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SOMERSWORTH, NH

Seacoast Center for Athletes

Concussion Management Plan

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Purpose:

Rehab 3 Center for Athletes is committed to providing quality health care services for all student-athletes. As such, Rehab 3 Center for Athletes is proactive in the assessment and management of concussions with the intention of limiting the risks of concussions associated with athletics, and the potential catastrophic and long-term complications from said concussions. Assessment and management of concussive injuries, and return-to play decisions remain some of the most difficult responsibilities facing the sports medicine team. Due to the nature of concussions, and their potentially serious complications, it is imperative that the health care professionals taking care of athletes are able to recognize, evaluate and treat these injuries in a complete and progressive fashion. This guideline has been developed to help the Rehab 3 Center for Athletes Athletic Training staff care for student-athletes of its contracted high schools who have sustained a concussion.

Definition:

As defined in the Consensus Statement from the International Conference on Concussion in Sport (Zurich, 2008): “Concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces. Several common features that incorporate clinical, pathologic and biomechanical injury constructs that may be utilized in defining the nature of a concussive head injury include:

1. Concussion may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an “impulsive” force transmitted to the head.
2. Concussion typically results in the rapid onset of short-lived impairment of neurologic function that resolves spontaneously.
3. Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury.
4. Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course; however, it is important to note that, in a small percentage of cases, post-concussive symptoms may be prolonged.
5. No abnormality on standard structural neuroimaging studies is seen in concussion.”

Common Signs & Symptoms of Concussion:

The suspected diagnosis of concussion can include one or more of the following clinical domains. These are not the only signs and symptoms of a concussion:

- a. Symptoms: somatic (e.g., headache), cognitive (e.g., feeling like in a fog) and/or emotional symptoms (e.g., emotional lability (crying or laughing inappropriately))
- b. Physical signs (e.g., loss of consciousness, amnesia, distant stare)
- c. Behavioral changes (e.g., irritability, depressed mood, anxious)
- d. Cognitive impairment (e.g., slowed reaction times)
- e. Sleep disturbance (e.g., drowsiness or insomnia)

Prior Education

Prior the start of each sports season the student-athletes and parents of the student-athletes will be presented with educational material about concussions (see appendix #7).

The Center for Athletes Athletic Training staff will ensure that coaches are instructed and understand the concussion management plan and their role within the plan. They will receive educational material about concussions (see appendix #6).

Baseline Testing

Currently, the Rehab 3 Center for Athletes Athletic Training Staff utilizes the IMPACT™ concussion management system (www.impact.com). All student-athletes who are participating in a contact or collision sport will be baseline tested prior to the start of their sports season. Student-athletes will be baseline tested during their freshman year (approx. 14years old) and retested during their junior year (Approx. 16 years old). Student-athletes who transfer from another school and have never been baseline tested will also be tested prior to the start of their first sports season. Any student-athletes participating in a non-contact sport but have a history of concussion as identified by their health history form will also be baseline tested.

Management & Return to Play Guidelines:

If an athlete is suspected of having sustained a concussion, the athlete is removed from competition and thoroughly assessed for signs and symptoms of a concussion. As per the guidelines set forth by the National Federation of High School Associations (NFHS), any athlete who sustains a concussion will be held from practice or competition for the remainder of that day.

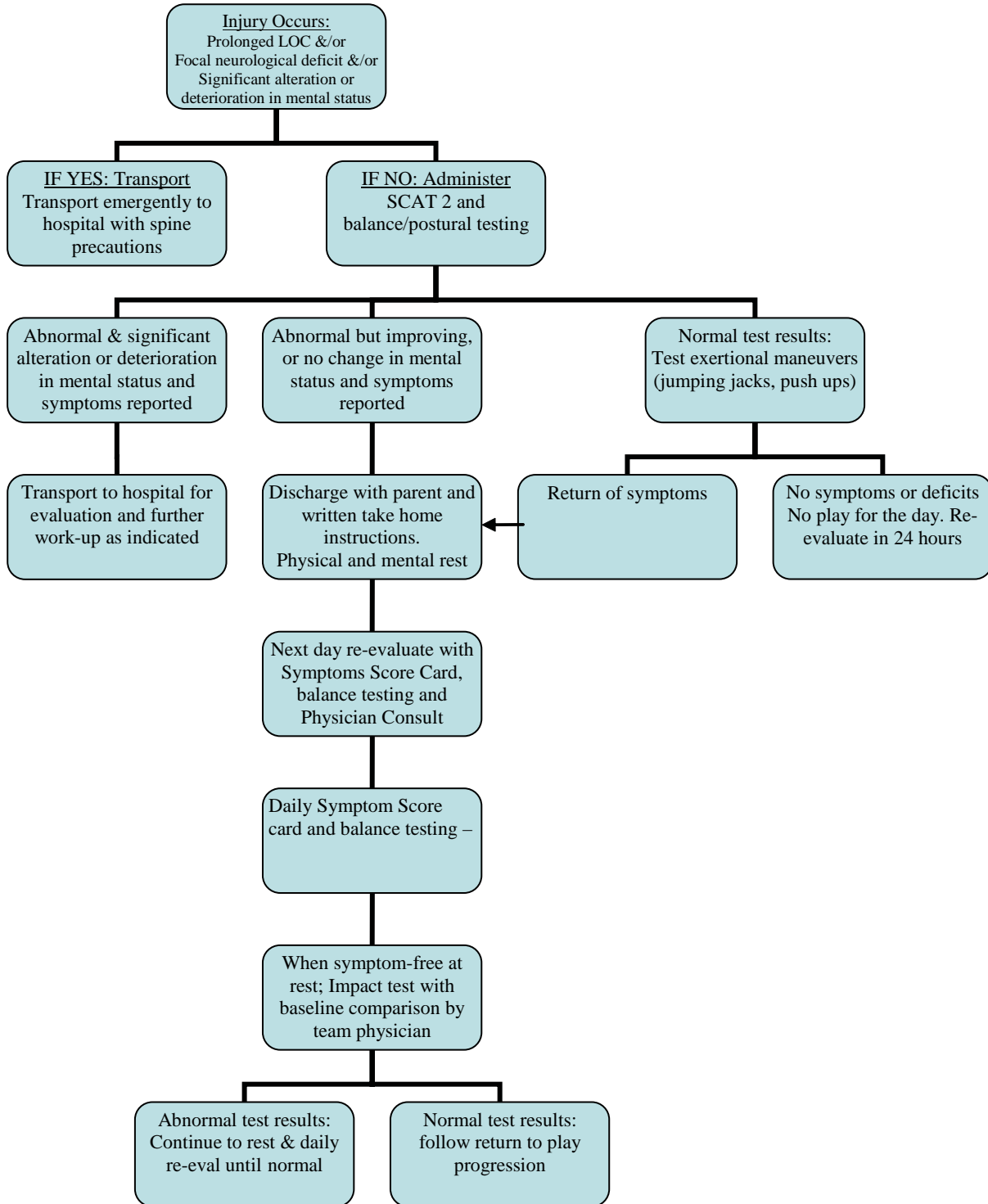
Sideline Management of Concussions:

