

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

### GUIDELINE SUMMARY

- **RECOGNISE AND REMOVE** - learn to recognise the signs and symptoms of concussion and remove a player from the field **if ANY doubt**
- **PROTECT OUR YOUNG ATHLETES** - The IRB recommends **different** return to play protocols for **different ages**
- Concussion must be taken extremely seriously to safeguard the long term welfare of players.
- **All players with a diagnosed concussion** must be removed from the field of play and not return to play or train on the same day. Players with a diagnosed concussion must go through a graduated return to play program (GRTP), described later in this document.
- **All players with a suspected concussion where no appropriately trained personnel are present** must be assumed to have a diagnosed concussion and must be removed from the field of play and not return to play or train on the same day. In this situation, players must go through a graduated return to play (GRTP) protocol.
- For elite competitions, where approved by the IRB's Chief Medical Officer and Head of Technical Services, players with a head injury where the diagnosis is not immediately apparent must be removed from play and can be assessed by a certified medical professional (CMP - defined as "A Certified Medical Professional who has successfully completed the IRB on line education programme for Match Day Medical Staff") assisted by the Pitch Side Concussion Assessment (PSCA) Tool.
- Players who complete a GRTP must receive medical clearance from a doctor or an approved healthcare professional (as defined by each Union) before returning to play
- The IRB recognises that there is considerable diversity in health care support across and within each Member Union. Because of this diversity each Union is encouraged to identify the roles and responsibilities of medical and healthcare practitioners and to establish a definition of approved healthcare professional relevant to their respective jurisdictions. **Each Union will be responsible** for confirming who is approved to diagnose concussion, provide a clearance to start a GRTP, monitor a GRTP and provide a clearance to return to play.

### Introduction

The IRB takes player welfare seriously and has been a primary supporter of the 2008 and 2012 Zurich Concussion in Sport Consensus Meetings. These meetings bring together the world experts in concussion every four years to review the current evidence surrounding concussion. Following a Consensus Conference, a position paper (Consensus Statement) is developed summarizing the current evidence based on knowledge in the area of concussion. This 2013 IRB Concussion Guideline has been updated to reflect the principles agreed at the Zurich 2012 Concussion Consensus conference.

These IRB guidelines are designed to be used by Medical Practitioners (CMPs) and approved healthcare professionals. All other parties involved in concussion management should refer to the guidelines for non approved healthcare professionals and General Public.

These Guidelines are meant to ensure that players who suffer concussion are managed effectively to protect their short and long term health and welfare. Scientific knowledge in the field of concussion is constantly evolving and the consensus process and scientific meetings will make sure that the IRB guidelines keep pace with these changes.

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

Separate guidelines are available for non approved healthcare professionals and general public..

### What is Concussion?

Concussion is a brain injury caused by either direct or indirect forces to the head. Concussion typically results in the rapid onset of short lived impairment of brain function<sup>1</sup>. Loss of consciousness (LOC) occurs in less than 15% of concussion cases and whilst a feature of concussion, loss of consciousness is not a requirement for diagnosing concussion.

Concussion results in a disturbance of brain function (e.g. memory disturbance, balance problems or symptoms) rather than damage to structures such blood vessels, brain tissue or fractured skull. Typically standard neuro-imaging such as MRI or CT scan is normal.

### CONCUSSION MUST BE TAKEN EXTREMELY SERIOUSLY.

### Head Injuries, Concussion and Structural Brain Injuries

Concussion is only one diagnosis that may result from a head injury. Head injuries may result in one or more of the following:

1. Superficial injuries to scalp or face such as lacerations and abrasions
2. Subconcussive event – a head impact event that does not cause a concussion
3. Concussion - an injury resulting in a disturbance of brain **function**
4. Structural brain injury - an injury resulting in damage to a brain structure for example fractured skull, bleed into or around brain

Structural brain injuries may present mimicking a concussion. In this instance, the signs and symptoms of a structural brain injury will usually persist or deteriorate over time eg persistent or worsening headache, increased drowsiness, persistent vomiting, increasing confusion and seizures.

