

Concussions in Cycling Consensus Statement 2012

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One of the most feared consequences of any sport is traumatic brain injury.

Concussions are a form of traumatic brain injury resulting from a direct blow to the head or body that results in the rapid acceleration/ deceleration of the brain inside the skull and alters cellular processes within the brain. Concussion can occur without direct impact to the head or a loss of consciousness, and can be present with normal hospital imaging. Concussion can result in symptoms that are evident immediately, or may evolve and persist over the course of hours, days, and even months. Some signs and symptoms of a concussion are only evident with specific testing or questioning. Additionally, certain symptoms of concussion such as disequilibrium and slowed reaction times, increase the risk for further injury to the concussed cyclist and those around him/her if precautions are not taken before returning to training and competition. Once an athlete has had a concussion, the brain is more susceptible to repeat injury, necessitating proper clinical care. Cyclists significantly decrease their odds of head and skull injury by wearing helmets, but helmets cannot prevent concussion.

As a group of physicians and researchers with a special interest in cycling medicine, we have reviewed the current literature on concussion in sports. In this document, we discuss our opinion of the best practices for concussion awareness and management in cycling. Any cyclist suspected of sustaining a concussion would ideally receive a complete neurologic exam by a properly trained medical staff member. We recognize that teams may not have access to a team physician and in competition the peloton does not wait for a timely and thorough investigation from a race physician in the caravan. Members of the Medicine of Cycling Concussion Task Force include:

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The following guidelines are intended for the general education of cycling team physicians, managers, coaches, and athletes regarding the most common signs, symptoms, and general management principles of concussion. These guidelines are not a surrogate for personal evaluations by medical professionals trained in concussion management. Our recommendations primarily pertain to adult athletes, although the principles outlined here can also be applied to Junior and U-23 athletes. As children and adolescents are at a higher risk of protracted recovery, we strongly recommend immediate personal examination of any cyclist with findings consistent with concussion within this age group by a physician trained in concussion management. This concussion statement is based on current knowledge and best practices, and will need to be modified as more information emerges.

Actions to take in the pre-season:

- Education. The athlete has the biggest stake holder in his or her health. Cyclists should be educated on the signs and symptoms of concussion and encouraged to be honest with medical staff as any new symptoms develop.
- Obtaining an assessment of the cyclist’s baseline neurologic function. This is one of the most important aspects of good neurological care for all athletes. Establishing an athlete’s baseline neurological function allows for a more accurate diagnosis in case of future injury and helps guide for their safe return to cycling. Cyclists who have a history of prior concussion are at an increased risk of repeat injury, so it is particularly imperative for these athletes to have a baseline cognitive and motor control (e.g. balance) assessment performed prior to the start of the racing season.
- Preseason assessments with a baseline cognitive functioning test performed by a licensed medical professional trained in concussion management. This may include a Primary Care Physician, Neuropsychologist, Neurologist, or Certified Athletic Trainer using established tests for neurostatus (e.g. SCAT2 or SAC), neurocognitive testing (e.g. ImPACT, Axon, ANAM, Headminder CRI, CNS Vital Signs), and motor control (e.g. BESS). See the provided website links to these baseline testing options below.
- For teams and athletes without access to formal testing, a tool such as SCAT2 (available at no cost) can serve as a helpful guide to documenting prior events. In athletes without

formal testing, a written account of *at least* a prior history of possible head injury or concussions, including when the injuries occurred, what symptoms the athlete experienced, what testing was done, length of recovery, and how the athlete was cleared for competition. Cyclists with prior concussions resulting in extended symptomatic periods are at increased risk for prolonged recovery after any additional injury.

