



**WORLD
RUGBY™**

What is concussion?

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WHAT IS RUGBY?



Short video

CONCUSSION – WHY IMPORTANT?

1. Can mimic more serious intra-cranial injury
2. Can lead to persistent symptoms – weeks to months to recover
3. Can impact on learning in young people
4. Can increase risk of a subsequent injury (including non head injury)
5. Reported to be linked to long-term neurocognitive and psychiatric issues.

Remember - Concussive symptoms may not be related to a brain injury but other pathology

WHAT IS CONCUSSION?

Depends who you ask

- Concussion Consensus Groups
- Individual Concussion Expert – discipline → impacts on response
- Team physician
- Chief Medical Officer
- General public
- **Media**

WHAT IS CONCUSSION?



First described in the 10th Century by the Persian physician, Razes, to describe an injury that resulted in a transient neurological disturbance that wasn't a structural brain injury.

WHAT IS A CONCUSSION?



6 Consensus Group - 1964

- Committee from the Congress of Neurological Surgeons (CNS)
- American Academy of Neurology (AAN),
- Concussion in Sports Group (CISG)
- Team Consensus Group – collaborative response from 6 American Academies
- American Medical Society for Sports Medicine (AMSSM)
- National Athletic Trainers' Association (NATA)

Still there is no universal consensus regarding the definition of concussion

WHAT IS A CONCUSSION?



1964 - Committee on Head Injury Nomenclature of the Congress of Neurological Surgeons (CNS)

Definition

“a clinical syndrome characterised by the immediate and transient post-traumatic impairment of neural function such as alteration of consciousness, disturbance of vision or equilibrium due to mechanical forces.”

WHAT IS A CONCUSSION?



1997 - American Academy of Neurology (AAN)

Used a similar definition to the CNS group, but highlighted the key role of alteration of mental status (especially the presence of confusion and amnesia).

In 2013

Concussion is recognized as a clinical syndrome of biomechanically induced alteration of brain function, typically affecting memory and orientation, which may involve loss of consciousness (LOC).

WHAT IS A CONCUSSION?



2001 – Concussion in Sports Group (CISG) defined concussion “as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces”. They went on to list common features:

1. caused by a direct blow or blow elsewhere causing “impulsive” force transmitted to the head.
2. typically results in the rapid onset of short lived impairment of neurological function that resolves spontaneously.
3. may result in neuropathological changes but the acute clinical symptoms largely reflect a functional disturbance rather than structural injury.
4. results in a graded set of clinical syndromes that may or may not involve loss of consciousness. Resolution typically follows a sequential course.
5. typically associated with grossly normal structural neuroimaging studies.

WHAT IS A CONCUSSION?



CISG - 2004, 2008, 2012

2004

Same definition as 2001 however within the consensus document there is reference that post-concussive symptoms may be prolonged or persistent but this was not included in the definition.

2008

Post concussive symptoms added to definition “however it is important to note that in a small percentage of cases, post-concussive symptoms may be prolonged”.

TBI reference – “There was acknowledgement that the terms refer to different injury constructs and should not be used interchangeably”

2012

Definition unchanged from 2008 but reference within consensus paper to TBI “Concussion is a subset of TBI and will be the term used in this document”.

WHAT IS A CONCUSSION?

Consensus
Groups

Experts

Team
Physician

Chief
Medical
Officer

General
Public

Media

2004 – National Athletic Trainers' Association

‘Defined as trauma- induced alteration in mental status that may or may not involve loss of consciousness.’

WHAT IS A CONCUSSION?



2005 – Team Consensus Statement

Definition was based on the CISG 2001 definition however the terms concussion and mTBI were used interchangeably.

WHAT IS A CONCUSSION?



2012 – American Medical Society for Sports Medicine

“A concussion is defined as a traumatically induced transient disturbance of brain function and is caused by a complex patho-physiological process.

Concussions have also been referred to as mild traumatic brain injuries (mTBI). While all concussions are mTBIs, not all mTBIs are concussions. Concussions are a subset of mTBIs, on the less-severe end of the brain injury spectrum and are generally self-limited in duration and resolution.”

WHAT IS A CONCUSSION?



Common elements of Consensus Statements

- Trauma is involved
- Brain injury
- Signs and symptoms are transient but not always
- Injury associated with some alteration in “mental status”, “neural function” or “neurological function”
- It is within the TBI spectrum

WHAT IS A CONCUSSION?



A concussion follows a head impact or whiplash type event and results in a destructive pathophysiological and biochemical response that initiates a chain of neurometabolic and neurochemical reactions that include:

- Activation of Inflammatory Response
- Disturbance of ionic concentrations
- Increase in Excitatory Amino Acids
- Dysregulation of Neurotransmitter Release & Synthesis
- Disturbance of Mitochondrial Functions & Energy Metabolism
- Production of Free Radicals

WHAT IS A CONCUSSION?



