

This guideline document has been produced to inform National Sports Organisations (NSOs), and recreation, education and health sectors in their development of specific policy for concussion in sport. Produced by ACC in consultation with a panel of medical, sport and research experts, it is based on the 2012 Zurich Consensus Statement^[1] on Sport Concussion.

These guidelines are intended to help provide advice via the NSOs and recreation, education and health sectors to help people (e.g. medical doctors, health providers, first aiders, coaches/trainers, players, parents, sports administrators, school teachers etc.) to understand:

1. **Why there is a need for concussion guidelines.**
2. **What concussion is.**
3. **How to recognise the signs and symptoms of concussion.**
4. **What action to take when a concussion occurs, and how to get help.**
5. **Who can assess and diagnose concussion (only a medical doctor).**
6. **Why a management protocol for graduated return to school/work/sport is needed.**
7. **How NSO's can develop a concussion policy and implementation plan.**

Guideline Summary

- **Recognise and Remove.** If concussion is suspected, remove from play/activity immediately and seek urgent assessment by a medical doctor.
- Concussions often occur **without** loss of consciousness (only 10-20% lose consciousness).
- Extra caution is required for child and adolescent athletes.
- It may take several hours (or even days) post injury for some or all of the symptoms of concussion to emerge.
- Non-medical personnel have an important role to play in recognising the signs and symptoms of concussion. Concussion can present in a similar manner to other catastrophic conditions with delayed onset of symptoms.
- A medical doctor must provide assessment and diagnosis of concussion because the diagnosis may be difficult and relies on clinical judgement.
- It is unanimously agreed that **no return** to sport/activity on the day of concussive injury should occur.^[1]
- The effects of concussion can interfere with the athlete's ability to learn in the classroom or to function well at work. Return to school/work may need to be graduated and demands altered to reflect level of function, guided by a medical practitioner experienced in this area. Return to school/work and social activities should be achieved before return to sport/activity.

1. Why we need concussion guidelines

Concussion is a serious injury and occurs frequently:

- Estimated 35,000 head injuries in New Zealand per year.^[2]
- 21% (7,350 injuries per year) of all head injuries in New Zealand are sustained through sport related activity.^[3] ACC only receive claims for 6,250 of those sports related concussion injuries suggesting that 1,100 currently go untreated.
- 2009-2013 sports related concussion claims cost ACC \$76 million.
- 46% (3,381 injuries per year) of sports head injuries are classified as 'mild with a high risk of complications'. Injuries are most frequently sustained during rugby, cycling and equestrian activities.
- 11% of sports related concussion claimants had multiple concussions within a 2 year period (2009-2013).
- Evidence shows that with repeat concussion people may experience a decline in general health and quality of life up to 10 years following injury.^[4]

2. Definition of concussion

Concussion is a mild traumatic brain injury (mTBI). Concussion is a brain injury defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces. Several common features that incorporate clinical, pathologic, and biomechanical injury constructs can be utilized in defining the nature of a concussive head injury.

A laymen's definition of concussion is:

Concussion is a brain injury that can occur in any sport, particularly where there is full body contact. Concussion is caused by the impact of force (a blow) to a part of the body not necessarily the head directly.^[1]

3. Signs and symptoms of concussion

Concussion presents with a range of signs and/or symptoms that may or **may not** include loss of consciousness.^[1] It is important to remember that not every sign and symptom will be present every case and signs and symptoms may have delayed onset.