- See Appendix #1
- If there are any signs, symptoms or behaviors consistent with a concussion, the athlete shall be removed from practice or competition and evaluated by a healthcare provider with experience in the evaluation and management of concussions.
- Assessment of a potential concussion includes an evaluation of the airway, breathing, and circulation (ABC's). The head and neck will be closely examined for signs of injury, especially those athletes who lose consciousness. Serial neurologic exams will be done and documented to ensure that there is no deterioration in their clinical status. Balance and postural stability will be assessed and objectively scored (BESS without foam pad) (see Appendix #2).
- A written timeline of the injury and the presence and severity of symptoms will be noted.
- ASCAT 2 (Sideline Concussion Assessment Tool) exam (see Appendix #3) will be performed and documented.
- If an athlete experiences prolonged loss of consciousness (greater than one minute), significant prolonged confusion seizure activity (lasting longer than a minute), focal neurologic deficits, or worsening clinical or cognitive symptoms the athlete should be transported to a local emergency department for further assessment.
- A student-athlete diagnosed with a concussion will be withheld from competition or practice and will not return to activity for the remainder of that day.
- Student –Athlete's parent/guardian will be contacted and provided with written home care instructions (see Appendix #8).
- A student-athlete who suffers a concussion will be referred to Seacoast Orthopedics and Sports Medicine (SOSMED).
- Dr. Brennan will be contacted via email or phone prior to the student-athletes appointment.
- Return-to-play decisions will be made for each specific athlete who sustains a concussion. There is no "cookie cutter" answer to when an athlete can return to play after sustaining a concussion. These decisions may depend on factors such as the clinical symptoms, previous history of concussion and severity of previous concussions, amongst others. The

final return to play decision will ultimately be made by a team physician, with or without potential consultation with other experts in the field of concussion management.

- During the recovery process is it imperative that the athlete have complete physical and cognitive rest. Cognitive rest includes reduced mandatory reading time, text messaging, internet surfing, video gaming, and test taking (if possible)
- Once the athlete is asymptomatic, the return to play process should follow a gradual, sequential progression with time delayed increments in physical activity (See Appendix #3).
 - The first step is light aerobic exercise (e.g. stationary cycle).
 - If he/ she does not experience any symptoms, this can be followed by sport-specific exercise (non-contact, higher intensity).
 - Progressing to non-contact full speed training drills.
 - Resistance training can also begin once the athlete demonstrates that he/she is symptom-free with low intensity aerobic activity.
 - If he/ she remains symptom free, he/ she then progresses to full practice activities
 - If he/ she remains symptom free, he/ she then may return to competition
 - Each athlete will progress to each stage under the guidance of the athletic training staff. (see Appendix #4)
 - Each athlete who received a baseline neurocognitive test will be retested and the results will be compared to their baseline prior to their return to full participation. (see Appendix #5)
 - A team physician or other experienced medical provider must provide final medical clearance before returning the athlete to full contact practice or games.

Appendix #1: Concussion Management Flow Chart



Appendix #2: Balance Error Scoring System (BESS)

The Rehab 3 Center for Athletes Athletic Training staff members will assess and objectively score an athlete's balance and postural stability with BESS for firm surface only (a foam pad will not be used).

Score Card

Balance Error Scoring System (BESS) (Guskiewicz)																	
<p>Balance Error Scoring System – Types of Errors</p> <ol style="list-style-type: none"> 1. Hands lifted off iliac crest 2. Opening eyes 3. Step, stumble, or fall 4. Moving hip into > 30 degrees abduction 5. Lifting forefoot or heel 6. Remaining out of test position >5 sec <p>The BESS is calculated by adding one error point for each error during the 6 20-second tests.</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">SCORE CARD: (# errors)</th> <th style="text-align: center;">FIRM Surface</th> <th style="text-align: center;">FOAM Surface</th> </tr> </thead> <tbody> <tr> <td>Double Leg Stance (feet together)</td> <td></td> <td></td> </tr> <tr> <td>Single Leg Stance (non-dominant foot)</td> <td></td> <td></td> </tr> <tr> <td>Tandem Stance (non-dom foot in back)</td> <td></td> <td></td> </tr> <tr> <td>Total Scores:</td> <td></td> <td></td> </tr> </tbody> </table>	SCORE CARD: (# errors)	FIRM Surface	FOAM Surface	Double Leg Stance (feet together)			Single Leg Stance (non-dominant foot)			Tandem Stance (non-dom foot in back)			Total Scores:			
SCORE CARD: (# errors)	FIRM Surface	FOAM Surface															
Double Leg Stance (feet together)																	
Single Leg Stance (non-dominant foot)																	
Tandem Stance (non-dom foot in back)																	
Total Scores:																	
<p>BESS TOTAL:</p>																	

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

SCAT2

Sport Concussion Assessment Tool 2



Name _____

Sport/team _____

Date/time of injury _____

Date/time of assessment _____

Age _____ Gender M F

Years of education completed _____

Examiner _____

What is the SCAT2?¹

This tool represents a standardized method of evaluating injured athletes for concussion and can be used in athletes aged from 10 years and older. It supersedes the original SCAT published in 2005². This tool also enables the calculation of the Standardized Assessment of Concussion (SAC)^{3,4} score and the Maddocks questions⁵ for sideline concussion assessment.

Instructions for using the SCAT2

The SCAT2 is designed for the use of medical and health professionals. Preseason baseline testing with the SCAT2 can be helpful for interpreting post-injury test scores. Words in *italics* throughout the SCAT2 are the instructions given to the athlete by the tester.

This tool may be freely copied for distribution to individuals, teams, groups and organizations.

What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific symptoms (like those listed below) and often does not involve loss of consciousness. Concussion should be suspected in the presence of **any one or more** of the following:

- Symptoms (such as headache), or
- Physical signs (such as unsteadiness), or
- Impaired brain function (e.g. confusion) or
- Abnormal behaviour.

Any athlete with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle.

Symptom Evaluation

How do you feel?

You should score yourself on the following symptoms, based on how you feel now.

	none	mild	moderate	severe			
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck 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
Trouble falling asleep (if applicable)	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

Total number of symptoms (Maximum possible 22)

Symptom severity score

(Add all scores in table, maximum possible: 22 x 6 = 132)

Do the symptoms get worse with physical activity? Y N

Do the symptoms get worse with mental activity? Y N

Overall rating

If you know the athlete well prior to the injury, how different is the athlete acting compared to his / her usual self? Please circle one response.

no different very different unsure

Cognitive & Physical Evaluation

1 Symptom score (from page 1)
22 minus number of symptoms of 22

2 Physical signs score

Was there loss of consciousness or unresponsiveness? Y N
If yes, how long? _____ minutes
Was there a balance problem/unsteadiness? Y N

Physical signs score (1 point for each negative response) of 2

3 Glasgow coma scale (GCS)

Best eye response (E)

No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4

Best verbal response (V)

No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5

Best motor response (M)

No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6

Glasgow Coma score (E + V + M) of 15

GCS should be recorded for all athletes in case of subsequent deterioration.

