TRAINING GUIDE

CONCUSSION

UPDATING AND RESTRUCTURING OF INTERNATIONAL RECOMMENDATIONS (JUNE 2023)

PUBLISHERS: **DR. FRANCHEK DROBNIC MARTÍNEZ**
DR. LUIS MENDÍA ESPINOSA DE LOS MONTEROS
DR. JOSÉ CARLOS SALÓ CUENCA
DR. CARLES LUACES CUBELLS

MEDICAL COMMISSION OF THE SPANISH RUGBY FEDERATION
SPANISH ASSOCIATION OF SOCCER TEAMS DOCTORS – AEMEF
SPANISH ASSOCIATION OF BASKETBALL MEDICINE – AEMB
HOSPITAL SANT JOAN DE DÉU. BARCELONA. EMERGENCY SERVICE

MEDICAL COMMISSION

With the collaboration of the emergency service of HSDJ

TRAINING GUIDE

CONCUSSION

Dr. FRANCHEK DROBNIC MARTÍNEZ
Medical Services Wolverhampton Wanderers FC (GB)
Medical Services FER

Dr. JOSÉ CARLOS SALÓ CUENCA
Medical Trainer World Rugby
Orthopedic Surgery service. Arnau de Vilanova Hospital (Lleida)
Medical Services FER

Dr. LUIS MENDÍA ESPINOSA DE LOS MONTEROS
Anaesthesist Orthopedic surgery Service, University Hospital Coventry and Warwickshire NHS (GB). Medical consultant Dep. High Performance World Rugby. Medical servies Saracens RFC (GB). Medical Services FER

Dr. CARLES LUACES CUBELLS
Paediatric Emergency Department
Hospital Sant Joan de Deu (Barcelona)

Dr. GERARDO RUIZ ARES
Neurology Service.
Hospital Universitario La Paz (Madrid)
Medical Services FER

Mr. ANGEL DE LANUZA TORRES
Functional Recovery Center Calviá (Palma de Mallorca)
Medical Trainer World Rugby
Medical Services FER

Dr. ALBERTO GÓMEZ DE DIEGO
Emergency Services
Hospital Clínico Universitario (Valladolid)
Medical Services VRAC (Valladolid)
Medical Services FER

Dr. JACOBO SALVAT DÁVILA
Traumatology Institute,
Hospital Recoleta (Burgos)
Medical Services Recoletas Burgos Rugby
Medical Services FER

Mr. ROBERTO MURÍAS LOZANO
Camilo José Cela University
Medical Trainer World Rugby
Medical Services FER (Madrid)

Dra. CARMEN LEÓN PARÍS
Medical Services Real Canoe N.C. (Madrid)
Medical Educator World Rugby
Medical Services

Dr. JAVIER YANGUAS LEYES
FC Barcelona Medical Services (Barcelona)

Dr. ANGEL BERBEL GARCÍA
Ad-Hoc Head Trauma Committee S.E.N.
Neurology Service Hospital de la Cruz Roja (Madrid)

MEDICAL COMMITTEE

With the collaboration of the Emergency Department of HSJD

SUMMARY

Cover photo courtesy of **Walter Degirolmo Bacigalupe.** The medical personnel attending the player of the national team are: **Dr. Alberto Delgado** and physiotherapist **Mr. Ignacio San Andrés.**

ISBN: 978-84-126387-7-6
Legal deposit: B 9710-2024

A PRACTICAL GUIDE TO CONCUSSION IN SPORTS

The purpose of this document is to provide information to the public, players, parents and minors about concussion. This document is not a substitute for the advice of an experienced physician when assessing a concussion. In this spirit, the document is reiterative in several messages and recommendations that, even when reading some of them separately, there is no doubt as to how to act, because:

Concussion **MUST be taken very seriously.**

- Any player suspected of concussion **MUST be removed from training or play immediately** and not return for that session..
- **MUST be evaluated and managed** by a physician or health care provider trained in concussion assessment.
- **MUST NOT be left alone** and must not drive any vehicle.
- **Alcohol intake** in the first **24 h can be harmful.**

WHEN IN DOUBT AS TO WHETHER
A PLAYER HAS A CONCUSSION:

PROTECT HIM/HER

Follow the guide

WHAT IS A CONCUSSION?

Concussion is a traumatic brain dysfunction. It is a complex process in which forces are transmitted to the brain resulting in immediate temporary loss or alteration of certain brain functions.

Concussion can have significant short- and long-term consequences on the player's health if not managed correctly, but most recover without leaving sequelae.

At this moment, a brain lesion cannot be demonstrated by conventional CT or MRI, so the concussion is considered a transient alteration of brain function, which is what is evident.

WHAT CAUSES A CONCUSSION?

Concussion can be caused either by a direct blow to the head or by whiplash-like movements of the head and neck, which occur when the body is the recipient of the impact, For example, when a player is blocked or collides with another player, hits the ground or an element of the environment (post, fences, baskets, goals, an unexpected ball, etc.).