Will refer to the tool they most reference, SCAT:

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and / or symptoms (some examples listed below) and most often does not involve loss of consciousness.

Concussion should be suspected in the presence of **any one or more** of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g. confusion) or
- Abnormal behaviour (e.g., change in personality).

The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional.

WHAT IS A CONCUSSION?



- As a CMO of a world sport, concussion requires a clear, concise and practical definition that will be easily understood and consistently implemented across a large number of Team Physicians within 120 countries.
- 2013 - World Rugby developed an operational definition for concussion moving away from theoretical or conceptual definitions but acknowledging the key and consistent features identified in the consensus definitions.

WHY OPERATIONAL DEFINITION?

- Concussion was and is the number one injury risk in Rugby.
- In order to optimise injury management and to undertake accurate injury surveillance studies early and consistent identification of concussive events was critical.
- Current definitions did not support the early and consistent identification of concussive events by team physicians
- Overriding message that “the diagnosis of a concussion is a clinical judgment, ideally made by a medical professional” whilst being correct, provided “an out”, for Team Physicians. It also assumes a level of knowledge that in my experience is not justified.

OPERATIONAL DEFINITION

- **Developed**, during the evolution and implementation of World Rugby's pitch-side assessment process (HIA).
- **Provides** World Rugby medical and healthcare professional staff with clear criteria for diagnosing concussion which assists in both the clinical and research areas.
- **Recognises** that concussion has a variable natural history, with transient, fluctuating, delayed and evolving signs or symptoms and is based on a multimodal and multi-timed approach.
- **Aligns** with the times that the team doctor's normal responsibilities involve team contact.

WHAT IS AN OPERATIONAL DEFINITION?

An Operational Definition should outline:

1. When a concussion assessment(s) should be undertaken
2. What tools (if any) should be used
3. The content of each tool or examination
4. How a diagnosis is confirmed or excluded

WHEN - THREE POINT IN TIME ASSESSMENT

World Rugby's opinion is that an assessment should occur

1. Immediately post injury – HIA 1
2. Within 3 hours of the injury – HIA 2
3. 36-48 hours post injury – HIA 3

HIA = Head Injury Assessment

WHAT - TOOLS TO BE USED

Only those authorised by World Rugby

CONTENT - OF EACH TOOL

All tools are based on the SCAT 3 and are available with procedures on

[http:// playerwelfare.worldrugby.org/concussion](http://playerwelfare.worldrugby.org/concussion)

CONTENT - OF EACH TOOL

HIA 1 – two sections (post injury)

- Section 1 criteria - outlines signs and symptoms indicating an immediate removal from play (Section 2 does not require completion)
- Section 2 is the off-field multimodal assessment closely aligned to SCAT 3. One abnormal response (against baseline) confirms a removal from play but **not** a confirmed concussion.

HIA 2 (≤ 3 hours)

Is the SCAT 3 with additional questions to assist with injury and research data collection

HIA 3 (36-48 hours)

Includes an expanded symptom checklist from SCAT 3 that assesses symptom duration and severity, BESS and tandem gait and preferably computer neuro-cognitive testing and as a minimum SAC

HIA 1 - SECTION 1 CRITERIA

Signs (seen live or via video) and Symptoms (hear on arrival)

1. Confirmed loss of consciousness
2. Suspected loss of consciousness
3. Convulsion
4. Tonic posturing
5. Balance disturbance / ataxia
6. Clearly dazed
7. Player not orientated in time, place and person
8. Definite confusion
9. Definite behavioural changes
10. Oculomotor signs (e.g. spontaneous nystagmus)
11. Other signs or symptoms of concussion

HIA 1 – SECTION 2 CRITERIA

Off-field assessment indications

1. Head impact event where diagnosis is not immediately apparent
2. Possible behaviour change
3. Possible confusion
4. Injury event witnessed with potential to result in a concussive injury
5. Other symptoms or signs suggesting a suspected concussion

WHAT IS A CONCUSSION?

A concussion is deemed to have occurred following a direct or indirect traumatic head impact if

1. Section 1 criteria sign or symptom is present
 2. Any modal result is lower than baseline on HIA 2 assessment
 3. Any modal result is lower than baseline on HIA 3 assessment
 4. Clinical suspicion by the treating doctor
- Any negative modal result on HIA 2 and or 3 confirms a concussion unless the treating doctors provides clinical confirmation that the abnormal findings are not related to a concussion (requirement to justify over-ruling the tool)
 - A concussion can be diagnosed immediately following a head injury but cannot be excluded until re-evaluation of the player at 3 hours and 36–48 hrs after the injury.

