new symptoms.

# VIII. Post-Physician Evaluation

- i) After each physician evaluation, each student athlete diagnosed with a TBI will complete ImPACT testing.
- ii) Each student athlete will complete a physical exam comprising of vestibular-ocular motor (Appendix D) and balance error scoring system (BESS) (Appendix E)

# IX. ImPACT Testing

- ImPACT test scores are to be reviewed by a team physician and a neuropsychologist, to assess when an athlete's cognitive abilities are deemed commensurate with baseline functioning.
  - (1) A designated neuropsychologist will be assigned and on call to consult on neurocognitive performance and respond within 12 hours of being notified a test was administered

# X. Referral to Neuropsychologist

- (1) In addition to examination by a physician, a neuropsychologist referral should be considered in any athlete with any of, but not limited to, the following presentations.
  - (a) Athletes with a history of multiple concussive episodes
  - (b) Athletes who have a history of protracted recovery from concussion
  - (c) Athlete who are not showing signs of improvement after3 days
  - (d) Athletes with a history of risk factors for concussion including
    - (i) Headache/migraine/family history of migraines
    - (ii) Motion sensitivity
    - (iii) Ocular dysfunction
    - (iv) Learning/Academic disabilities
    - (v) ADHD/ADD
    - (vi) Psychiatric history
  - (e) Athletes with ImPACT data which meets criteria for extended recovery

# XI. Special Considerations

- a) Athletic Training Students
  - i) All athletic training students who suspect an athlete of having sustained a TBI are to initially act as first responders to rule out life threatening emergent situations, and immediately report such incidents to the supervising staff certified athletic trainer.
  - ii) No athlete is to be allowed to participate until evaluated by a certified athletic trainer.
  - iii) It will be the responsibility of the evaluating certified athletic trainer to decide if the athlete's condition necessitates evaluation by a physician.

# b) Traveling

- i) Any athlete that is suspected of sustaining a head injury or concussion is to be evaluated by the attending physician at away events. The attending physician will be responsible for deciding if an athlete shall return to participation.
- ii) If no physician is available the staff athletic trainer is to follow the policies for return to play previously outlined in this document.
- iii) If the certified athletic trainer decides that the athlete shall not return to play, the host athletic trainer is to be contacted in order to facilitate evaluation by an on-call physician. If an on-call physician is not available a visit to the local hospital for evaluation is necessary.
- c) Home Care Instructions
  - Each athlete suffering a concussive injury will be given home care instructions regarding proper actions to take while at their residence and warning signs of a worsening condition that necessitates a visit to the emergency room for evaluation by a physician. (See Appendix C)

# XII. Documentation

a) Documentation of the incident, evaluation, continued management, and clearance of the student-athlete with a TBI shall be kept in the student-athlete's medical files.

# XIII. Return to Learn

- a) The team athletic trainer will be the point person within athletics who will navigate return-tolearn with the student-athlete
- b) Identification of a multi-disciplinary team\* that will navigate more complex cases of prolonged return-to-learn:
  - (1) Multi-disciplinary team may include, but not limited to:
    - (a) Team physician
    - (b) Athletic Trainer
    - (c) Psychologist/counselor
    - (d) Neuropsychologist consultant
    - (e) Faculty athletic representative
    - (f) Academic counselor
    - (g) Course instructor(s)
    - (h) College administrators
    - (i) Office of disability services representatives
    - (i) Coaches
- c) Compliance with ADAAA
- d) No classroom activity on same day as concussion
- e) Individualized initial plan that includes:
  - i) Remaining at home/dorm if student-athlete cannot tolerate light cognitive activity
- f) Gradual return to classroom/studying as tolerated
- g) Re-evaluation by team physician if concussion symptoms worsen with academic challenges.
- h) Modification of schedule/academic accommodations for up to two weeks, as indicated, with help from the team athletic trainer
- i) Re-evaluation by team physician and members of the multi-disciplinary team, as appropriate, for student-athlete with symptoms > 2 weeks
- j) Engaging campus resources for cases that cannot be managed through schedule modification/academic accommodations