In-Race Evaluation for Concussion:

1. Communicate to riders and staff the importance of immediate assessment for possible concussion by the medical staff following a crash. Following any crash, any damage to rider's helmet, face, or neck should warrant an evaluation. In the event of a high-speed impact, an evaluation for concussion is warranted regardless of the rider's complaints.
 - Fast and effective evaluation can ensure proper triage and safety for the athlete.
 - Cooperating with medical staff performing the exam will speed up the process. If the athlete is safe to return to competition, following these guidelines will help him or her get there faster.
2. Situations may exist where medical staff will not be on hand after a crash, but team staff may be present. In these situations it is important to be aware of life threatening signs (***what you see***) and symptoms (***what the cyclist experiences***) consistent with severe injury to the brain or spine. Should a cyclist develop any of these signs or symptoms, the cyclist should immediately be withdrawn from competition and transported by emergency medical personnel to a medical facility. **These include, but are not limited to:**
 - Loss or change in consciousness
 - Nausea and/or Vomiting
 - Severe headache
 - Disorientation
 - Inability to speak or swallow
 - Amnesia
 - Skull fracture
 - Leakage of clear or bloody fluid from the nose or ears
 - Inability to walk or ride a bike in a straight line
 - Seizure
 - Arm or leg weakness or numbness
 - Neck pain
3. It can be challenging to identify riders who may have sustained a concussion. Tests performed immediately following trauma are imperfect, as symptoms of concussion can evolve over time. Signs and symptoms of concussion listed below (see #5) signal that the athlete needs medical attention. If still on the bike, the cyclist should immediately withdraw from competition and be taken for more specific medical assessment.

4. Cyclists suspected of a concussion would ideally be observed for 15 minutes following guidelines established in other sports. This may not be possible in the context of most bicycle racing. Those athletes that are suspected of having a concussion, but do not demonstrate life threatening or initial symptoms of concussion outlined in the [Post-Race Evaluation of Concussed Athlete](#) below, should have at least the following brief exam performed before clearance to continue the race is considered:

- Observe the athlete stand feet together, eyes closed, and head tilted back. If the athlete is unable to maintain their balance they have failed this assessment and cannot be returned to competition until assessed by a medical professional.
- Ask questions like the following seven. A rider should be able to answer five of the questions below, assessing memory and comprehension (you can substitute questions you are able to answer yourself if applicable):
 - Can you tell me how you crashed?
 - What city is this?
 - What lap or stage are you in?
 - How far are you from the finish?
 - Was there a break in the race?
 - What’s in the pockets of your jersey?
 - Can you name all of the months backwards, starting with December?

Post-Race Evaluation of Concussed Athlete

1. Regardless of a cyclist’s ability to finish their race after a crash has occurred, signs and symptoms can evolve for up to 14 days and persist for many weeks afterwards. Evaluate the cyclist using any of the modalities listed above in the Pre-season discussion if previous baseline tests performed. Otherwise, consider using SAC, SCAT2, or BESS at this time.
2. Observe for signs and symptoms of concussion in the hours and days after a crash occurs, as these also suggest the need for further medical evaluation. signs and symptoms of a concussion may include, but are not limited to¹:

Physical	Cognitive	Emotional/Behavioral
<ul style="list-style-type: none"> •Loss of consciousness •Headache •Pressure in the head •Neck pain •Nausea •Vomiting •Blurred vision •Dizziness •Fatigue prolonged or greater than expected 	<ul style="list-style-type: none"> •Confusion •Feeling slowed down •Sensitivity to light •Sensitivity to noise •Impaired balance •Feeling in a fog •Difficulty concentrating •Difficulty remembering 	<ul style="list-style-type: none"> •More emotional •Irritability •Restlessness •Drowsiness •Sadness •Anxiety •Nervousness •Sleep disturbance •Personality changes

3. Any cyclist suspected of having a concussion should AVOID the following:

- Strenuous physical and cognitive activity until any previous concussion symptoms are completely resolved. **Consult a physician if symptoms worsen at any time or persist beyond 72 hours**
- Consuming Alcohol
- Taking Sleeping pills or anti-anxiety medications
- Taking aspirin, ibuprofen, naproxen, or narcotics. Consider using acetaminophen (Tylenol®) for headaches and other associated bodily injury after sustaining a possible concussion
- Driving or operating machinery, including their bike