4 Sideline Assessment – Maddocks Score
"I am going to ask you a few questions, please listen carefully and give your best effort."

Modified Maddocks questions (1 point for each correct answer)

At what venue are we at today?	0	1
Which half is it now?	0	1
Who scored last in this match?	0	1
What team did you play last week/game?	0	1
Did your team win the last game?	0	1

Maddocks score of 5

Maddocks score is validated for sideline diagnosis of concussion only and is not included in SCAT 2 summary score for serial testing.

5 Cognitive assessment

Standardized Assessment of Concussion (SAC)

Orientation (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1
What time is it right now? (within 1 hour)	0	1

Orientation score of 5

Immediate memory
"I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order."

Trials 2 & 3:
"I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before."

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. Score 1 pt. for each correct response. Total score equals sum across all 3 trials. Do not inform the athlete that delayed recall will be tested.

List	Trial 1	Trial 2	Trial 3	Alternative word list
elbow	0 1	0 1	0 1	candle baby finger
apple	0 1	0 1	0 1	paper monkey penny
carpet	0 1	0 1	0 1	sugar perfume blanket
saddle	0 1	0 1	0 1	sandwich sunset lemon
bubble	0 1	0 1	0 1	wagon iron insect
Total				

Immediate memory score of 15

Concentration
Digits Backward:
"I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1-9, you would say 9-1-7."

If correct, go to next string length. If incorrect, read trial 2. One point possible for each string length. Stop after incorrect on both trials. The digits should be read at the rate of one per second.

	Alternative digit lists
4-9-3	0 1 6-2-9 5-2-6 4-1-5
3-8-1-4	0 1 3-2-7-9 1-7-9-5 4-9-6-8
6-2-9-7-1	0 1 1-5-2-8-6 3-8-5-2-7 6-1-8-4-3
7-1-8-4-6-2	0 1 5-3-9-1-4-8 8-3-1-9-6-4 7-2-4-8-5-6

Months in Reverse Order:
"Now tell me the months of the year in reverse order. Start with the last month and go backward. So you'll say December, November ... Go ahead"

1 pt. for entire sequence correct

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan	0	1
--------------------------------------------------	---	---

Concentration score of 5

¹ This tool has been developed by a group of international experts at the 3rd International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2008. The full details of the conference outcomes and the authors of the tool are published in British Journal of Sports Medicine, 2009, volume 43, supplement 1. The outcome paper will also be simultaneously co-published in the May 2009 issues of Clinical Journal of Sports Medicine, Physical Medicine & Rehabilitation, Journal of Athletic Training, Journal of Clinical Neuroscience, Journal of Science & Medicine in Sport, Neurosurgery, Scandinavian Journal of Science & Medicine in Sport and the Journal of Clinical Sports Medicine.

² McCrory P et al. Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague 2004. British Journal of Sports Medicine. 2005; 39: 196-204

³ McCrea M. Standardized mental status testing of acute concussion. Clinical Journal of Sports Medicine. 2001; 11: 176-181

⁴ McCrea M, Randolph C, Kelly J. Standardized Assessment of Concussion: Manual for administration, scoring and interpretation. Waukesha, Wisconsin, USA.

⁵ Maddocks, DL; Dicker, GD; Saling, MM. The assessment of orientation following concussion in athletes. Clin J Sport Med. 1995;5(1):32-3

⁶ Guskiewicz KM. Assessment of postural stability following sport-related concussion. Current Sports Medicine Reports. 2003; 2: 24-30

6 Balance examination

This balance testing is based on a modified version of the Balance Error Scoring System (BESS)[®]. A stopwatch or watch with a second hand is required for this testing.

Balance testing

"I am now going to test your balance. Please take your shoes off, roll up your pant legs above ankle (if applicable), and remove any ankle taping (if applicable). This test will consist of three twenty second tests with different stances."

(a) Double leg stance:

"The first stance is standing with your feet together with your hands on your hips and with your eyes closed. You should try to maintain stability in that position for 20 seconds. I will be counting the number of times you move out of this position. I will start timing when you are set and have closed your eyes."

(b) Single leg stance:

"If you were to kick a ball, which foot would you use? [This will be the dominant foot] Now stand on your non-dominant foot. The dominant leg should be held in approximately 30 degrees of hip flexion and 45 degrees of knee flexion. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."

(c) Tandem stance:

"Now stand heel-to-toe with your non-dominant foot in back. Your weight should be evenly distributed across both feet. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."

Balance testing – types of errors

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forefoot or heel
6. Remaining out of test position > 5 sec

Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the athlete. The examiner will begin counting errors only after the individual has assumed the proper start position. **The modified BESS is calculated by adding one error point for each error during the three 20-second tests. The maximum total number of errors for any single condition is 10.** If a athlete commits multiple errors simultaneously, only one error is recorded but the athlete should quickly return to the testing position, and counting should resume once subject is set. Subjects that are unable to maintain the testing procedure for a minimum of **five seconds** at the start are assigned the highest possible score, ten, for that testing condition.

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

Condition	Total errors
Double Leg Stance (feet together)	of 10
Single leg stance (non-dominant foot)	of 10
Tandem stance (non-dominant foot at back)	of 10
Balance examination score (30 minus total errors)	of 30

7 Coordination examination

Upper limb coordination

Finger-to-nose (FTN) task: *"I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm (either right or left) outstretched (shoulder flexed to 90 degrees and elbow and fingers extended). When I give a start signal, I would like you to perform five successive finger to nose repetitions using your index finger to touch the tip of the nose as quickly and as accurately as possible."*

Which arm was tested: Left Right

Scoring: 5 correct repetitions in < 4 seconds = 1

Note for testers: Athletes fail the test if they do not touch their nose, do not fully extend their elbow or do not perform five repetitions. Failure should be scored as 0.

Coordination score of 1

8 Cognitive assessment

Standardized Assessment of Concussion (SAC)

Delayed recall

"Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order."

Circle each word correctly recalled. Total score equals number of words recalled.

List	Alternative word list		
elbow	candle	baby	finger
apple	paper	monkey	penny
carpet	sugar	perfume	blanket
saddle	sandwich	sunset	lemon
bubble	wagon	iron	insect

Delayed recall score of 5

Overall score

Test domain	Score
Symptom score	of 22
Physical signs score	of 2
Glasgow Coma score (E + V + M)	of 15
Balance examination score	of 30
Coordination score	of 1
Subtotal	of 70
Orientation score	of 5
Immediate memory score	of 5
Concentration score	of 15
Delayed recall score	of 5
SAC subtotal	of 30
SCAT2 total	of 100
Maddocks Score	of 5

Definitive normative data for a SCAT2 "cut-off" score is not available at this time and will be developed in prospective studies. Embedded within the SCAT2 is the SAC score that can be utilized separately in concussion management. The scoring system also takes on particular clinical significance during serial assessment where it can be used to document either a decline or an improvement in neurological functioning.

