



CONCUSSION POLICY STATEMENT AND MANAGEMENT GUIDELINES

INTRODUCTION

It is clear that a persuasive argument can be made that a comprehensive and systematic approach to concussion injury utilizing an evidence based method holds potential benefit for both the injured athlete and for management decisions. As well as being of benefit to athletes, the use of a standardized evidence based protocol has important medico legal and insurance implications that ultimately will protect the medical staff from potential problems that may arise in their clinical management.

These guidelines assist medical personnel, coaches and individuals involved in the care of injured players to provide world's best practice medical care for our athletes, and ensure that concussed athletes return to play safely with minimal risk of long-term cognitive or neurological damage. Adherence to this system affords maximum medico-legal protection for our governing body and associated medical staff.

The broad aims of the Concussion Management System are:

- a. To develop a consistent evidence-based clinical strategy in the diagnosis and management of concussion
- b. To provide clinicians with a simple management protocol to guide return to play decisions

Definition of concussion

The Vienna Consensus Conference 2001 and updated in the Zurich Conference 2008 has developed the following definition of concussion.

Concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces. Several common features that incorporate clinical, pathological 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 neurological function that resolves spontaneously.
3. Concussion may result in neuropathological changes but the acute clinical symptoms largely reflect a functional disturbance rather than structural injury.
4. Concussion results in a graded set of clinical syndromes that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course, but may be prolonged.
5. Concussion is typically associated with grossly normal structural neuroimaging studies.

MANAGEMENT GUIDELINES

The following guidelines are based on the Zurich consensus Group 2008 but modified slightly to be appropriate to EH's needs.



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Baseline evaluation

Baseline clinical and neuropsychological evaluation including a detailed concussion history and paper based psychometric testing is a critical part of the protocol. Such testing is important for three reasons:

1. It establishes the athletes 'normal' level of cognitive function, which acts as a comparison to any post-concussion testing undertaken; and
2. It helps stop 'practice effects' from interfering with the return to play decision making process; and
3. It provides useful clinical information regarding the athlete's history of concussion, which must be considered when making return to play decisions.
- 4.

Concussion history

A detailed concussion history taken while the athlete is healthy may provide important information in the event of a concussion. There is little evidence to suggest that repetitive head injuries result in 'second impact syndrome' or cumulative damage, indeed it seems more likely that there is a genetic predisposition to concussion incidence and/or outcome (i.e. some athletes may be more prone to concussion and take longer to recover from them). Where an athlete has a history of previous concussions medical staff may proceed with extra caution when making return to play decisions. It should be noted that reliance on the athlete to accurately document previous concussions is limited. Also previous cervical and/or maxillary-facial injuries may include associated concussions.

Baseline psychometric testing

Establishing the athlete's status when normal helps determine whether cognition has changed post-concussion. Statistically, the cognitive impairments that follow concussion are much easier to detect if the athlete's post-concussion performance is compared to his/her own performance when normal (i.e. at baseline), than if post-concussion performance is compared to a 'normal range' derived from a group of peers. This is because the variability within the individual is most often much less than the variability within a group of individuals who may have diverse neuropsychological profiles. The mild performance changes that often occur following concussion are effectively lost amongst this variability when comparison to normal ranges is undertaken.

Sideline diagnosis and evaluation

Sideline diagnosis refers to the immediate assessment given on-field when an athlete is suspected to have been concussed. Sideline clinical evaluation including neurological assessment and mental status testing is an essential component in the protocol. In the diagnosis of an acute concussive episode brief neuropsychological tests that assess attention of memory function have been shown to be practical and effective. Such validated tests include the Maddocks questions (see table I) – it is worth noting that standard orientation



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questions (e.g. time, place, person) have repeatedly been shown to be unreliable in a sporting situation.

Maddocks questions

These questions are a system by which a clinician can make a rapid diagnosis of concussion. They combine scientific validity with a quick simple and practical tool which can be administered either on-field or on the sidelines. Any incorrect response is indicative of concussion and would mandate removal from the playing field for further medical evaluation.

Table 1: Maddocks questions

It is recognized however that abbreviated testing paradigms are designed for rapid concussion diagnosis on the sidelines and are not meant to replace comprehensive neurological and neuropsychological testing which may detect subtle deficits that may persist beyond the acute episode. Furthermore, although such tools may be used to suspect a diagnosis of concussion in non-medically trained individuals, it is recommended that a mandatory medical examination follow such provisional diagnosis as soon as possible.

