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► **To cite this version:**

Martin Raftery, Simon Kemp, Jon Patricios, Michael Makdissi, Philippe Decq. It's time to give concussion an operational definition: A 3-step process to diagnose (or rule out) concussion within 48 hours of injury: World Rugby Guideline. *British Journal of Sports Medicine*, 2016, 50 (11), pp.642-643. 10.1136/bjsports-2016-095959 . hal-02517216

HAL Id: hal-02517216

<https://hal.science/hal-02517216>

Submitted on 24 Mar 2020

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It's time to give concussion an operational definition: A 3-step process to diagnose (or rule out) concussion within 48 hours of injury: World Rugby Guideline

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Competing Interests:

Martin Raftery is the current Chief Medical Officer for World Rugby and has been since 2011.

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Jon Patricios has been a member of World Rugby Concussion Advisory Group since 2013.

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KEY WORDS: Concussion, definition, operational, diagnosis

Introduction

Concussion is the number one injury risk in contact and collision sports. Identification of concussive events is critical to optimise injury management and, as identified by Quarrie and Murphy¹, to undertake accurate injury surveillance studies.

The Zurich Consensus Statement on Concussion² provides an expanded theoretical or conceptual definition of concussion but there is not yet an operational definition of concussion.

In 2012 World Rugby introduced a new pitch side process for assessment of head injuries, called the HIA³ (Head Injury Assessment). During the evolution of this process an operational definition of concussion has been developed and successfully implemented.

This World Rugby operational definition of concussion was developed with the intent of increasing recognition and sensitivity of diagnosis within the sport and subsequently to improve player welfare

and safety. Confirmed cases of concussion must follow the recommended rest and graduated return to play program that serves as a final part of the serial evaluation process.

An Operational Definition of Concussion

During the development of this operational definition of concussion it was agreed that this definition should address the timing of concussion assessment(s), how the diagnosis of concussion is confirmed or excluded and the content of each point-in-time assessment.

Timing of the Assessment

World Rugby has introduced a three-stage diagnostic process. This incorporates:

- (1) an assessment immediately post-injury (HIA 1),
- (2) repeat assessment within 3 hours of the injury (HIA 2) and,
- (3) follow-up assessment at 36-48 hours post injury (HIA 3).

This three-stage process was introduced recognising that concussion has a variable natural history, with transient, fluctuating, delayed and evolving signs or symptoms. In addition, the diagnostic process also aligns with the times that the team doctor's normal responsibilities involve team contact.

Diagnosis, Confirmation or Exclusion

World Rugby's operational definition assumes that any abnormal assessment confirms a concussion diagnosis unless the treating doctors provides clinical confirmation that the abnormal findings are not related to a concussion. In addition, exclusion of a concussion following a head injury cannot occur immediately after the injury but can only be confirmed after re-evaluation of the player at 36-48 hours post injury

World Rugby's operational definition a concussion applies with *any* of the following:

1. the presence, pitch-side, of any Criteria Set 1 signs or symptoms (Table 1) - HIA 1
2. an abnormal post-game, same day assessment - HIA 2
3. an abnormal 36-48 hour assessment - HIA 3
4. the presence of clinical suspicion by the treating doctor at any time

What does the assessment consist of?

The content of all three World Rugby's HIA Tools is based on the SCAT3⁴ and is available with the procedures on <http://playerwelfare.worldrugby.org/concussion>. It is acknowledged that the content of HIA Tools will continue to be modified as the evidence around concussion diagnosis evolves.

World Rugby's HIA 1, contains Criteria Set 1 (Table 1) which are indications for immediate and permanent removal from further game participation. The presence of any Criteria Set 1 confirms a concussion, unless proven otherwise. The HIA 1 also contains a 10-minute off-field assessment tool used when a player has a head injury where the diagnosis is not immediately apparent.

A key fact of the World Rugby off-field assessment is that it has been designed to screen for cases of *suspected* concussion. This off-field assessment was not developed with the intention of *diagnosing* a concussion.

HIA 2, completed within 3 hours of the injury, is SCAT 3 without the Glasgow Coma Scale and the Maddocks' Questions and includes relevant athlete and injury information.

HIA 3, completed within 36-48 hour of the injury includes

1. Symptom checklist as per SCAT 3 with collection of all symptoms experienced since the head injury, symptom duration and maximum symptom severity
2. Cognitive assessment of that team's choice using the computer neuro-cognitive assessment tool of that team's choice and/or the SAC component of SCAT 3
3. Balance evaluation using Modified Balance Error Scoring System and tandem gait.

Table 1

Criteria Set 1 – immediate and permanent removal not pitch side assessment required*	
Confirmed loss of consciousness	Suspected loss of consciousness
Convulsion	Tonic posturing
Balance disturbance / ataxia	Clearly dazed
Player not orientated in time, place and person	Definite confusion
Definite behavioural changes	Oculomotor signs (e.g. spontaneous nystagmus)
On field identification of signs or symptoms of concussion	

**Definitions are provided within the HIA procedures manual for each criterion*

Summary

World Rugby has introduced an operational definition of concussion into Rugby to better identify and manage concussion and to support injury surveillance studies. This definition acknowledges the variability in clinical concussion presentation by incorporating a three-point in time diagnostic process with the recommended times aligning with the times that team doctor's normal responsibilities involve team contact.

The current content of each assessment is based on SCAT 3 and will continue to be modified as the evidence around concussion diagnosis evolves.

This operational definition of concussion also includes the recommendation that any abnormal assessment be considered as being due to concussion. This default can be overruled if the team doctor decides that the abnormal assessment is not related to a concussion. Finally with World Rugby's operational definition, a concussion following a head injury cannot be excluded until an assessment is completed at 36-48 hours post injury.

Acknowledgements The authors gratefully acknowledge the support and input of the following members of the IRB HIA working group for their expert recommendations. Roles identified were those at time of working group involvement: Conor McCarthy (Irish RFU Medical Director), Deborah Robinson (New Zealand Rugby Union Team Physician), Rob Nichol (CEO International Rugby Players' Association), Vincenzo Ieracitano (Chairman Medical Commission of Italian FIR), Mike England (Director English RFU Injured Players Foundation), Paul Watson (Medical Director Rugby Canada); Eanna Falvey (Team Physician Irish Rugby Union), Mark Harrington (IRB Training and Medical Manager – World Rugby representative).

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