- i) Such campus resources must be consistent with ADAAA, and include at least one of the following:
  - (1) Learning specialists
  - (2) Office of disability services
  - (3) ADAAA office

# XIV. Reducing Exposure to Head Trauma

- a) Adherence to Inter-Association Consensus: Year-Round Football Practice Contact Guidelines
- b) Adherence to Inter-Association Consensus: Independent Medical Care Guidelines
- c) Reducing gratuitous contact during practice
- d) Taking a 'safety first' approach to sport
- e) Taking the head out of contact
- f) Coaching and student-athlete education regarding safe play and proper techniques (See Attached Documentation)

<sup>\*</sup>All recommendations are based on those outlined in the NATA's Position Statement on Management of Sport Related Concussion, NCAA Committee on Competitive Safeguards and Medical Aspects of Sports, Dr. Michael Collins and Dr. Mark Lovell, Sports Medicine Concussion Program, UPMC Center for Sports Medicine.

# Glasgow Coma Scale

	Spontaneous-open with blinking at baseline	4
Best eye response (E)	Opens to verbal command, speech, or shout	3
	Opens to pain, not applied to face	2
Å.	None	1
	Oriented	5
Best verbal response (V)	Confused conversation, but able to answer questions	4
	In appropriate responses, words discernible	3
X.	In compreh en sible speech	2
	None	1
Best motor response (M)	Obeys commands for movement	6
	Purposeful movement to painful stimulus	5
	With draws from pain	4
	Abnormal (spastic) flexion, decorticate posture	
	Extensor (rigid) response, decerebrate posture	
	None	1

	T	
Stage of Rehabilitation	Physical Therapy Program	Recommended Exercises
Stage 1  Target Heart Rate: 30-40% of maximum exertion * (Max HR – Rest HR X .30) + Rest HR  Recommendations: exercise in quiet area (treatment rooms recommended); no impact activities; balance and vestibular treatment by specialist (prn); limit head movement/position change; limit concentration activities; 10-15 minutes of light cardio exercise.	- Very light aerobic conditioning  - Sub-max isometric strengthening and gentle isotonic  - ROM/Stretching  - Low level balance activities	- Stationary Bike; Seated Elliptical; UBE; Treadmill walking: (10-15 min) - Quad sets; Ham sets; (UE) light hand weights; resistive band rowing; (LE) SLR's, resistive bands ankle strengthening - Cervical ROM exercises, Trap/LS stretching, Pec stretching, Hamstring stretching, Quad stretching, Calf stretching - Romberg exercises (feet together, tandem stance, eyes open-closed); single leg balance
Stage 2	Title Miles III III	- Treadmill; Stationary Bike; Elliptical
Target Heart Rate: 40-60% of maximum exertion  * (Max HR – Rest HR X .40) + Rest HR  Recommendations: exercise in gym areas recommended; use various exercise equipment; allow some positional changes and head movement; low level concentration activities (counting repetitions); 20-30 minutes of cardio exercise.  (stage 1 exercises included, as appropriate)	- Light to Moderate aerobic conditioning  - Light weight PRE's (Progressive Resistance Exercises)  - Stretching (active stretching initiated)  - Moderate Balance activities initiate activities with head position changes	(upright/seated); UBE; (10-20 min) -Light weight strengthening exercises (Nautilus style equipment); resistive band exercises (UE/LE); wall squats, lunges, step up/downs - Any stage 1 stretching; active stretching as tolerated (lunge walks, side to side groin stretching, walking hamstring stretch) - Romberg exercises, VOR exercise (vestibular ocula reflex exercises: walking with eyes focused with heact turns); Swiss ball exercises; single leg balance
Stage 3	- Moderately aggressive aerobic exercises	- Treadmill (jogging); Stationary Bike; Elliptical
Target Heart Rate: 60-80% of maximum exertion  * (Max HR – Rest HR X .65) + Rest HR  Recommendations: any environment ok for exercise (indoor, outdoor); integrate strength, conditioning, and balance/proprioception exercise; can incorporate concentration challenges (counting exercises, MRS equipment/visual games)  (stage 1&2 exercises included, as appropriate)	- All forms of strength exercise (80% max)  - Active stretching exercise  - Impact activities running, Plyometrics (no contact)  - Challenging proprioceptive/dynamic balance (integrated with strength and conditioning);	(upright/seated); UBE (25-30 min)  - Passive weight training including free weights, MRS/Functional Squat; dynamic strength activities  - Active stretching (lunge walks, side to side groin stretching, walking hamstring stretch)  - Initiate agility drills (zig zag runs, side shuffle, etc); jumping on tramp/blocks  - Higher level balance activities: ball toss on plyo floor, balance disc, trampoline squats and lunges on BOSU ball
Stage 4 (Sport Performance Training)	challenging positional changes	2000 0411
Target Heart Rate: 80% of maximum exertion  * (Max HR – Rest HR X .80) + Rest HR  Recommendations: continue to avoid contact activity; but resume aggressive training in all environments	- Non-contact physical training  - Aggressive strength exercise  - Impact activities/plyometrics  - Sport Specific Performance training	<ul> <li>Program to be designed by Sports Performance Trainers</li> <li>Graded treadmill testing</li> <li>Interval training</li> <li>Sport specific drills/training</li> </ul>
Stage 5 (Sport Performance Training)	- Resume full physical training activities with	
Target Heart Rate: Full exertion Recommendations: initiate contact activities as appropriate to sport activity; full exertion activities for sport activities.	- Continue aggressive strength/conditioning exercise	<ul> <li>- Program to be designed by Sports Performance Trainers</li> <li>- Practice and game intensity training</li> <li>- Sport specific activities</li> </ul>
	- Sport Specific Activities	