Physical signs (you see)

- Loss of consciousness or non-responsive
- Lying on the ground not moving or slow to get up
- Loss of balance/co-ordination
- Disorientation/confusion
- Visible injury to face or head (especially in combination with any other signs)
- Seizure or convulsion
- Vomiting

Clinical symptoms (they feel)

- Blurred vision
- Neck pain
- Nausea
- Dizziness
- Confusion
- Difficulty sleeping
- Headache/pressure in the head
- Sensitivity to light &/or noise
- Generally feeling "not quite right"
- Fatigue
- Drowsiness/trouble sleeping
- More emotional
- Irritability
- Problems with memory
- Reduced ability to think/concentrate

4. Action to take when a concussion occurs, and how to get help

When a concussion or possible concussion occurs it is important to take action and to get help. **The most important steps in the early identification of concussion are to recognise a possible injury and remove the athlete from the sport/activity.**

Recognise and Remove

Use the **Concussion Recognition Tool (CRT)** (a printable PDF of the pocket CRT can be downloaded at: <http://links.lww.com/JSM/A32>).

Pocket CONCUSSION RECOGNITION TOOL™

To help identify concussion in children, youth and adults



RECOGNIZE & REMOVE

Concussion should be suspected if one or more of the following visible clues, signs, symptoms or errors in memory questions are present.

1. Visible clues of suspected concussion

Any one or more of the following visual clues can indicate a possible concussion:

Loss of consciousness or responsiveness
Lying motionless on ground/Slow to get up
Unsteady on feet / Balance problems or falling over/Incoordination
Grabbing/Clutching of head
Dazed, blank or vacant look
Confused/Not aware of plays or events

2. Signs and symptoms of suspected concussion

Presence of any one or more of the following signs & symptoms may suggest a concussion:

- | | |
|--------------------------|----------------------------|
| - Loss of consciousness | - Headache |
| - Seizure or convulsion | - Dizziness |
| - Balance problems | - Confusion |
| - Nausea or vomiting | - Feeling slowed down |
| - Drowsiness | - "Pressure in head" |
| - More emotional | - Blurred vision |
| - Irritability | - Sensitivity to light |
| - Sadness | - Amnesia |
| - Fatigue or low energy | - Feeling like "in a fog" |
| - Nervous or anxious | - Neck Pain |
| - "Don't feel right" | - Sensitivity to noise |
| - Difficulty remembering | - Difficulty concentrating |

© 2013 Concussion in Sport Group

3. Memory function

Failure to answer any of these questions correctly may suggest a concussion.

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

Any athlete with a suspected concussion should be **IMMEDIATELY REMOVED FROM PLAY**, and should not be returned to activity until they are assessed medically. Athletes with a suspected concussion should not be left alone and should not drive a motor vehicle.

It is recommended that, in all cases of suspected concussion, the player is referred to a medical professional for diagnosis and guidance as well as return to play decisions, even if the symptoms resolve.

RED FLAGS

If **ANY** of the following are reported then the player should be safely and immediately removed from the field. If no qualified medical professional is available, consider transporting by ambulance for urgent medical assessment:

- | | |
|------------------------------------------------|---------------------------------|
| - Athlete complains of neck pain | - Deteriorating conscious state |
| - Increasing confusion or irritability | - Severe or increasing headache |
| - Repeated vomiting | - Unusual behaviour change |
| - Seizure or convulsion | - Double vision |
| - Weakness or tingling/burning in arms or legs | |

Remember:

- In all cases, the basic principles of first aid (danger, response, airway, breathing, circulation) should be followed.
- Do not attempt to move the player (other than required for airway support) unless trained to do so
- Do not remove helmet (if present) unless trained to do so.

from McCrory et. al, Consensus Statement on Concussion in Sport. Br J Sports Med 47 (5), 2013

© 2013 Concussion in Sport Group

- Non-medical personnel have an important role in observing possible concussion and its effects (e.g. behaviour/symptoms), and should take responsibility for removing the injured athlete from the sport/activity.
- If a suspected concussion has occurred it is important to see a medical doctor for assessment immediately.
- Medical doctors are available at general practitioner practices, concussion clinics or hospital emergency departments.
- It is unanimously agreed that **no return** to sport/activity on the day of concussive injury should occur.^[1]
- In cases of uncertainty always adopt a conservative approach – **"If in doubt sit them out"**.