Scoring data from the SCAT2 or SAC should not be used as a stand alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion.

Athlete Information

Any athlete suspected of having a concussion should be removed from play, and then seek medical evaluation.

Signs to watch for

Problems could arise over the first 24-48 hours. You should not be left alone and must go to a hospital at once if you:

- Have a headache that gets worse
- Are very drowsy or can't be awakened (woken up)
- Can't recognize people or places
- Have repeated vomiting
- Behave unusually or seem confused; are very irritable
- Have seizures (arms and legs jerk uncontrollably)
- Have weak or numb arms or legs
- Are unsteady on your feet; have slurred speech

Remember, it is better to be safe.

Consult your doctor after a suspected concussion.

Return to play

Athletes should not be returned to play the same day of injury. When returning athletes to play, they should follow a stepwise symptom-limited program, with stages of progression. For example:

1. rest until asymptomatic (physical and mental rest)
2. light aerobic exercise (e.g. stationary cycle)
3. sport-specific exercise
4. non-contact training drills (start light resistance training)
5. full contact training after medical clearance
6. return to competition (game play)

There should be approximately 24 hours (or longer) for each stage and the athlete should return to stage 1 if symptoms recur. Resistance training should only be added in the later stages.

Medical clearance should be given before return to play.

Tool	Test domain	Time	Score			
		Date tested				
		Days post injury				
SCAT2	Symptom score					
	Physical signs score					
	Glasgow Coma score (E + V + M)					
	Balance examination score					
	Coordination score					
SAC	Orientation score					
	Immediate memory score					
	Concentration score					
	Delayed recall score					
SAC Score						
Total	SCAT2					
Symptom severity score (max possible 132)						
Return to play			<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N

Additional comments

Concussion injury advice (To be given to concussed athlete)

This patient has received an injury to the head. A careful medical examination has been carried out and no sign of any serious complications has been found. It is expected that recovery will be rapid, but the patient will need monitoring for a further period by a responsible adult. Your treating physician will provide guidance as to this timeframe.

If you notice any change in behaviour, vomiting, dizziness, worsening headache, double vision or excessive drowsiness, please telephone the clinic or the nearest hospital emergency department immediately.

Other important points:

- Rest and avoid strenuous activity for at least 24 hours
- No alcohol
- No sleeping tablets
- Use paracetamol or codeine for headache. Do not use aspirin or anti-inflammatory medication
- Do not drive until medically cleared
- Do not train or play sport until medically cleared