Immediate management of concussion

The major initial priorities with regard to any head injury are the basic principles of first aid. The simple mnemonic **DR ABC** may be a useful aide-memoir.

Table 2: Initial on-field assessment of concussion

D anger	Ensuring that there are no immediate environmental dangers which may potentially injure the patient or treatment team. This may involve stopping play.
R esponse	Is the patient conscious? Can he/she talk?
A irway (with cervical spine control)	Ensuring a clear and unobstructed airway. Remove a mouthguard (which should be present) if appropriate.
B reathing	Ensure the patient is breathing adequately.
C irculation	Ensure an adequate circulation.



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Once these basic aspects of care have been achieved and the patient stabilized, then consideration of removal of the patient from the field to an appropriate facility is necessary. At that time, careful assessment for the presence of a cervical spinal cord or other injury is necessary. If an alert patient complains of neck pain, has evidence of neck tenderness or deformity or has neurological signs suggestive of a spinal injury, then neck bracing and transport on a suitable spinal frame is required. If the patient is unconscious, then a cervical injury should be assumed until proven otherwise. Airway protection takes precedence over any potential spinal injury.

The clinical management may involve the treatment of a disorientated, confused, unconscious, uncooperative or convulsing patient. The immediate treatment priorities remain the basic first aid principles of ‘**ABC** – airway, breathing and circulation’. Once this has been established and the patient stabilized, a full medical and neurological assessment exam should follow.

Signs and symptoms of acute concussion

If any one of the symptoms or problems described in Table 3 is present, a head injury should be suspected. A player does not need to have lost consciousness to suffer a concussion. In order to make a specific diagnosis then, the clinician should test the player’s cognitive function formally using the Maddocks questions (see *Table 1*).

Table 3: Typical signs and symptoms of concussion

Typical Symptoms	Physical Signs
Headache	Loss of consciousness/impaired conscious state
Dizziness	Poor coordination or balance
Nausea	Convulsive convulsion/impact seizure
Fogging	Gait unsteadiness/loss of balance
Unsteadiness/loss of balance	Slow to answer questions or follow directions
Confusion/amnesia	Easily distracted, poor concentration
Unaware of period, opposition, score of game	Displaying unusual or inappropriate emotions
Feeling “dinged”, stunned or “dazed”	Nausea/vomiting
Seeing stars or flashing lights	Vacant stare/glassy eyed
ringing in the ears	Slurred speech
Double vision/blurred vision	Personality changes
Emotional lability	Inappropriate playing behaviour
	Significantly decreased playing ability



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Early management

Assessment of injury severity is best performed in a quiet medical room rather than pitch-side. When examining a concussed athlete, a full neurological examination is important. Because the major management priorities at this stage are to establish an accurate diagnosis and exclude a catastrophic intracranial injury, this part of the examination should be particularly thorough. Having determined the presence of a concussive injury, the patient needs to be serially monitored until full recovery ensues. Postural stability deficits can last up to 72 hours post-injury and therefore can be a useful assessment tool (See Appendix 3 – SCAT 2)

The treating medical professional also must face the decision as to whether to refer the athlete to hospital. There are number of indications (listed in Table 4 below) which would suggest the need to refer onwards but the decision depends on the experience, ability, competency and confidence of the attending health professional. The overall approach should be “when in doubt – refer”.

Table 4: Indications for urgent hospital referral

Any player who has or develops the following:

- Fractured skull
- Penetrating skull trauma
- Deterioration in conscious state following injury
- Focal neurological signs
- Confusion or impairment of consciousness > 30 minutes
- Loss of consciousness > 5 minutes
- Persistent vomiting or increasing headache post injury
- More than one episode of concussive injury in a match or training session
- Where there is assessment difficulty (e.g. an intoxicated patient)
- All children with head injuries
- High risk patients (e.g. haemophilia, anticoagulant use)
- Inadequate post injury supervision
- High risk injury mechanism (e.g. high velocity impact, missile injury)

Referral of the concussed athlete to an emergency department for observation is not mandatory as most uncomplicated cases of concussion recover rapidly and are able to be supervised by a health professional before the patient can be discharged home under the care of a responsible adult. Good practice would be to give the patient and his attendant a head injury advice card, as illustrated on the next page.



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Head injury advice card

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 in such cases it is not possible to be quite certain.