It is useful to have a list of local medical doctors, concussion clinics and emergency departments close to where the sport/activity is being played. A pre-activity checklist of the appropriate services could include:

- Local doctors or medical centre.
- Local hospital emergency department.
- Ambulance services (111).

To help an unconscious athlete:

- Apply first aid principles – DRABC (Danger, Response, Airway, Breathing, Circulation).
- It is extremely important to treat all unconscious athletes as though they have a neck injury.
- An unconscious athlete must ONLY be moved by a medical professional trained in spinal immobilisation techniques.
- Urgent hospital care is necessary if there is concern regarding the risk of structural head or neck injury – call 111.
- An athlete with any of the following should be referred to hospital URGENTLY:
 - Loss of consciousness or seizures.
 - Persistent confusion.
 - Deterioration after being injured – increased drowsiness, headache or vomiting.
 - Report of neck pain or spinal cord symptoms – numbness, tingling, muscle weakness.
- If at any time there is any doubt the athlete should be referred to hospital.

5. Assessment and diagnosis of concussion by medical doctors

Only a qualified medical doctor can assess and diagnose a concussion.

Anyone with a suspected head injury needs to see and be assessed by a medical doctor. This is essential to confirm the diagnosis of concussion and to assess the risk for more serious injury.

We endorse the Sport Concussion Assessment Tool version 3 (SCAT3) and the Child-SCAT3 as a validated means of assessing concussion by a medical doctor. A printable PDF of SCAT3 can be downloaded at: <http://links.lww.com/JSM/A30>. A printable PDF of Child-SCAT3 can be downloaded at: <http://links.lww.com/JSM/A31>. We recommend you become familiar with symptoms evaluated SCAT3.

The SCAT3 is NOT to be used for diagnosis of concussion alone. It provides a standardized assessment to aid diagnosis by a medical doctor.

NOTE: In some areas of the world, sports physiotherapists and other trained medical personnel can do the assessment (e.g., SCAT3), **but only a doctor can diagnose concussion.**

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	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 (Maximum possible 132)

Do the symptoms get worse with physical activity? Y N

Do the symptoms get worse with mental activity? Y N

self rated self rated and clinician monitored

clinician interview self rated with parent input

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 N/A

is

in

6. Concussion management and a graduated return to school/work/sport protocol

Initial concussion management involves physical and cognitive rest until the acute symptoms resolve and then a graded programme of exertion (physical and mental activity) prior to medical clearance and return to sport.

All athletes diagnosed with concussion must go through a graduated return to activity protocol led by a person trained in concussion management (e.g. coach, physical trainer, teacher, parent etc.). Athletes should have fully returned to school or work and social activities **before** returning to activity. **Clearance by a medical doctor is required before return to sport/activity.**

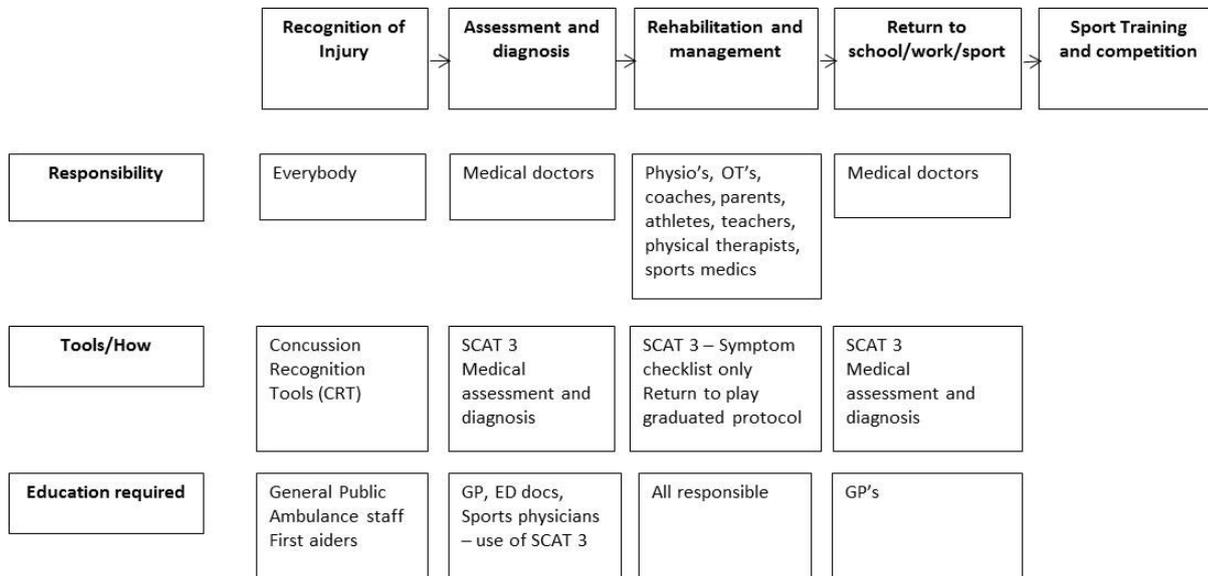
There is a lack of research to support the optimal period of time an athlete should be out of training and competition. Below is an example of a **graduated return to sport protocol** based on the best available evidence and expert experience.