# Appendix C

# Recommendations for Traumatic Brain Injury Home Care

Please read over the following recommendations to ensure proper management of your mild concussion/TBI. If possible, please have a roommate or friend in your household read over the following recommendations.

# <u>Call EMS (911) and Consult with a Medical Professional Trained in Concussion Identification and Management Practices Immediately If:</u>

- Decreases in Neurological Function
- Decreases in Consciousness
- Decreased or Irregular Breathing
- Decreased or Irregular Pulse
- Changes in Pupils
- Seizure
- Nausea
- Vomiting
- Worsening Headaches or Any Other Symptoms

# **What You Should Do:**

- Take Acetaminophen/Tylenol for Headaches
  - O No ibuprofen or other anti-inflammatories
- Eat Light Nutritious Meals
- Return to School
- Go To Sleep/Rest

# What You Shouldn't Do:

- Check Eyes With Flashlight
- Wake During Sleeping
- Test Reflexes
- Stay in Bed

# Do Not:

- Drink Alcohol
- Eat Spicy Food
- Participate in Strenuous Activities/Sports

<sup>\*</sup>All recommendations are based on those outlined in the NATA's Position Statement on Management of Sport Related Concussion.

#### Appendix D

# **Vestibular/Ocular Motor Baseline Screening**

	Norm	Abn	HA 0-10	Dizziness 0-10	Nausea 0-10	Foggy 0-10	Comments
Smooth Pursuits/"H" Test			0 10		0 20	0 20	
Saccades – Horizontal							
Saccades – Vertical							
Gaze Stability (VOR) – Horizontal							
Gaze Stability (VOR) - Vertical							
Optokinetic Sensitivity							
Convergence (Near Point)							(Near Point in cm) Measure 1:
Accommodation							(Distance in cm) Right: Left:

#### **Ocular Motor Testing:**

- Smooth Pursuits/Tracking Test ability to follow slowly moving target. Hold pen or finger at arm's length from patient in horizontal direction, so that the patient can focus on a single point. Move target slowly in all planes, to a maximum angle of 30 degrees. Record: HA, Dizziness & Nausea ratings 5 sec after test. Abnormal:
  - o Inability to move eyes fully in any direction
  - o lack of smooth tracking (ie, saccadic pursuit eye movements)
- Saccades Test ability of eyes to move quickly from target to target. Hold two single points (fingertips or tips of a pen) horizontally at arms length from the patient so that the patient must gaze 30 degrees to left and 30 degrees to the right. Instruct the patient to move their eyes as quickly as possible from point to point 10 times. Repeat in with 2 points held in the vertical direction. Record: HA, Dizziness & Nausea ratings 5 sec after test. Abnormal:
  - o Unable to move eyes to each target without multiple saccades (hypometric saccades)
  - Overshooting the targets (hypermetric saccades)
  - Slowed eye movements
- VOR/Gaze Stability Measure the ability to keep visual focus while head is in motion. Patient is seated. Have the
  patient focus on a stationary target and move their head horizontally 10 cycles. Repeat moving head vertically 10
  cycles. Abnormal:
  - o Unable to move head at normal speed
  - o Blurring of visual target
  - Symptom provocation
- Optokinetic Sensitivity Test in standing. Have the patient hold their thumb directly in front of them at arms length. Ask the patient to focus on their thumb, while rotating their head, eyes and trunk side to side (in an arc of approx. 180 degrees). Perform 5 cycles. Record: HA, Dizziness & Nausea ratings 5 sec after test. Abnormal:
  - Unable to move quickly
  - Significant symptom reproduction
- Convergence Measure ability to view near target without diplopia. Patient is seated; wearing corrective lenses for near vision (if needed). Patient focuses on small target at arm's length (number on corner of playing card) and brings it toward the tip of his nose. Patient stops moving target when object doubles (patient is instructed to ignore any blurring). Distance in cm between target and tip of nose is measured and recorded. This is repeated a total of 3 times with measures recorded each time. Record: HA, Dizziness & Nausea ratings 5 sec after test. Abnormal:

- o Near point of Convergence ≥ 6 cm from tip of nose
- Accommodation Measure near point at which a visual image becomes blurry. Patient is seated, wearing corrective lenses for near vision (if needed). Patient focuses on small printed target held at arms length and brings it toward the nose. The patient stops moving the target when it is no longer in focus. To measure RIGHT accommodation, the left eye is covered. To measure LEFT accommodation, the right eye is covered. Abnormal:
  - O Accommodation ≥ 15 cm from nose; significant asymmetry between right and left eyes

# **Balance Error Scoring System (BESS)**

Romberg Eyes Open <30 sec or unsteady	No Yes N/A
Romberg Eyes Closed <30 sec or unsteady	No Yes N/A
Tandem Romberg Eyes Open <30 sec or unsteady	No Yes N/A
Tandem Romberg Eyes Closed <20 sec	No Yes N/A
Compliant Foam Eyes Open <30 sec or unsteady	No Yes N/A
Compliant Foam Eyes Closed <30 sec or unsteady	No Yes N/A
Tandem gait unsteady	No Yes N/A

# **Scoring the BESS:**

Each of the twenty-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the subject. The examiner will begin counting errors only after the individual has assumed the proper testing position.

# **Errors:**

An error is credited to the subject when any of the following occur:

- ♦ moving the hands off of the iliac crests
- ♦ opening the eyes
- ♦ step stumble or fall
- ♦ abduction or flexion of the hip beyond 30°
- ♦ lifting the forefoot or heel off of the testing surface
- ♦ remaining out of the proper testing position for greater than 5 seconds

# **Score Card**

# **Balance Error Scoring System**

BalanceErrorScoring System— Types of Errors			
<ol> <li>Hands lifted off iliac crest</li> <li>Opening eyes</li> <li>Step, stumble, or fall</li> <li>Moving hip into &gt; 30 degrees abduction</li> <li>Lifting forefoot or heel</li> <li>Remaining out of test position &gt;5 sec</li> </ol>			
The BESS is calculated by adding one error point for each error			

during the 6 20-second tests.

SCORE CARD:	FIRM	FOAM
(# errors)	Surface	Surface
Double Leg Stance (feet together)		
Single Leg Stance		
(non-dominant foot)		
Tandem Stance		
(non-dom foot in back)		
Total Scores:		
BESS TOTAL:		

Which **foot** was tested: Left Right (i.e. which is the **non-dominant** foot)