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

**IMPORTANT:
until medical review**

**No alcohol
No analgesics or pain killers
No driving**

Patients name

Date & time of injury

Date of medical review

Treating physician

Clinic Phone Number

Return to play decisions

It is recognized that two broad scenarios occur in sport-related concussion. **First**, the athlete who sustains a minor injury and recovers rapidly within seconds to minutes. In this situation, return to play (RTP) on the day of the injury is likely providing the athlete has fully recovered. The **second** scenario is an athlete with prolonged post-concussion symptoms who takes several days to recover fully.

In the former, the RTP strategy will be based upon both clinical symptom recovery and neuropsychological testing returning to baseline level of functioning. In the latter case, following clinical and cognitive recovery, a graded rehabilitation program is commenced prior to RTP. Optimal implementation of both strategies requires that appropriate baseline assessment has been undertaken.

Return to play on the day of injury

The consensus of expert opinion suggests that mild cases of concussion can safely return to play on the day of injury providing full recovery has occurred. An example of such a situation may be where an athlete is stunned or dazed and experiences a few seconds or minutes of cognitive dysfunction and then recovers rapidly. Under the American Academy of Neurology (AAN) guidelines, symptoms lasting less than 15 minutes are compatible with return to play on the same day as long as the athlete has recovered. **A player should never return to play while symptomatic. "When in doubt, sit them out!"**



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It is important to emphasize that any concussed athlete must be medically assessed as soon as possible following injury and prior to return-to-play. It is not within the scope or expertise of a physiotherapist, trainer or other non-medical person to manage a concussive injury or determine the timing of return to play. This should be determined by a doctor experienced in the management of concussion with access to both neurological imaging and neuro-cognitive testing

If no baseline neuropsychological assessment has been performed, the return-to-play would not be permitted on the day of injury.

Return to play where symptoms persist for several days

A far more common situation is where an athlete is concussed during a match, experiences acute post concussive symptoms (e.g. amnesia, headache, dizziness etc) for a short time (usually < 30 minutes) and then recovers full cognitive function over several days. It has been shown in published studies that the vast majority of concussive injuries recover over 3-5 days. Referral to a neurologist or neurosurgeon with expertise in concussion may be appropriate if symptoms/signs do not settle quickly.

Common symptoms experienced following injury include: headache, nausea, vomiting, drowsiness, numbness or tingling, dizziness, balance problems, sleeping more than usual, sensitivity to light, sensitivity to noise, feeling slowed down, feeling like “in a fog”, difficulty concentrating, difficulty remembering, trouble falling asleep, more emotional than usual, irritability, sadness, nervousness.

A structured and supervised concussion rehabilitation protocol is conducive to optimal injury recovery and safe and successful return to play. The rehabilitation principles were common to all identified programs and are outlined below. **The important principle is that the athlete is completely asymptomatic and have normal neurological and cognitive evaluations prior to the start of the rehabilitation program.** Therefore the more prolonged the symptom duration, the longer the athlete will have sat out. The athlete will then proceed stepwise with gradual incremental increases in exercise duration and intensity and pause or backtrack with any recurrence of concussive symptoms. It is appreciated that although each step may take a minimum of one day, depending on the duration of symptoms, proceeding through each step may take longer in individual circumstances.

Return to play protocol

Return to play post-concussion follows a stepwise process:

1. No activity, complete physical and cognitive rest. (Cognitive rest includes rest from normal work, reading, TV, texting) Once asymptomatic at rest and with exercise challenge, proceed to level 2.
2. Light aerobic exercise (Less than 70% of maximum heart rate) such as walking or stationary cycling.
3. Sport specific training (e.g. running drills, ball handling skills)



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4. Non-contact training drills.
5. Full contact training after medical clearance.
6. Neuro-cognitive testing (same or better than baseline)
7. Game play.

With this stepwise progression, the athlete should continue to proceed to the next level if asymptomatic at the current level. If any post concussion symptoms occur, the patient should drop back to the previous asymptomatic level and try to progress again after 24 hours.

Psychometric testing

The application of psychometric testing in concussion has been shown to be of value and continues to contribute significant information in concussion evaluation and particularly to assist in return to play decisions. It has been demonstrated that cognitive recovery usually follows clinical symptom resolution, suggesting that the assessment of cognitive function should be an important component in any return to play protocol.

The consensus of the Zurich conference was that psychometric testing is one of the cornerstones of concussion evaluation and contributes significantly to both understanding of the injury and management of the individual. To maximize the clinical utility of such psychometric assessment, baseline testing is recommended.