Clinic phone number

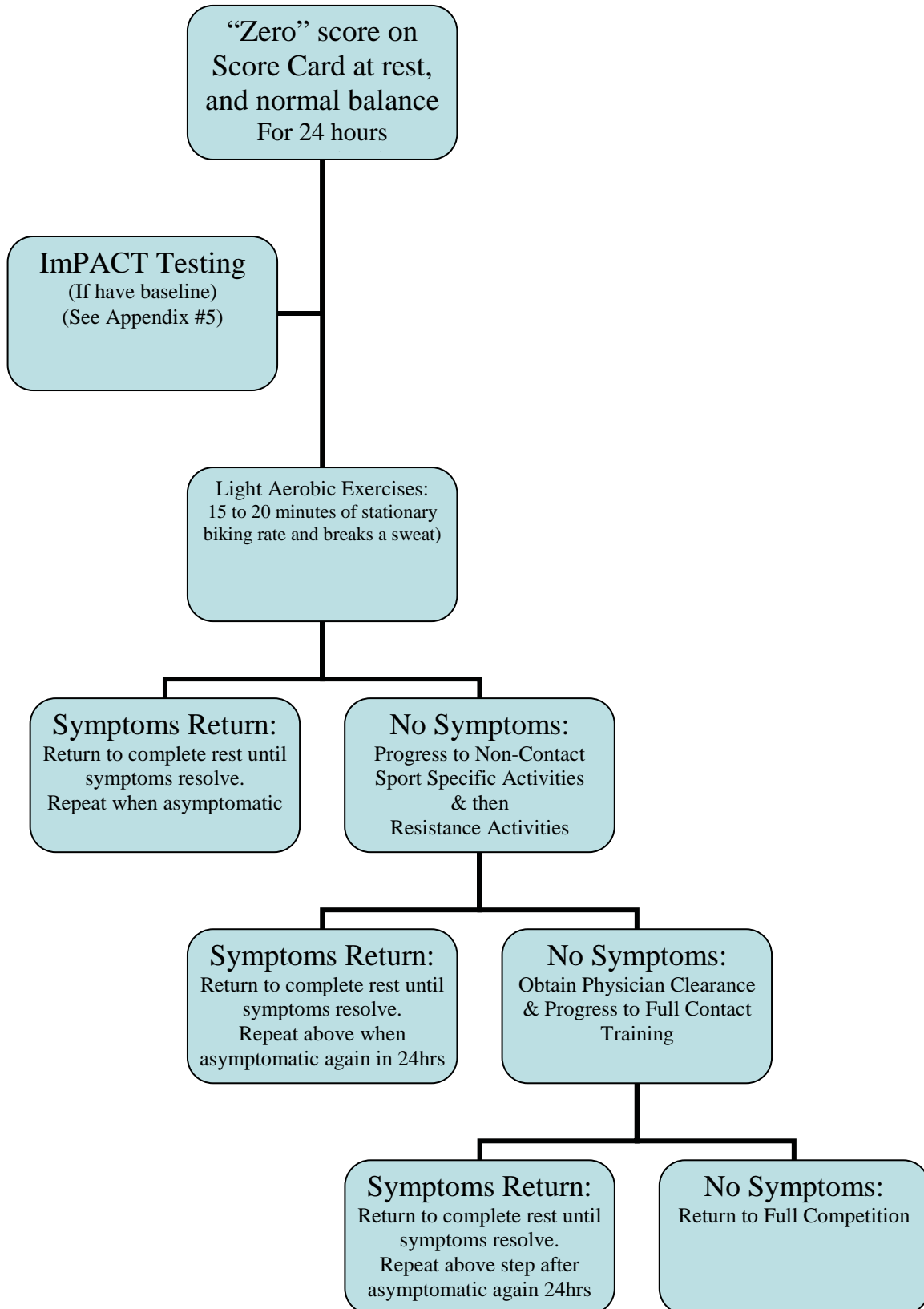
Patient's name

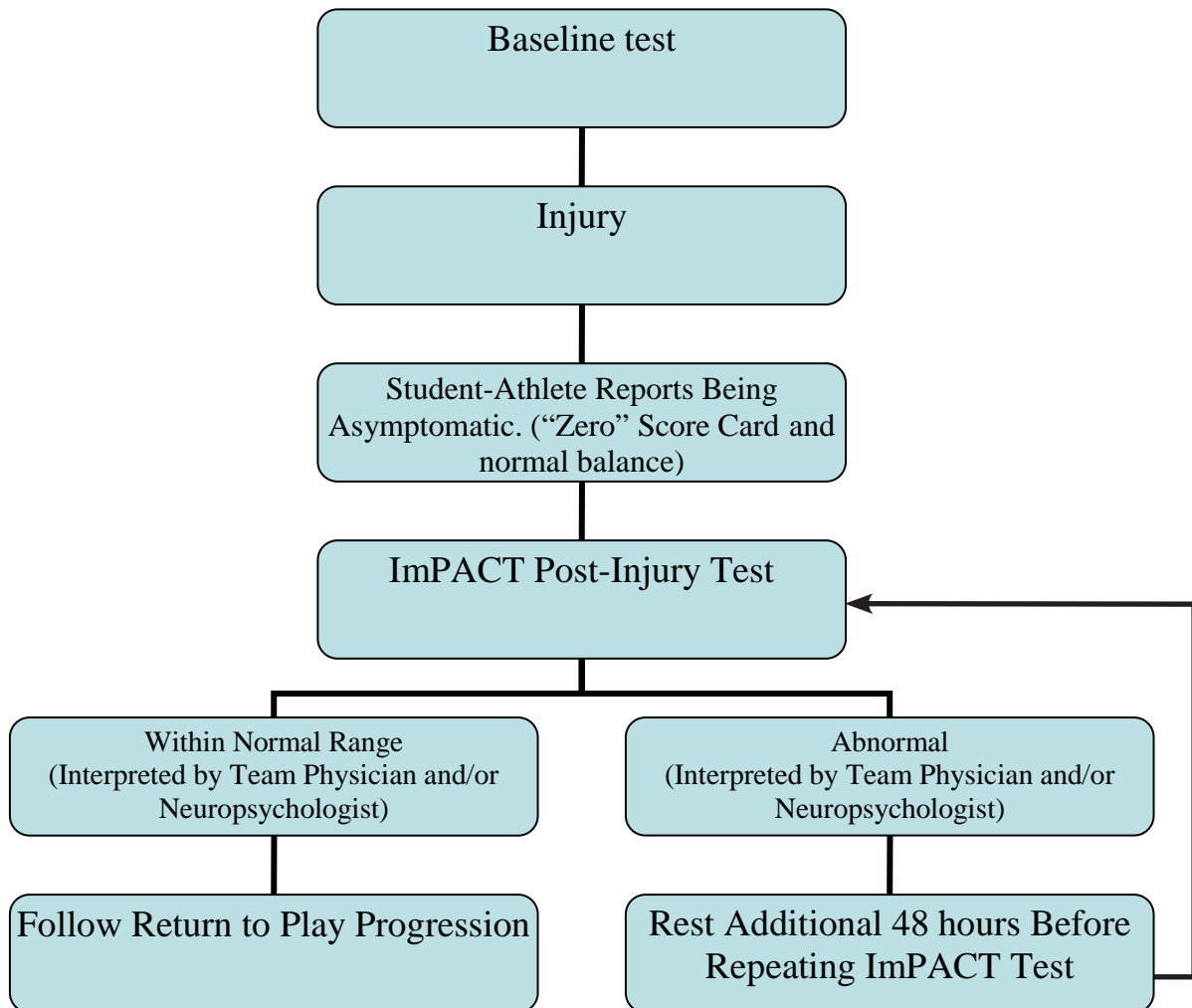
Date/time of injury

Date/time of medical review

Treating physician

Contact details or stamp





National Federation of State
High School Associations



SUGGESTED GUIDELINES FOR MANAGEMENT OF CONCUSSION IN SPORTS

EVEN SEEMINGLY MINOR CONCUSSIONS
CAN HAVE DEVASTATING RESULTS

CHECKING FOR CONCUSSION

The presence of any of the signs or symptoms that are listed in this brochure suggest a concussion has most likely occurred. In addition to observation and direct questioning for symptoms, medical professionals have a number of other instruments to evaluate attention, processing speed, memory, balance, reaction time, and ability to think and analyze information (called executive brain function). These are the brain functions that are most likely to be adversely affected by a concussion and most likely to persist during the post concussion period.

if an athlete seems "clear" he or she should be exercised enough to increase the heart rate and then evaluate if any symptoms return before allowing that athlete to practice or play

Computerized tests that can evaluate brain function are now being used by some medical professionals at all levels of sports from youth to professional and elite teams. They provide an additional tool to assist physicians in determining when a concussed athlete appears to have healed enough to return to school and play. This is especially helpful when dealing with those athletes denying symptoms in order to play sooner.

For non-medical personnel, the Centers for Disease Control and Prevention (CDC) has also developed a tool kit ("Heads Up: Concussion in High School Sports"), which has been made available to all high schools, and has information for coaches, athletes and parents. The NFHS is proud to be a co-sponsor of this initiative.

PREVENTION

Although all concussions cannot be prevented, many can be minimized or avoided. Proper coaching techniques, good officiating of the existing rules, and use of properly fitted equipment can minimize the risk of head injury. Although the NFHS advocates the use of mouthguards in nearly all sports and mandates them in some, there is no convincing scientific data that their use will prevent concussions.

Prepared by NFHS Sports Medicine Advisory Committee, 2009

References

NFHS. Concussions. 2008 NFHS Sports Medicine Handbook (Third Edition). 2008: 77-82.
NFHS. <http://www.nfhs.org>.

**National Federation of State
High School Associations**

PO Box 690 | Indianapolis, Indiana 46206
Phone: 317-972-6900 | Fax: 317-822-5700
www.nfhs.org

SIGNS AND SYMPTOMS OF CONCUSSION

Concussions can appear in many different ways. Listed below are some of the signs and symptoms frequently associated with concussions. Most signs, symptoms and abnormalities after a concussion fall into the four categories listed below. A coach, parent or other person who knows the athlete well can often detect these problems by observing the athlete and/or by asking a few relevant questions of the athlete, official or a teammate who was on the field or court at the time of the concussion. Below are some suggested observations and questions a non-medical individual can use to help determine whether an athlete has suffered a concussion and how urgently he or she should be sent for appropriate medical care.

1. PROBLEMS IN BRAIN FUNCTION:

- Confused state – dazed look, vacant stare or confusion about what happened or is happening.
- Memory problems – can't remember assignment on play, opponent, score of game, or period of the game; can't remember how or with whom he or she traveled to the game, what he or she was wearing, what was eaten for breakfast, etc.
- Symptoms reported by athlete – Headache, nausea or vomiting; blurred or double vision; oversensitivity to sound, light or touch; ringing in ears; feeling foggy or groggy; dizziness
- Lack of sustained attention – difficulty sustaining focus adequately to complete a task, a coherent thought or a conversation.