Return to Sport considerations after concussion:

1. The return to normal activities is a critical step in the recovery of concussed cyclists. However, performing this safely requires supervision by a physician trained in the care of concussed athletes. Though each cyclist's recovery has to be evaluated on a case by case basis, a few basic premises should be followed to maximize safety and allow for proper recovery. **These should serve only as educational guidelines and not rules for unmonitored return to competition:**
 - a. The primary treatment for concussion is physical and mental rest. Cognitive stimulation via activities such as computer work, e-mail, watching TV or movies, attending school or work, or attending loud and stressful events, may continue to stress the brain and prolong recovery. Limit any such activity to the point where symptoms are not increased.
 - b. For athletes who have a baseline neurocognitive test, return for repeat evaluation and comparison to baseline once the athlete no longer reports any concussion related symptoms.
 - c. Once the cyclist exhibits no further signs or symptoms of concussion, use a step-wise approach when increasing levels of physical activity. **Advance to the next step every 24 hours, but only if symptoms of concussion are not reproduced with each level of increasing activity.**
 - i. Start with a low impact stationary bike or trainer, keeping the cyclist's heart rate <70% of their known or predicted maximum and monitor for symptom recurrence. If the cyclist experiences any prior concussion symptoms, stop the activity immediately, and rest the athlete for 24 hours. Reattempt exercise only if the athlete is again without any symptoms of concussion.

- ii. Gradually increase the intensity and duration of activity only if there is no recurrence of symptoms throughout the next 24 hours. Continue this daily progression until the athlete is able to train at pre-injury level without recurrence of any concussion symptoms. If the athlete develops symptoms during any stage of the step-wise progression, rest the cyclist a minimum of 24 hours (or until symptoms resolve), and resume the progression at the last level the cyclist could complete without symptoms.
 - iii. Once the athlete has returned to the road, pay special attention to the cyclist's balance and reaction time, as these functions may take longer to return. Ongoing deficits may predispose the cyclist to repeat injury once back on the road or mountain.
 - iv. Delayed presence of symptoms or recovery may indicate ongoing trauma or mark another serious condition that requires attention by a physician.
 2. A sample return to competition protocol adapted from the Zurich Concussion Consensus 2008 is outlined below. This protocol should be monitored by a physician familiar with concussion management when possible.
 - a. No activity - complete physical and cognitive rest until symptom free
 - b. Stationary riding at a HR <70% of max, short duration, and not on rollers as full coordination of the cyclist may not yet be assured
 - c. Solo riding on a road, track, or trail at low intensity and short duration
 - d. Solo riding on a road, track, or trail incorporating intervals and/or hill workouts at higher levels of intensity and duration
 - e. Group rides with sprints and/or climbs, pacelines
 - f. Return to competition
 3. If concussion symptoms return during any portion of the cyclist's return to competition protocol, the athlete must inform the managing physician of their recurrent symptoms, and rest a minimum of 24 hours before resuming the level of activity where symptoms recurred, and then only with physician clearance.

You can contact Dr. Jason Brayley to learn more about concussion in athletes at jason@medicineofcycling.com and Dr. Anna Abramson with questions regarding the Medicine of Cycling at anna@medicineofcycling.com.

List of Resources and Helpful Websites:

1. SCAT2 Assessment - <http://www.neurosurgery.net.au/SCAT2.html>
2. ImPACT Resources - <http://www.impacttestoffice.com>
3. AXON Resources - <http://www.axonsports.com>
4. CDC info sheet for coaches -
http://www.cdc.gov/concussioninyouthsports/images/coaches_Engl.pdf
5. http://www.cdc.gov/concussion/sports/cdc_ncaa.html?source=govdelivery
6. Zurich Concussion Consensus 2008 -
<http://www.sportconcussions.com/html/Zurich%20Statement.pdf>