Examples of paper-based psychometric tests are shown in [Appendix I](#)

Investigations

Usually no investigation is necessary for simple concussion. However, if there is a suspicion of an intracranial injury (altered conscious state/penetrating injury/focal neurological defect) then a CT or MRI scan is indicated. Other radiological investigations, such as PET scanning, have been used but their effectiveness is too early to evaluate

Medication

This is usually unnecessary but may be indicated for specific prolonged symptoms such as sleep disturbance or anxiety (Mild depression is common post-concussion as is usually short-lived and self limiting). If an athlete returns to play on medication beware that this is not masking any symptoms.

Modifying Factors

There is inconclusive evidence that females are more prone to concussion than males or that the effects are worse.

Loss of consciousness greater than one minute is a predictor of a slower recovery

Post event amnesia: the nature, burden and duration of symptoms is important

Motor and convulsive phenomena is no longer thought to be diagnostic of a more serious injury



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Protective equipment

There is no good evidence that protective head gear reduces the risk of concussion but they can protect against serious head injury (Fractured skull) or facial injury. Gum shields have been shown to reduce dental and oro-facial injuries

Children (under 10) and Adolescents

Any child over the age of 10 years old should follow the current guidelines. For those that are younger, they may report different symptoms and therefore should be treated more conservatively. Cognitive rest may often need to be longer. They should not return-to-play on the same day.

Education

To minimize the effects of concussion after the event it is vital that athletes and the healthcare provider are better educated regarding the detection of concussion, its clinical features, assessment techniques and principles of safe return to play. Hopefully this document will be part of that process.

SCAT 2 (Sports Concussion Assessment Tool) has replaced the original SCAT and is useful assessment tool for acute concussion and can also be used to serially monitor recovery (See Appendix 2 and 3)



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Appendices:

Appendix 1 – see below

Appendix 2 – SCAT 2 cards – Please click link.

Orientation document of NP tests

Trials B

Trials B - the smaller square box labelled "sample" is the reverse side of the trails test form. It is a trial run to show the subjects how to do the test. The larger form with letters and numbers is the test itself

Trials B - "join the dots" task alternating letters and numbers. Start at "1" and finish at "13". (Then do the sample page to show them) I is a timed task so the faster the better.

Basically it is a join the dots game - except no funny picture comes out.

The line drawn goes 1-A-2-B-3-C-4-D-5-E-6-F etc until complete. On the test itself none of the lines cross which makes it easy for an observer to pick up a mistake.

Probably an average takes about 40 seconds.

DSST

Substitution test of symbols for numbers.

Essentially DSST - the player has 90 secs to complete as many responses as possible.

Do them across the page and don't skip any boxes (sequential).

Player cannot pick one symbol and fill all boxes then go onto next etc - has to be sequential.

No one has ever finished the test!

(Tell them this so they don't feel bad if they only do half the form).

A usual score is in the region of 65 boxes completed



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Digit Symbol—Coding



Digit Symbol Substitution Test

Player has 90 seconds to complete this test
How many boxes can he complete in 90 seconds?
Boxes must be completed in sequential order