2. SPEED OF BRAIN FUNCTION: Slow response to questions, slow slurred speech, incoherent speech, slow body movements and slow reaction time.

3. UNUSUAL BEHAVIORS: Behaving in a combative, aggressive or very silly manner; atypical behavior for the individual repeatedly asking the same question over and over; restless and irritable behavior with constant motion and attempts to return to play; reactions that seem out of proportion and inappropriate; and having trouble resting or "finding a comfortable position."

4. PROBLEMS WITH BALANCE AND COORDINATION: Dizziness, slow clumsy movements, inability to walk a straight line or balance on one foot with eyes closed.

IF NO MEDICAL PERSONNEL ARE ON HAND AND AN INJURED ATHLETE HAS ANY OF THE ABOVE SYMPTOMS, HE OR SHE SHOULD BE SENT FOR APPROPRIATE MEDICAL CARE.

MANAGEMENT OF CONCUSSIONS AND RETURN TO PLAY

(See "SIDELINE DECISION-MAKING" Below)

Increasing evidence is suggesting that initial signs and symptoms, including loss of consciousness and amnesia, may not be very predictive of the true severity of the injury and the prognosis or outcome. More importance is being assigned to the duration of such symptoms and this, along with data showing symptoms may worsen some time after the head injury, has shifted focus to continued monitoring of the athlete. This is one reason why these guidelines no longer include an option to return an athlete to play even if clear in 15 minutes and why there is no discussion about the "Grade" of the concussion.

Any athlete who is removed from play because of a concussion should have medical clearance from an appropriate health care professional before being allowed to return to play or practice. The Second International Conference on Concussion held in Prague recommends an athlete should not return to practice or competition in sport until he or she is asymptomatic including after exercise.

Recent information suggests that mental exertion, as well as physical exertion, should be avoided until concussion symptoms have cleared. Premature mental or physical exertion may lead to more severe and more prolonged post concussion period. Therefore, the athlete should not study, play video games, do computer work or phone texting until his or her symptoms are resolving. Once symptoms are clear, the student-athlete should try reading for short periods of time.

When 1-2 hours of studying can be done without symptoms developing, the athlete may return to school for short periods gradually increasing until a full day of school is tolerated without return of symptoms.

Once the athlete is able to complete a full day of school work, without PE or other exertion, the athlete can begin the gradual return to play protocol as outlined below. Each step increases the intensity and duration of the physical exertion until all skills required by the specific sport can be accomplished without symptoms. These recommendations have been based on the awareness of the increased vulnerability of the brain to concussions occurring close together and of the cumulative effects of multiple concussions on long-term brain function. Research is now revealing some fairly objective and relatively easy-to-use tests which appear to identify subtle residual deficits that may not be obvious from the traditional evaluation. These identifiable abnormalities frequently persist after the obvious signs of concussion are gone and appear to have relevance to whether an athlete can return to play in relative safety. The significance of these deficits is still under study and the evaluation instruments represent a work in progress. They may be helpful to the professional determining return to play in conjunction with consideration of the severity and nature of the injury; the interval since the last head injury; the duration of symptoms before clearing; and the level of play.

INTRODUCTION

Concussions are a common problem in sports and have the potential for serious complications if not managed correctly. Even what appears to be a "minor ding or bell ringer" has the real risk of catastrophic results when an athlete is returned to action too soon. The medical literature and lay press are reporting instances of death from "second impact syndrome" when a second concussion occurs before the brain has recovered from the first one regardless of how mild both injuries may seem.

At many athletic contests across the country, trained and knowledgeable individuals are not available to make the decision to return concussed athletes to play. Frequently, there is undue pressure from various sources (parents, player and coach) to return a valuable athlete to action. In addition, often there is unwillingness by the athlete to report headaches and other findings because the individual knows it would prevent his or her return to play.

Outlined below are some guidelines that may be helpful for parents, coaches and others dealing with possible concussions. Please bear in mind that these are general guidelines and must not be used in place of the central role that physicians and athletic trainers must play in protecting the health and safety of student-athletes.

SIDELINE MANAGEMENT OF CONCUSSION

- 1. Did a concussion take place?** Based on mechanism of injury, observation, history and unusual behavior and reactions of the athlete, even without loss of consciousness, assume a concussion has occurred if the head was hit and even the mildest of symptoms occur. (See other side for signs and symptoms)
- 2. Does the athlete need immediate referral for emergency care?** If confusion, unusual behavior or responsiveness, deteriorating condition, loss of consciousness, or concern about neck and spine injury exist, the athlete should be referred at once for emergency care.
- 3. If no emergency is apparent, how should the athlete be monitored?** Every 5-10 minutes, mental status, attention, balance, behavior, speech and memory should be examined until stable over a few hours if appropriate medical care is not available, an athlete even with mild symptoms should be sent for medical evaluation.
- 4. No athlete suspected of having a concussion should return to the same practice or contest, even if symptoms clear in 15 minutes.**

SIDELINE DECISION-MAKING

1. No athlete should return to play (RTP) on the same day of concussion.
2. Any athlete removed from play because of a concussion must have medical clearance from an appropriate health care professional before he or she can resume practice or competition.
3. Close observation of athlete should continue for a few hours.
4. After medical clearance, RTP should follow a step-wise protocol with provisions for delayed RTP based on return of any signs or symptoms.

MEDICAL CLEARANCE RTP PROTOCOL

1. No exertional activity until asymptomatic.
2. When the athlete appears clear, begin low-impact activity such as walking, stationary bike, etc.
3. Initiate aerobic activity fundamental to specific sport such as skating or running, and may also begin progressive strength training activities.
4. Begin non-contact skill drills specific to sport such as dribbling, fielding, batting, etc.
5. Full contact in practice setting.
6. If athlete remains asymptomatic, he or she may return to gameplay.

A. ATHLETE MUST REMAIN ASYMPTOMATIC TO PROGRESS TO THE NEXT LEVEL.

B. IF SYMPTOMS RECUR, ATHLETE MUST RETURN TO PREVIOUS LEVEL

C. MEDICAL CHECK SHOULD OCCUR BEFORE CONTACT.

National Federation of State
High School Associations



A Parent's Guide to Concussion in Sports

What is a concussion?

- A concussion is a brain injury which results in a temporary disruption of normal brain function. A concussion occurs when the brain is violently rocked back and forth or twisted inside the skull as a result of a blow to the head or body. An athlete does **not** have to lose consciousness ("knocked-out") to suffer a concussion.

Concussion Facts

- It is estimated that over 140,000 high school athletes across the United States suffer a concussion each year. (Data from NFHS Injury Surveillance System)
- Concussions occur most frequently in football, but girl's lacrosse, girl's soccer, boy's lacrosse, wrestling and girl's basketball follow closely behind. All athletes are at risk.
- A concussion is a traumatic injury to the brain.
- Concussion symptoms may last from a few days to several months.
- Concussions can cause symptoms which interfere with school, work, and social life.
- An athlete should not return to sports while still having symptoms from a concussion as they are at risk for prolonging symptoms and further injury.
- A concussion may cause multiple symptoms. Many symptoms appear immediately after the injury, while others may develop over the next several days or weeks. The symptoms may be subtle and are often difficult to fully recognize.