Medical assessment of a concussion or head injury where the diagnosis is not apparent is recommended to exclude a potential structural brain injury.

*All head injuries should be considered associated with a cervical spine injury until proven otherwise.*

### Different Ages

It is accepted that children and adolescent athletes (< 19 years old) with concussion should be managed more conservatively. This is supported by evidence that confirms that children:

1. are more susceptible to concussion
2. take longer to recover
3. have more significant neurocognitive sequelae.
4. are more susceptible to the rare and dangerous neurological complications, including death defined as second impact syndrome (athletes under 19 years)

**The IRB supports a more conservative management of concussion for children and adolescent and has developed age specific return to play protocols for these groups** (details of these return to play protocols are outlined later in this document)

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

### DIAGNOSIS AND ASSESSMENT OF CONCUSSION

#### Identifying concussion

The IRB supports and promotes **RECOGNISE and REMOVE**.

The **Pocket Concussion Recognition Tool** (Appendix 1) developed by the Zurich 2012 Concussion Consensus Group supports this Recognise and Remove message and is suitable for use in Aged Grade and Community Rugby. This Tool highlights the signs and symptoms suggestive of a concussion. They include:

#### **Visible clues of a potential concussion**

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

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

#### **Symptoms of a potential concussion - What you are told**

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

- Headache
- Dizziness
- Mental clouding, confusion, or feeling slowed down (69.4%)
- Visual problems
- Nausea or vomiting
- Fatigue
- Drowsiness / Feeling like “in a fog” / difficulty concentrating
- “Pressure in head”
- Sensitivity to light or noise

#### **Questions to ask**

*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?”

If a Player is has signs or symptoms of a possible concussion that player must be

**RECOGNISE AND REMOVE**

**and**

**IF IN DOUBT, SIT THEM OUT.**

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

### On field or pitch side management

A Player with a signs or symptoms of concussion must be removed in a safe manner in accordance with emergency management procedures and medically assessed. If a cervical spine injury is suspected the Player should only be removed by emergency healthcare professionals with appropriate spinal care training.

Team mates, coaches, match officials, team managers, administrators or parents who observe an injured player displaying any of the signs or symptoms after an injury event with the potential to cause a concussion MUST do their best to ensure that the player is removed from the field of play in a safe manner.

### Pitch side management

In elite competitions where approval has from the IRB's Chief Medical Officer and Head of Technical Services and where a Certified Medical Practitioner is present, a pitchside assessment (PSCA) may be undertaken. The PSCA was developed to provide the experienced Team Doctors with extra time to assess a player who has a head injury where the diagnosis is not immediately apparent.

The PSCA has **NOT** been developed for the Community Game. Detailed information regarding the PSCA can be found on <http://www.irbplayerwelfare.com/matchdaymedical>

### Timing of post injury assessment

Uncertainty regarding the timing of the side line assessment exists and this is highlighted by the two conflicting recommendations within the Zurich 2012 papers.

The **Consensus Statement**<sup>1</sup> identifies that "It is recommended that these latter steps be conducted following a 15 minute rest period on the sideline to avoid the influence of exertion or game fatigue on the athlete's performance. Although it is noted that this time frame is an ARBITRARY one, the expert panel agreed nevertheless that a period of rest was important prior to assessment."

The **Putukian paper** titled On Field Assessment<sup>2</sup> states " Sideline concussion assessment tools should include a symptom checklist, balance assessment and cognitive assessment as an absolute minimum, with the assessment performed as soon as possible after the injury, with the understanding that the research related to the timing of the exam is not yet clear and that concussion signs and symptoms evolve over time".

The IRB has currently adopted a 5 minute and "as soon as possible" assessment approach as this is more appropriate for the existing IRB Laws and Regulations that incorporate a replacement system as opposed to free interchange used by other sports. Free interchange sports are not time restricted and are able to incorporate a rest period prior to post injury assessment.

The primary reason for other sports adopting the 15 minute period assessment is to allow athletes time to rest prior to a concussion assessment. This rest period is recommended to allow athletes to recover from game induced fatigue and avoid false positive results occurring due to this fatigue.