OPERATIONAL DEFINITION

Value

- Simplified the education and awareness of medical and healthcare staff across 120 countries
- Standardised the diagnosis of concussion across all countries using the HIA
- Improved recognition and diagnosis of concussion within the sport
- Reduced number of players with a confirmed concussion from returning to play following a head injury
- Has underpinned research through introduction of a standardised operational definition.

IMPORTANT MANAGEMENT MESSAGES

1. Players with any Section 1 criteria sign or symptom must not return to play on the same day
2. Players with a Section 1 criteria sign or symptom do not require completion of a HIA 1 side-line assessment but must have an HIA 2 and HIA 3 completed
3. An abnormal side-line HIA 1 does not diagnose a concussion it confirms a suspected concussion and players must be followed up with HIA 2 and HIA 3 to confirm or exclude the diagnosis.
4. Irrespective of the HIA 1 result all players must have a HIA 2 and HIA 3 completed to identify evolving or delayed concussions

COMPLIANCE

Improved by CSx software

HIA forms within software program that has improved

- functionality – baseline data immediately available
- compliance – all questions must be answered to complete HIA
- follow up – failure to complete HIA 2 and HIA 3 – automated emails
- reporting – allows progressive reporting in real time

COMPLIANCE

World Rugby limits access to temporary substitution to elite adult rugby teams who must sign agreement to abide by Player Welfare Standards:

- a) Complete on-line concussion education modules
- b) Follow operational definition – potential for UIR → disciplinary
- c) Complete baselines on all athletes
- d) Risk stratification of all players - aim individual management
- e) Annual player, coach and administration education
- f) Agree to participate in ongoing research

RWC 2015 - HIA SUMMARY

48 games - 46 player reviews – 21 confirmed concussions

37 pitch-side decisions

- 13 immediate and permanent removal (Criteria 1) – 62% of confirmed concussions
- 24 HIA 1 completed
 - 5 abnormal HIA 1 – 4 confirmed concussion
 - **19 normal HIA 1 – 1 confirmed concussion**

9 post game presentations – post game video identification or post-game symptoms

- 4 confirmed concussions – supports 3 point-in-time diagnostic process
 - 1 confirmed on HIA 2 alone
 - 1 confirmed on both HIA 2 and 3
 - 2 confirmed on HIA 3 alone

PITCH-SIDE ASSESSMENT (PSCA & HIA)



As at 18/11/16

HIA used in 23 Tournaments world-wide

April 2015 – November 2016 → 1406 HIA completed

Year 1 - 2012 / 13 – 165 PSCA completed in 8 Tournaments

Year 2 - 2014 / 15 – 230 PSCA completed

Total pitch-side assessments completed since inception – 1,801

Ask a question about your data

- Criteria 1
- N/a
 - No
 - Yes

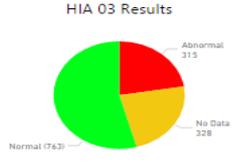
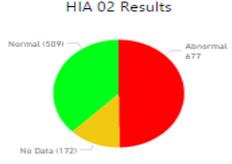
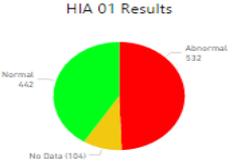
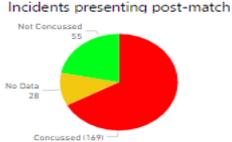
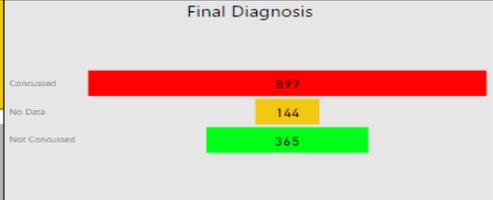
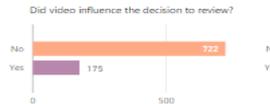
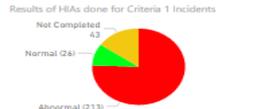
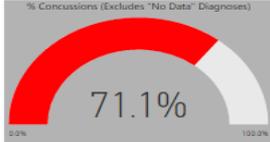
- HIA 01 Result
- Abnormal
 - N/a
 - No Data
 - Normal