What are the signs and symptoms of a concussion?

SIGNS OBSERVED BY PARENTS, FRIENDS, TEACHERS OR COACHES

Appears dazed or stunned

Is confused about what to do

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

SYMPTOMS REPORTED BY ATHLETE

Headache

Nausea

Balance problems or dizziness

Double or fuzzy vision

Sensitivity to light or noise

Feeling sluggish

Feeling foggy or groggy

Concentration or memory problems

Confusion

What should I do if I think my child has had a concussion?

If an athlete is suspected of having a concussion, he or she **must** be immediately removed from play, be it a game or practice. Continuing to participate in physical activity **after** a concussion can lead to worsening concussion symptoms, increased risk for further injury, and even death. Parents and coaches are not expected to be able to "diagnose" a concussion, as that is the job of a medical professional. However, you must be aware of the signs and symptoms of a concussion and if you are suspicious, then your child must stop playing:

When in doubt, sit them out!

All athletes who sustain a concussion need to be evaluated by a health care professional who is familiar with sports concussions. You should call your child's physician and explain what has happened and follow your physician's instructions. If your child is vomiting, has a severe headache, is having difficulty staying awake or answering simple questions he or she should be taken to the emergency department immediately.

When can an athlete return to play following a concussion?

After suffering a concussion, **no athlete should return to play or practice on that same day.** Previously, athletes were allowed to return to play if their symptoms resolved within 15 minutes of the injury. Studies have shown us that the young brain does not recover quickly enough for an athlete to return to activity in such a short time.

Concerns over athletes returning to play too quickly have led state lawmakers in both Oregon and Washington to pass laws stating that **no player shall return to play following a concussion on that same day and the athlete must be cleared by an appropriate health-care professional before he or she are allowed to return to play in games or practices.** The laws also mandate that coaches receive education on recognizing the signs and symptoms of concussion.

Once an athlete no longer has symptoms of a concussion and is cleared to return to play by health care professional knowledgeable in the care of sports concussions he or she should proceed with activity in a step-wise fashion to allow the brain to re-adjust to exertion. On average the athlete will complete a new step each day. The return to play schedule should proceed as below following medical clearance:

Step 1: Light exercise, including walking or riding an exercise bike. No weight-lifting.

Step 2: Running in the gym or on the field. No helmet or other equipment.

Step 3: Non-contact training drills in full equipment. Weight-training can begin.

Step 4: Full contact practice or training.

Step 5: Game play.

If symptoms occur at any step, the athlete should cease activity and be re-evaluated by their health care provider.

How can a concussion affect schoolwork?

Following a concussion, many athletes will have difficulty in school. These problems may last from days to months and often involve difficulties with short and long-term memory, concentration, and organization.

In many cases it is best to lessen the athlete's class load early on after the injury. This may include staying home from school for a few days, followed by a lightened schedule for a few days, or perhaps a longer period of time, if needed. Decreasing the stress on the brain early on after a concussion may lessen symptoms and shorten the recovery time.

What can I do?

- Both you and your child should learn to recognize the "Signs and Symptoms" of concussion as listed above.
- Teach your child to tell the coaching staff if he or she experiences such symptoms.
- Emphasize to administrators, coaches, teachers, and other parents your concerns and expectations about concussion and safe play.
- Teach your child to tell the coaching staff if he or she suspects that a teammate has a concussion.
- Monitor sports equipment for safety, fit, and maintenance.
- Ask teachers to monitor any decrease in grades or changes in behavior that could indicate concussion.
- Report concussions that occurred during the school year to appropriate school staff. This will help in monitoring injured athletes as they move to the next season's sports.

Other Frequently Asked Questions

Why is it so important that an athlete not return to play until they have completely recovered from a concussion?

Athletes who are not fully recovered from an initial concussion are significantly vulnerable for recurrent, cumulative, and even catastrophic consequences of a second concussive injury. Such difficulties are prevented if the athlete is allowed time to recover from the concussion and return to play decisions are carefully made. No athlete should return-to-sport or other at-risk participation when symptoms of concussion are present and recovery is ongoing.

Is a "CAT scan" or MRI needed to diagnose a concussion?

Diagnostic testing, which includes CT ("CAT") and MRI scans, are rarely needed following a concussion. While these are helpful in identifying life-threatening brain injuries (e.g. skull fracture, bleeding, swelling), they are not normally utilized, even by athletes who have sustained severe concussions. A concussion is diagnosed based upon the athlete's story of the injury and the health care provider's physical examination.

What is the best treatment to help my child recover more quickly from a concussion?

The best treatment for a concussion is rest. There are no medications that can speed the recovery from a concussion. Exposure to loud noises, bright lights, computers, video games, television and phones (including text messaging) all may worsen the symptoms of a concussion. You should allow your child to rest as much as possible in the days following a concussion. As the symptoms

lessen, you can allow increased use of computers, phone, video games, etc., but the access must be lessened if symptoms worsen.

How long do the symptoms of a concussion usually last?

The symptoms of a concussion will usually go away within one week of the initial injury. You should anticipate that your child will likely be out of sports for about two weeks following a concussion. However, in some cases symptoms may last for several weeks, or even months. Symptoms such as headache, memory problems, poor concentration, and mood changes can interfere with school, work, and social interactions. The potential for such long-term symptoms indicates the need for careful management of all concussions.

How many concussions can an athlete have before he or she should stop playing sports?

There is no "magic number" of concussions that determine when an athlete should give up playing contact or collision sports. The circumstances surrounding each individual injury, such as how the injury happened and length of symptoms following the concussion, are very important and must be considered when assessing an athlete's risk for further and potentially more serious concussions. The decision to "retire" from sports is a decision best reached following a complete evaluation by your child's primary care provider and consultation with a physician or neuropsychologist who specializes in treating sports concussion.

I've read recently that concussions may cause long-term brain damage in professional football players. Is this a risk for high school athletes who have had a concussion?

The issue of "chronic encephalopathy" in several former NFL players has received a great deal of media attention lately. Very little is known about what may be causing dramatic abnormalities in the brains of these unfortunate retired football players. At this time we have very little knowledge of the long-term effects of concussions which happen during high school athletics.

In the cases of the retired NFL players, it appears that most had long careers in the NFL after playing in high school and college. In most cases, they played football for over 20 years and suffered multiple concussions in addition to hundreds of other blows to their heads. Alcohol and steroid use may also be contributing factors in some cases. Obviously, the average high school athlete does not come close to suffering the total number or shear force of head trauma seen by professional football players. However, the fact that we know very little about the long-term effects of concussions in young athletes is further reason to very carefully manage each concussion.