Return to activity stage	Functional exercise at each stage of rehabilitation	Objective of each stage
No activity	Avoid all physical and mental exertion including the use of technology (e.g. use of phones, computers, reading, watching TV).	Recovery.
Light aerobic exercise	Walking, swimming or stationary bike keep intensity of exercise very low/easy. No resistance training.	Increase heart rate.
Sport specific exercise	Running drills. No head impact activities.	Add movement.
Non-contact training drills	Progression to more complex training drills e.g. passing, drills.	Exercise, co-ordination and cognitive load.
Full contact practice	Following clearance from medical doctor , participate in normal training activities.	Restore confidence and assess functional skills by coaching staff.
Return to play	Normal sport.	Full return to sport.

- It is unanimously agreed that **no return** to sport/activity on the day of concussive injury should occur.^[1]
- Return to activity should be particularly cautious where children and adolescents are concerned.
- Each individual international sports federation may have specific rules which **must** be considered (e.g. International Rugby Board rules for New Zealand Rugby).
- The safety of the athlete is the priority and must NOT be compromised.
- The decision regarding return to school/work and clearance to return to restricted activity should always be made by a medical doctor.

- The decision regarding the timing of return to sport/activity should always be made by a medical doctor.
- In some cases, symptoms may be prolonged or graded activity may not be tolerated. If recovery is prolonged, evaluation by a concussion specialist or clinic may be warranted to determine if there are other aspects of the concussion that could respond to rehabilitation.

In summary, the figure shows the roles and responsibilities for concussion management (i.e. stages of identification, assessment and diagnosis, rehabilitation and return to sport).



7. Develop a policy and implementation plan

It is suggested that National Sport Organizations (NSOs) and other relevant organisations develop a concussion policy and educate their members/community in how to implement the guidelines specific to their sport.

ACC has an 'expert panel' available that can be consulted to review organisations' concussion policies, implementation plans and education material with the goal of ensuring a consistently high standard of care across New Zealand.

References

1. McCrory P, Meeuwisse WH, Aubry M et al. Consensus statement on concussion in sport: The 4th International Conference on Concussion in Sport held in Zurich, November 2012. British Journal of Sports Medicine. 2013;**47**(5):250-8.
2. Feigin V, Theadom A, Barker-Collo S et al. Incidence of traumatic brain injury in New Zealand: A population-based study. The Lancet Neurology. 2013;**12**(1):53-64.
3. Theadom A, Parag V, Dowell T et al. Persistent problems one year following traumatic brain injury within a population based incidence and outcomes study. 2014 in press.
4. Zumstein MA, et al. Long term outcome in patients with mild TBI: A prospective observational study. Journal of Trauma and Acute Care Surgery. 2011;**71**(1):120-7.

It is intended to formally review this document prior to February 2017.