- HIA 02 Result
- Abnormal
 - N/a
 - No Data
 - Normal

- HIA 03 Results
- Abnormal
 - No Data
 - Normal

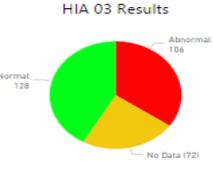
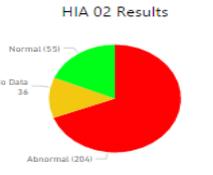
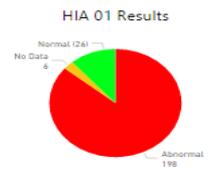
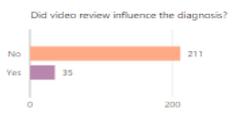
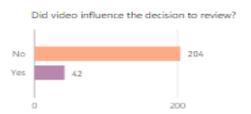
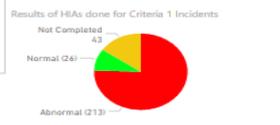
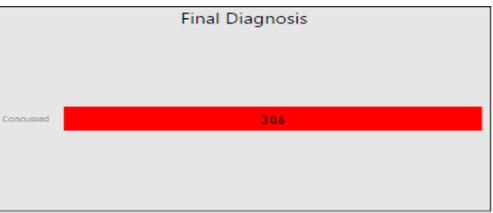
- Year
- (Blank)
 - 1931
 - 2014
 - 2015
 - 2016

- Phase
- Phase 2
 - Phase 3



Ask a question about your data

- Criteria 1
 - N/a
 - No
 - Yes
- HIA 01 Result
 - Abnormal
 - N/a
 - No Data
 - Normal
- HIA 02 Result
 - Abnormal
 - N/a
 - No Data
 - Normal
- HIA 03 Result
 - Abnormal
 - No Data
 - Normal
- Year
 - (Blank)
 - 2014
 - 2015
 - 2016
- Phase
 - Phase 3



Ask a question about your data

HIA Data Analysis
SUMMARY DATA

- Criteria 1
- N/a
 - No
 - Yes

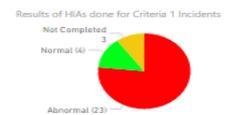
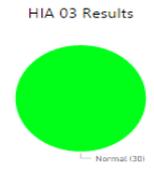
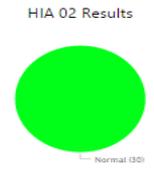
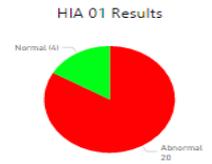
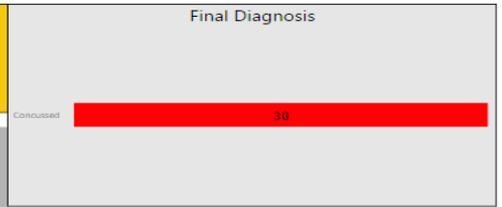
- HIA 01 Result
- Abnormal
 - N/a
 - Normal

- HIA 02 Result
- Abnormal
 - N/a
 - No Data
 - Normal

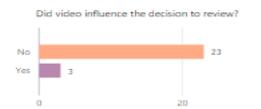
- HIA 03 Results
- Abnormal
 - No Data
 - Normal

- Year
- (Blank)
 - 2015
 - 2016

- Phase
- Phase 3



Incidents presenting post-match



Ask a question about your data

SUMMARY TABLE

- Competition ↕ List
- 6 Nations
 - Aviva Premiership
 - European Cup
 - Guinness Pro 12
 - International Series
 - LV Cup
 - Mitre 10 Cup
 - National Rugby Championship
 - None
 - Olympics
 - Preseason
 - Pro D2
 - RFU Championship
 - Rugby World Cup
 - Sevens World Series
 - Super Rugby
 - The Rugby Championship
 - Top 14
 - Training
 - U20 Championship
 - U20 Trophy
 - Welsh Premiership
-
- Year ↕ List
- (Blank)
 - 1931
 - 2014
 - 2015
 - 2016
-
- Phase
- Phase 2
 - Phase 3

	<u>Total Numbers</u>	<u>Confirmed Concussions</u>	<u>Team Doctor Confirmed Concussions</u>
Total Number of HIA Incidents logged	1406	897	879
HIA 1 Completed (not including Criteria 1)	848	422	428
Normal HIA 1	416	93	89
Abnormal HIA 1	334	271	273
No Data available on result of HIA 1	98	58	66
HIA 1 Criteria 1	306	306	286
HIA 2 First Entry	227	149	145
HIA 1 Should have been completed	49	29	29
Player presented post-game with signs or symptoms	153	101	97
HIA 3 First Entry	25	20	20
HIA 1 should have been completed	2	2	2
Player presented day(s) after game with signs or symptoms	23	18	18

HIA Data Analysis

WHAT IS A CONCUSSION?

Concussion is traumatic head injury caused by a direct or indirect force and is confirmed if a multimodal, multi-timed assessment shows deviation from baseline in any mode unless clinical explanation for this deviation is provided.

A concussion can be diagnosed immediately following a head injury but cannot be excluded until re-evaluation of the player at 3 hours and 36–48 hrs after the injury.

NEXT STEPS

Investigate the sensitivity and specificity of current modal tools
and other potential modal tools within the HIA framework

WHAT IS A CONCUSSION?



Ask the media!!

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