The "as soon as possible" assessment adopted by the IRB is likely to be more sensitive with respect to exclusion of players from further game participation as fatigue may impact on the concussion assessment. The IRB considers this a safety first approach.

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

### Diagnosing concussion

The Zurich 2012 Concussion Consensus Statement, recognised as the best practice document for concussion management, identifies concussion as being among the most complex injuries in sports medicine to diagnose, assess and manage<sup>1</sup>. This paper also confirms that there is no perfect diagnostic test or marker for an immediate diagnosis of concussion in the sporting environment<sup>1</sup>.

The Zurich Statement confirmed that clinical diagnosis remains the gold standard in concussion diagnosis and this diagnosis should be supported by:

- a review of symptoms using a standardised checklist
- cognitive (memory) assessment
- balance evaluation

SCAT 3 (Appendix 2) developed by the Concussion in Sports Group<sup>1</sup> is a multimodal assessment tool that incorporates a symptom checklist, cognitive assessment and balance evaluation.

The SCAT 3 Tool **supports** the doctor or approved healthcare professional to make a diagnosis and is not a stand-alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion. Within the SCAT 3 document it is highlighted that "an athlete may have a concussion even if their SCAT 3 is normal."

In summary the diagnosis of concussion is a clinical diagnosis supported by a multimodal tool such as SCAT 3. Decisions regarding concussion should not be based solely on the results of any support tool and remain a clinical decision for doctors supported by tools such as SCAT 3

### SCAT 3 interpretation

The SCAT 2, developed following the 2008 Consensus Conference used an overall score based on a maximum of 100 points. Results of the SCAT 2 used this post injury 'overall' score and compared it against the 'overall' baseline score of an injured individual to support a diagnosis of concussion.

SCAT 3 introduced following the 2012 Consensus Conference recommends that each mode, that is

- symptom checklist,
- cognitive assessment assessed using the SAC system to test memory
- balance evaluation

be compared against the baseline for each mode as opposed to a total score comparison. Any variation in one or more mode(s) is strongly in favour of concussion.

In the absence of baseline testing the IRB has identified reference range baseline data relating to over 700 individual rugby players. If no baseline data is available then the following should be considered strongly in favour of a diagnosis of concussion:

- Symptom checklist - one or more symptoms declared in the symptom list which is not usually experienced by the player following a Rugby match or training OR
- Balance evaluation - Tandem test - 3 or more errors or single leg stance test - 4 or more errors OR
- SAC assessment
  - Total SAC score 24 or below
  - Concentration score (digits backward) 2 or below
  - Delayed recall 3 or less words

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

*Players with baseline assessments below the above scores should be scrutinized to confirm that the baseline testing has not been manipulated by the player.*

**The IRB recommends the utilization of SCAT 3 for all players 13 years and older if practical.**

**A child SCAT 3 (Appendix 3) is now available for players under 13 years of age.**

In summary the diagnosis of concussion is a clinical diagnosis supported by a tool such as SCAT 3. Decisions regarding concussion should not be based solely on the results of any support tool and remain a clinical decision for doctors.

### Neuropsychological (computerized) testing

Cognitive recovery largely overlaps with the time course of symptom recovery however it more commonly follows symptom resolution. This delay in cognitive recovery supports the use of systems that assess cognition such as CogSport®, ImPACT®, HeadMinder™, etc.

Makdissi et al<sup>3</sup> in 2010 confirmed this delay in cognitive recovery when they compared cognitive recovery to symptom resolution. Data from this study confirmed that impairments on computerised testing persisted for 2–3 days after symptom resolution in 35% of concussed athletes.

Despite Makdissi's study, sole reliance on neuropsychological (NP) testing to determine recovery and return to play is not recommended. Studies by both Echlin<sup>4</sup> and Broglio<sup>5</sup> confirmed that normal NP testing occurred in up to 38% of diagnosed concussive cases who had persistent symptoms.

In summary sole reliance on computer NP testing to determine a return to play is NOT recommended. If available, NP testing can be used in conjunction with symptom checklists and balance evaluation as an aid to the clinical decision making process.