Some of this information has been adapted from the CDC's "Heads Up: Concussion in High School Sports" materials by the NFHS's Sports Medicine Advisory Committee. Please go to www.cdc.gov/ncipc/tbi/Coaches_Tool_Kit.htm for more information.

If you have any further questions regarding concussions in high school athletes or want to know how to find a concussion specialist in your area, please contact Michael C. Koester, MD, ATC and Chair of the NFHS Sports Medicine Advisory Committee at michael.koester@slocumcenter.com.

April 2010

Concussion Care Instructions

Your Son/Daughter has been diagnosed with a concussion (also known as a mild traumatic brain injury). These instructions are designed to help speed your recovery. Your careful attention to them can also prevent further injury. Before your Son/Daughter is allowed to return to activity they must be evaluated and cleared by a physician. Rehab 3 Center for Athletes strongly recommends Dr. Fred Brennan at Seacoast Orthopedics & Sports Medicine. Dr. Brennan is an expert in Concussion Management and works closely with the Rehab 3 Athletic Training staff to ensure the highest level of care for your child. For an appointment with Dr. Brennan contact the Seacoast Center for Athletes at 603-577-SCFA (7232).

Sometimes the signs and symptoms from a concussion do not become apparent until hours after the initial trauma. The following list includes some but not all possible signs and symptoms of a concussion:

Sensitivity to light	Headache	Drowsiness	Balance problems/ dizziness
Trouble sleeping	Nausea	Blurred vision	Sleeping more than usual
Sensitivity to noise	Vomiting	Irritability	Difficulty concentrating
Numbness/ tingling	Fatigue	Sadness	Difficulty remembering
Feeling like in a "fog"			

If any of the following symptoms occur, bring your child to the nearest hospital emergency room.

- Any significant increase in intensity in the signs and symptoms listed above
- Severe headache that is not alleviated by Tylenol or cool packs applied to the head
- Repetitive or persistent vomiting
- Difficulty seeing, any peculiar eye movements, or one pupil larger than the other
- Restlessness, irritability, or drastic changes in emotional control
- Convulsions/ seizures
- Difficulty walking or using arms
- Dizziness/ unsteady gait or confusion that gets progressively worse
- Difficulty being awakened
- Difficulty speaking or slurring of speech
- Bleeding or drainage of fluid from the nose or ears
- Any new or severe symptoms

Instructions:

- REST is the key - get lots of rest. Physical rest and "brain" rest. Be sure to get enough sleep at night & take naps if possible.
- Limit physical activity as well as activities that require a lot of thinking or concentration (homework, video games, texting). These activities can make symptoms worse.
- You should not physically exert yourself (e.g., sports, lifting, running, biking) if you still have any symptoms of a concussion. Simply walking at a normal pace is okay.
- Drink lots of fluids and eat healthy foods. Do not drink alcohol.
- You may take two Tylenol (acetaminophen) every 6 hours as needed for headache. Nothing stronger unless authorized by a medical provider.
- Report any new or changing signs and symptoms to your athletic trainer.

Return to Play Guidelines: When your son/daughter is symptom free they will be progressed through the following steps by the athletic trainer to ensure a safe return to sport.

- Step 1: Light exercise, including walking or riding an exercise bike. No weight-lifting.
- Step 2: Running in the gym or on the field. No helmet or other equipment.
- Step 3: Non-contact training drills in full equipment. Weight-training can begin.
- Step 4: Full contact practice or training.
- Step 5: Game play.

If symptoms occur at any step, the athlete should cease activity and be re-evaluated by their health care provider.

Appendix 9: Concussion - Daily Monitoring Sheet

NAME: _____ DATE: _____

DATE OF INJURY: _____

Symptom	None	Mild	Moderate	Severe			
HEADACHE	0	1	2	3	4	5	6
NAUSEA	0	1	2	3	4	5	6
VOMITING	0	1	2	3	4	5	6
BALANCE PROBLEM/ DIZZINESS	0	1	2	3	4	5	6
FATIGUE	0	1	2	3	4	5	6
SKIN RASH/ ITCHING	0	1	2	3	4	5	6
TROUBLE SLEEPING	0	1	2	3	4	5	6
SLEEPING MORE THAN USUAL	0	1	2	3	4	5	6
DROWSINESS	0	1	2	3	4	5	6
SENSITIVITY TO LIGHT	0	1	2	3	4	5	6
BLURRED VISION	0	1	2	3	4	5	6
SENSITIVITY TO NOISE	0	1	2	3	4	5	6
JOINT STIFFNESS (FINGERS)	0	1	2	3	4	5	6
SADNESS	0	1	2	3	4	5	6
IRRITABILITY	0	1	2	3	4	5	6
NUMBNESS/ TINGLING	0	1	2	3	4	5	6
FEELING LIKE "IN A FOG"	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
NECK PAIN	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
Column Total Score (add #s)	—	—	—	—	—	—	—

Total # of Items Endorsed: _____

Overall Total Score: _____

Assuming you were at 100% before your concussion, give a percentage rate to your current overall condition: _____%

What is a Concussion?

The definition of a concussion is a violent shaking or jarring action of the brain resulting in immediate or delayed and/or temporary impairment of neurological and motor functions. A concussion can be sustained following an acceleration or a deceleration force. An example of an acceleration force is the force generated by getting hit in the head by a ball, object, or opponents' body. A deceleration force is the force received when an athlete's head strikes the ground or another immovable object. Symptoms associated with a concussion include: headache, dizziness, lack of awareness of surroundings, nausea, vomiting, headache, and a number of other motor and neurological deficits. Though some of these symptoms may be very evident, many can go undetected without proper testing.

If a concussion is left untreated and an athlete sustains a subsequent head injury while recovering from the first, the consequences could be much more severe and potentially life threatening.

What is Impact Testing?

Impact Concussion Testing is a concussion management program that begins with a 25 minute computerized test. This test evaluates multiple brain functions including: impulse control, sustained attention, working memory, reaction time, visual-motor processing speed, visual and verbal memory, and response variability.

If at any point during the season an athlete sustains a concussion, he/she will be asked to repeat this computerized test to compare these scores to their baseline test scores. This information can then be used in order to determine if it is safe for the athlete to return to play.

Why Impact Testing?

It is very common for an athlete to intentionally and/or unintentionally withhold information regarding concussion signs and symptoms, therefore it becomes very hard to diagnose and manage the condition. Without the proper information return to play decisions can become very difficult. Impact concussion testing provides medical professionals objective data in order to make proper decisions regarding your child's health and return to play status.

I hereby give my son/daughter permission to participate in the Impact Concussion Testing program. This includes baseline computerized testing and any subsequent tests. I understand that I will be contacted in the event that my son/daughter suffers a possible head injury and will be advised of any necessary medical intervention.

Student-Athlete's name: _____

Parent/Guardian's Signature: _____ Date: _____

- **University of New Hampshire Concussion Management Plan**
- **National Federation of State High School Association**
- **Balance Error Scoring System (BESS)**
- **Sport Concussion Assessment Tool 2 (SCAT2)**