Player's name _____

Club _____

Date _____

Examining Dr (print name) _____

Baseline test Y/N _____ Post concussion test Y/N _____

Sample Items

2	1	3	7	2	4	8	2	1	3	2	1	4	2	3	5	2	3	1	4	

5	6	3	1	4	1	5	4	2	7	6	3	5	7	2	8	5	4	6	3	

7	2	8	1	9	5	8	4	7	3	6	2	5	1	9	2	8	3	7	4	

6	5	9	4	8	3	7	2	6	1	5	4	6	3	7	9	2	8	1	7	

9	4	6	8	5	9	7	1	8	5	2	9	4	8	6	3	7	9	8	6	

2	7	3	6	5	1	9	8	4	5	7	3	1	4	8	7	9	1	4	5	

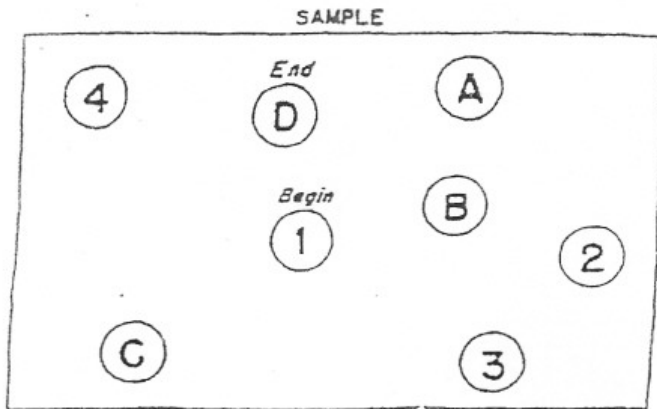
7	1	8	2	9	3	6	7	2	8	5	2	3	1	4	8	4	2	7	6	



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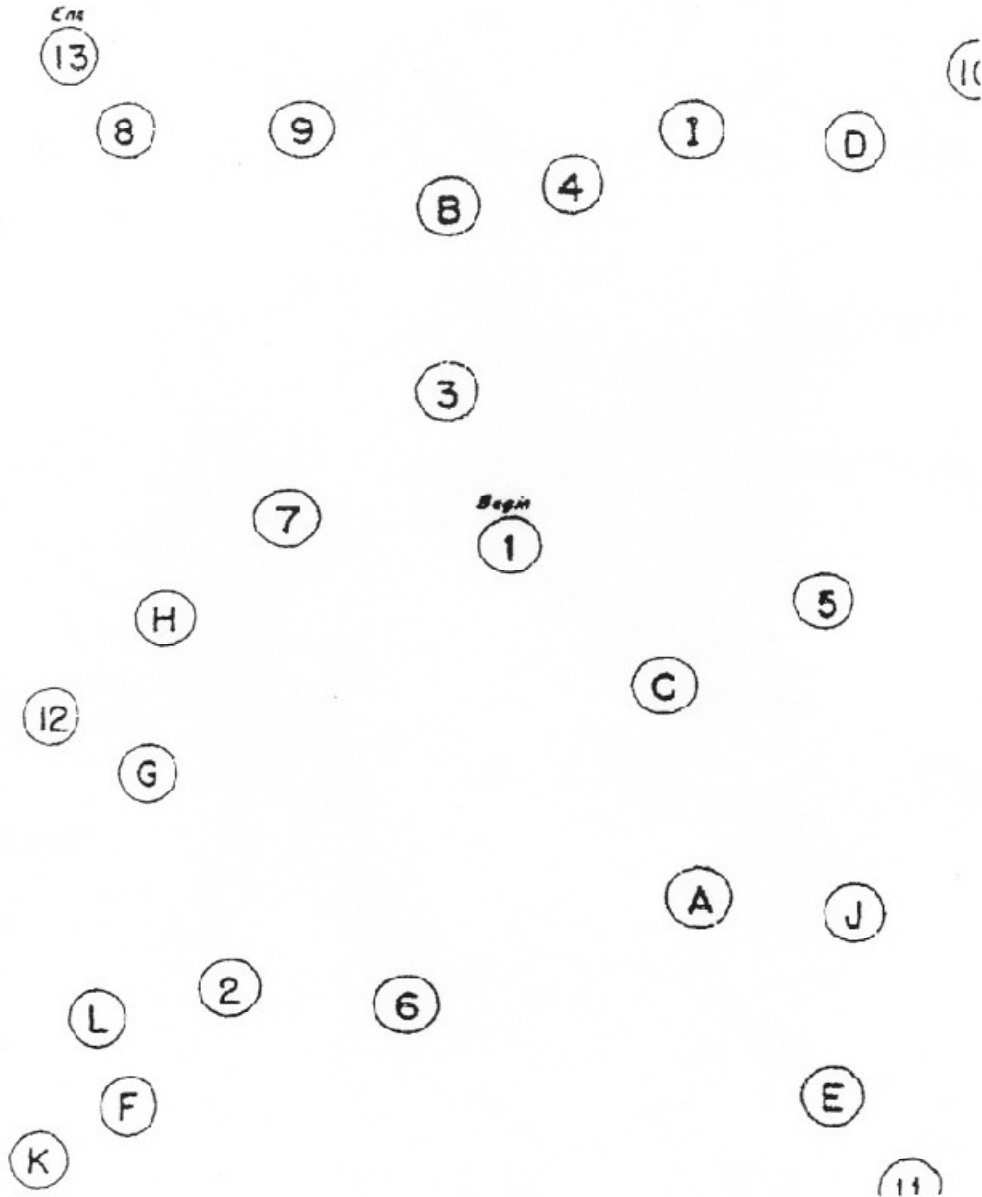
Trial B
Sample-Dr to complete to show player how to complete the test.
"Join the dots" test of alternating letters & numbers.
Start at 1 & finish at 13.
1-A-2-B-3-C-4-D-5-E-6-F-7-G etc
Test on reverse. Timed Task



Player's name _____
Club _____
Date _____
Examining Dr (print name) _____
Baseline test Y/N _____ Post concussion test Y/N _____



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Appendix 2 – Pocket SCAT 2 Card

Appendix 3 – SCAT 2