### Onset of Symptoms

It should be noted that the symptoms of concussion can present at any time but typically become evident in the first 24-48 hours following a head injury.

### Recovery from Concussion

Recovery from concussion is spontaneous and typically follows a sequential course. The majority (80–90%) of concussions resolve in a short (7–10 day) period, although the recovery time frame may be longer in children and adolescents<sup>1</sup>.

Players must be encouraged **not** to ignore symptoms at the time of injury and **must not** return to play prior to the full recovery from a diagnosed concussion. The risks associated with premature return to play include:

- a) a second concussion due to increased risk
- b) an increase risk of other injuries because of poor decision making or reduced reaction time associated with a concussion
- c) reduced performance
- d) serious injury or death due to an unidentified structural brain injury
- e) a potential increased risk of developing long term neurological deterioration

**Comprehensive medical assessment and follow up is required until a concussion has fully resolved. Players must be honest with themselves and medical staff for their own protection.**

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

The IRB recognizes the heightened risk of head injury and concussion and its complications in children and adolescent (less than 19 years of age) players. Extra caution must be taken to prevent such players returning to play or continuing playing or training if any suspicion of concussion exists.

**A second head impact in a player who has not fully recovered from concussion could lead to dangerous neurological complications, including death**

### MANAGEMENT OF CONCUSSION

#### Removal from Play

**All players with a diagnosed concussion** must be removed from the field of play and not return to play or train on the same day. Players with a diagnosed concussion must go through a graduated return to play protocol (GRTP).

**All non elite** players with a potential concussion must be presumed to have a diagnosed concussion and must be removed from the field of play and not return to play or train on the same day. Non elite players with a potential concussion must go through a graduated return to play protocol (GRTP).

In approved competitions, elite players with a head injury where the diagnosis is not immediately apparent may be medically assessed by a Certified Medical Practitioner (CMP) away from the field of play utilising the PSCA Tool as part of this assessment. **As for all supportive concussion assessment tools, clinical suspicion should override a negative PSCA.**

In **approved elite competitions** where the PSCA is in use, players who present with the following signs or symptom **MUST** be **permanently** removed from the field of play and do not require a PSCA

- Traumatic convulsion
- Tonic posturing
- Confirmed loss of consciousness
- Suspected loss of consciousness
- Ataxia - unsteady on feet
- Disorientated or confused

#### Graduated Return to Play

All players diagnosed with a concussion must go through a graduated return to play (GRTP) protocol as outlined in this document. **All non elite** players with a potential concussion must go through a **graduated return to play** (GRTP) program.

The IRB acknowledges, as per Zurich 2012, that younger athletes who sustain a concussion should be managed more conservatively. The IRB recommends different minimum rest periods and different length GRTP stages for differing aged groups - *protecting our young athletes.*

These recommendations are outlined in the **IRB Age Specific Concussion Return to Play Protocols** (Appendix 4). A summary of the minimum rest periods and different length GRTP stages for different ages is shown below:

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

U/6 - U/15 - **minimum rest period 2 weeks** and symptom free followed by a GRTP with each stage lasting 48 hours (Play - Day 23 post injury)

U/16 - U/19 - **minimum rest period 1 week** and symptom free followed by a GRTP with each stage lasting 24 hours (Play - Day 12 post injury)

Adult - **minimum rest period 24 hours free of symptom** followed by a GRTP with each stage lasting 24 hours (Play - Day 6 post injury)

A GRTP **should only commence** if the player

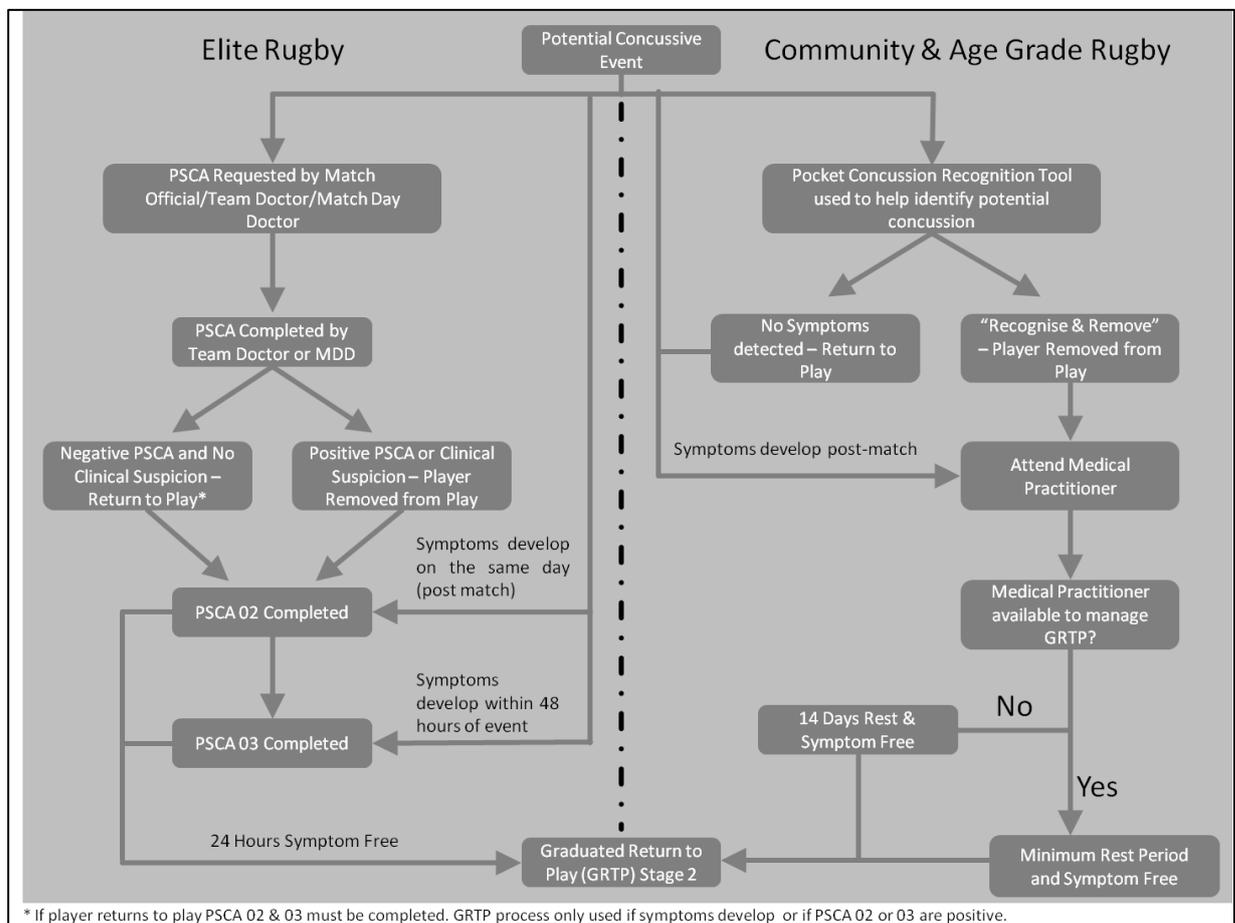
- has completed the minimum rest period for their age
- is symptom free and off medication that modifies symptoms of concussion.

Medical or approved healthcare professional clearance is required prior to commencing a GRTP.

The management of a GRTP should be undertaken on a case by case basis and with the full cooperation of the Player. The commencement of the GRTP will be dependent on the time in which symptoms are resolved and the age of the player. It is important that concussion is managed so that there is physical and cognitive rest (avoidance of activities requiring sustained concentration) until there are no remaining symptoms for a minimum of 24 consecutive hours without medication that may mask the symptoms.

In the early post injury period rest is defined as complete physical and cognitive rest however if recovery is delayed rest is defined as being activity below the level at which physical activity or cognitive activity provokes symptoms.

**Figure 1: Concussion Management Flowchart for Elite and Community Rugby**



# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

### The Graduated Return to Play Plan

Before a player can restart exercise they must have rested for the prescribed minimum rest period AND be symptom free.

The GRTP Process contains six distinct stages.

- The first stage is the recommended rest period for the athlete's age.
- The next four stages are training based restricted activity
- Stage 6 is a return to play

Under the GRTP Plan, the Player can proceed to the next stage if no symptoms of concussion (SCAT 3 provides the symptom checklist) are shown at the current stage (that is, both the periods of rest and exercise during that 24-hour period).

If any symptoms occur while progressing through the GRTP protocol, the player must return to the previous stage and attempt to progress again after a minimum 24-hour period of rest has passed without the appearance of any symptoms.

Prior to entering Stage 5, a Medical Practitioner or approved healthcare professional and the Player must first confirm that the Player can take part in this Stage. Full contact practice equates to return to play for the purposes of concussion. However return to play itself shall not occur until Stage 6 (**Table 3**).

The GRTP applies to all situations including 'multiple game-same day' tournaments.

**Table 3: GRTP Protocol**

Stage	Rehabilitation Stage	Exercise Allowed	Objective
1	Rest as per minimum rest period prescribed for player's age	Complete physical and cognitive rest without symptoms	Recovery
2	Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity, <70% maximum predicted heart rate. No resistance training. Symptom free during full 24-hour period.	Increase heart rate
3	Sport-specific exercise	Running drills. No head impact activities.	Add movement
4	Non-contact training drills	Progression to more complex training drills, e.g. passing drills. May start progressive resistance training.	Exercise, coordination, and cognitive load
5	Full Contact Practice	Normal training activities	Restore confidence and assess functional skills by coaching staff
6	Return to Play	Player rehabilitated	Recover

### **GRTP managed by a medical practitioner or approved healthcare professional (HCP)**

For GRTP programs managed by a medical practitioner or an approved HCP, the observation of progress may be delegated to a healthcare professional while the management of the program must remain the responsibility of the medical practitioner.

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

Adolescents and children, 19 years and under, MUST NOT return to play without clearance from a medical practitioner.

### **GRTP where no medical or approved healthcare professional practitioner is available**

When a medical practitioner or an approved healthcare practitioner is not available to manage and review the GRTP, the player MUST NOT play until completion of a minimum 2 week rest period and the relevant GRTP for that age. In addition the process should be observed and managed by someone familiar with the player who could identify any abnormal signs displayed by the player.

Clearance to play by a medical practitioner or approved healthcare practitioner should always be sought. However, there may be occasions (which will be in extreme and rare situations) where a player cannot access a medical practitioner or approved healthcare practitioner to assess the player and clear them to resume full contact practice. In these circumstances, the Union having jurisdiction over the player must put in place processes and mechanisms which only permit players to resume full contact practice when it is safe to do so. These processes and mechanisms will vary from Union to Union.

### **GRTP conclusion**

It is recognised that players will want to return to play as soon as possible following a concussion. Players, coaches, management, parents and teachers must exercise caution to ensure that:

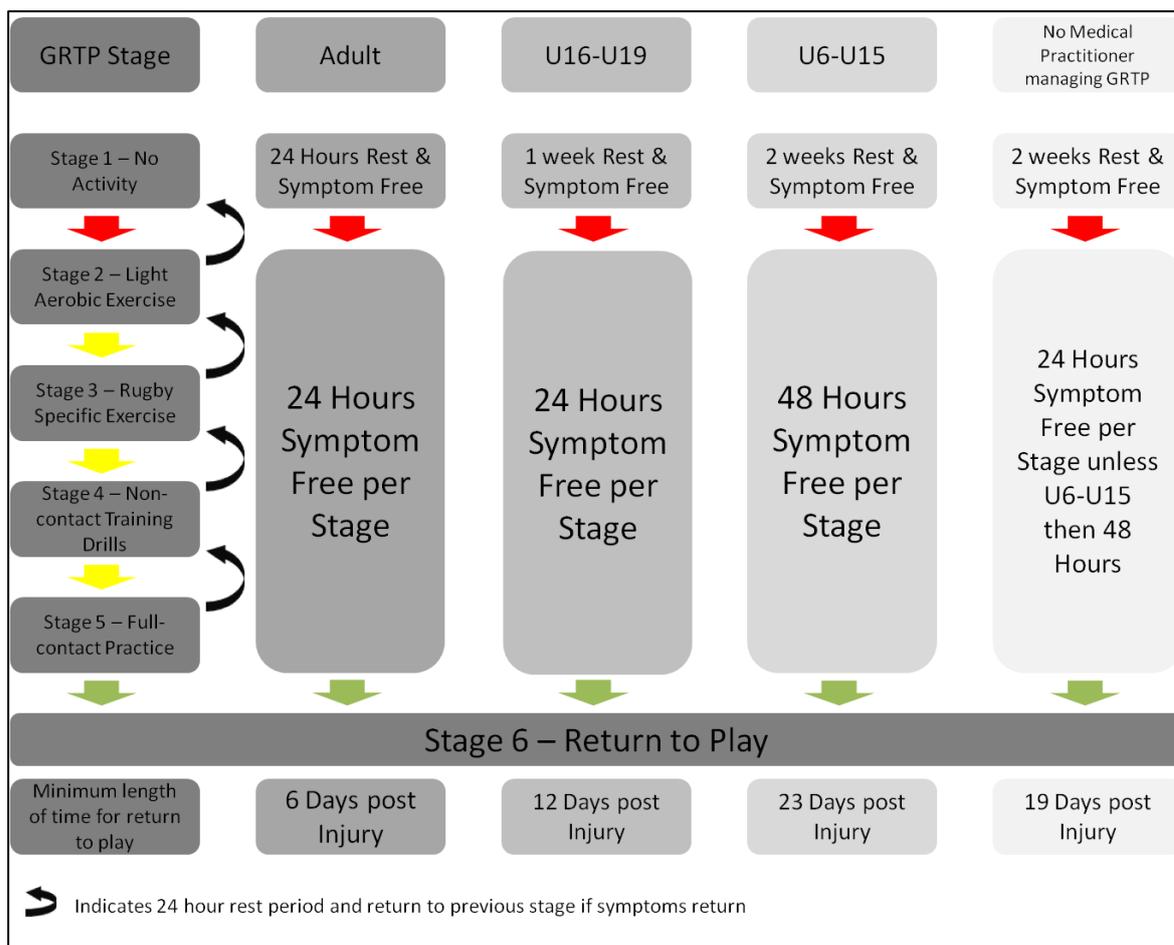
- all symptoms have subsided fully;
- the GRTP program is followed; and
- the advice of medical practitioners is strictly adhered to.

In doing so, all concerned can reduce the risk to a player's career longevity and long term health.

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

Figure 2: Concussion GRTP Protocols for different levels of the game



As identified in the last column of Figure 2, if no medical practitioner is available to manage a Graduated Return to Play (GRTP), irrespective of their age, the player MUST rest for a minimum of 2 weeks and be symptom free. At the completion of this 2 week rest period if the player is symptom free they can commence the GRTP with each stage progressing each 24 or 48 hours depending on the age of the player.

All involved in the process of concussion management must be vigilant for the return of symptoms or the possible development of psychological issues after a concussive event. If symptoms re-occur the player must consult a medical practitioner or approved healthcare practitioner. Those involved in the process of concussion management and/or aware of the return of symptoms should do all they can to ensure that the player consults a medical practitioner as soon as possible.

### Recurrent or difficult concussions

Following a concussion a player is at an increased risk of a second concussion within the next 12 months. The IRB recommends that all concussions be taken seriously and that full recovery be achieved prior to re-introduction of exercise. Players with:

- a second concussion within 12 month
- a history of multiple concussions
- unusual presentations or
- prolonged recovery

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

should be assessed and managed by health care providers (multidisciplinary) with experience in sports-related concussions.

**If a medical practitioner experienced in concussion management or Union approved healthcare provider is unavailable the player with a recurrent or difficult concussion history should be managed using the GRTP protocol from the lower age group as a minimum.**

**It is recommended that each Union identify a core list of specialists to deal with complex concussions**

### Factors impacting on the diagnosis and management of concussion

The factors listed below may predict the potential for prolonged or persistent symptoms. Players with these factors should be carefully monitored by experienced practitioners.

**Table 2**

Factors	Exacerbating factors
Symptoms	Number of concussions suffered historically Duration of current concussion symptoms (>10 days) Severity of current concussion
Signs	Prolonged loss of consciousness (>1 minute) Amnesia
Sequelae	Concussive convulsions
Temporal	Frequency – repeated concussions over time Timing – injuries close together in time “Recency” – recent concussion or traumatic brain injury
Threshold	Repeated concussions occurring with progressively less impact force or slower recovery after each successive concussion
Age	Child (<10 years) and adolescent (10-18 years)
Co- and premorbidities	Migraine, depression or other mental health disorders, attention deficit hyperactivity disorder (ADHD), learning disabilities, sleep disorders
Medication	Psychoactive drugs, anticoagulants
Behaviour	Dangerous style of play
Sport	High risk activity, contact and collision sport, high sporting level

### **Conclusion**

The IRB recommends that the “Gold Standard” concussion management be implemented for all players diagnosed with a concussion or when a player is suspected of having a concussion during a game or training at which there is no approved health care professional present.

This “Gold Standard” includes:

- Assessment by a certified medical practitioner familiar with international concussion protocols;
- Thorough, serial symptom analysis;
- General and neurological examination;
- Balance assessment; and
- Assessment of cognitive function preferably compared to a pre-injury baseline.

# IRB CONCUSSION GUIDELINES

## Certified Medical & Approved Healthcare Professionals

### IRB CONCUSSION MANAGEMENT - 6 Rs

**Recognise** – Learn the signs and symptoms of a concussion so you understand when an athlete might have a potential concussion (see the Concussion Recognition Tool for more details)

**Remove** – If an athlete has a concussion or even a potential concussion he or she must be removed from play immediately

**Refer** – Once removed from play, the player should be referred immediately to a certified medical practitioner or an approved healthcare professional who is trained in evaluating and treating concussions

**Rest** – Players must rest from exercise until symptom-free and then start a Graduated Return to Play. The IRB recommends minimum rest periods for different ages - U/6 to U/15 - 2 weeks minimum rest, U/16-U/19 - 1 week minimum rest, Adults - 24 hours minimum rest

**Recover** – Full recovery from the concussion is required before return to play is authorized. This includes being symptom-free. Rest and specific treatment options are critical for the health of the injured participant

**Return** – In order for safe return to play in Rugby, the athlete must be symptom-free and cleared in writing by a certified medical practitioner or approved healthcare professional who is trained in evaluating and treating concussions. The athlete must complete a GRTP (Graduated Return to Play) plan.

### 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. *Br J Sports Med* 2013;47:250–258.
2. Putukian M, Raftery M, Guskiewicz K, et al. On field assessment of concussion in the adult athlete. *Br J Sports Med* 2013;47:285–288.
3. Makdissi et al. Natural History of Concussion in Sport : Markers of Severity and Implications for Management *Am J Sports Med* 2010 38: 464-471
4. Echlin et al. Return to play after an initial or recurrent concussion in a prospective study of physician-observed junior ice hockey concussions: implications for return to play after a concussion. *Neurosurg Focus* 29 (5):E5, 2010; 1-5
5. Broglio et al. The Relationship of Athlete-Reported Concussion Symptoms and Objective Measures of Neurocognitive Function and Postural Control. *Clin J Sport Med* \_ Volume 19, Number 5, September 2009; 377-382

*The IRB recognises that the science of concussion is evolving. The IRB is actively involved in research and monitoring of the scientific developments and will endeavour to update these guidelines periodically as scientific evidence emerges however all users of these Guidelines are advised to check with a medical practitioner or approved healthcare professional should they have any concerns or queries with respect to concussion, these Guidelines and/or scientific developments in this field.*