Most concussions occur without loss of consciousness (only occurs in about 10%). Therefore, it is not necessary to lose consciousness to diagnose a concussion. On the other hand, any player who has lost consciousness in a traumatic mechanism has a concussion.

WHY SHOULD CONCUSSION BE TAKEN SERIOUSLY?

Concussion is a disturbance of the central nervous system that causes a temporary loss of brain function. The player who has suffered a concussion processes information more slowly and is not able to do so correctly. This leads the player into situations where wrong decisions are made. He is not able to perform as he would normally do and he becomes a risk to himself and to other players, increasing the risk of other injuries and leaving the team at a "disadvantage".

Ignoring the signs and symptoms of a concussion can lead to a more severe brain injury, a longer recovery period or even to a fatal outcome (Second impact Syndrome)*.

Immediately after a concussion the brain is susceptible to further damage if another impact occurs. Therefore, the player should be immediately withdrawn from the activity and should not return to it until going through a Gradual Return to Sport **(GRS),** which is protocolized.

On the other hand, a poor recovery with an incomplete **GRS** predisposes the athlete to injury to other structures during sport due to a motor control disorder that is more evident during fatigue.

*The **Second impact Syndrome** (SIS), also known as repeated craniocerebral trauma syndrome, describes a condition in which a person suffers a second head trauma before fully recovering from a previous head injury. The patient will quickly develop an altered mental status and loss of consciousness due to a catastrophic neurological injury within seconds or minutes after the second impact.

The clinical manifestations of severe structural brain injuries, due to a traumatic brain lesion (epidural or subdural hematoma, skull fracture) can be the same as those of a concussion in the first place, so we must avoid risks by **NOT** allowing the athlete to play with an injury that can have very serious consequences.

The need for **full medical assessment** and follow-up until the concussion has fully resolved is essential to limit the potential risk of severe and prolonged injury.

Returning to play before the complete resolution of the concussion exposes the player to a greater chance of repetitive concussions that could occur with successive lower energy impacts.

Repeated concussions can, not only shorten a player's career, but have some potential to cause permanent neurological impairment both in the short and long term.

Concussion is not currently categorized by severity levels. It can be very striking and present with very alarming signs and symptoms, but it can

also be present with very inconspicuous ones, even difficult to identify in some athletes by an inexperience person.

Concussion, even with minimal symptomatology, is a concussion. Therefore, the diagnosis of the specialist in the field is important to decide on the continuity of sporting activity, because of the importance in the health of the individual and on the game.

YOU EITHER HAVE A CONCUSSION OR YOU DON'T

When in doubt of a concussion, it should be considered that the athlete **HAS** it**.**

WHAT ARE THE VISIBLE SIGNS OF CONCUSSION FRON THE STANDS?

The athlete:

- Lies motionless on the ground.
- Stands up abnormally slowly.
- Holds head with both hands.
- Show unsteadiness in standing position.
- He/she is dazed, the gaze lost in infinity.
- Does not maintain balance easily or falls involuntarily.
- Has tonic movements or convulsions.

YOU DON'T HAVE TO LOSE CONSCIOUSNESS TO BE SHOCKED

SIGNS AND SYMPTOMS

Signs and symptoms of concussion usually begin at the time of the injury, but may appear 24, 48 or even 72 hours later.

Parents, guardians, sport coaches, referees, family and friends should be aware and knowledgeable of the signs and symptoms of a concussed player.

If a player exhibit any of the signs and symptoms, she/he must be immediately withdrawn from the activity and shall not return to it until the **GRS** has been properly completed.

The four areas in which the player may present symptoms are:

- On a **physical** level: headache, dizziness, changes in vision.
- At the level of **thinking or mental capacity:** reduced mental capacity, wrong decision making.
- At the **emotional** level: mood swings, aggressive, sad or emotional reactions (tendency to cry).
- At sleep level: not being able to sleep, being drowsy or sleeping too much.

WHAT ARE THE SIGNS AND SYMPTOMS OF A CONCUSSION IN THE ACUTE PHASE?

CRITERIA FOR IMMEDIATE REMOVAL FROM THE FIELD[1]	OTHER SIGND AND SYMPTOMS OF CONCUSSION
Tonic posture (body stiffness)	Headache
Loss of consciousness	Nausea, dizziness or vomiting
Convulsive seizure	Amnesia (memory impairment)
Balance problems	Drowsiness
Disorientation in time, place, people	Fatigue or lack of energy
Clearly dazed.	Blurred vision
Clear confusion	Increased sensitivity to light
Behavioural change	Increased emotionality
Oculomotor signs (spontaneous nystagmus*)	Irritability
	Sadness
	Anxiety and distress.

[1]*According to World rugby that confirm concussion and do not require Head Injury Assessment to confirm it.*

**Abnormal eye movements*

WHAT HAPPENS IF A PLAYER HAS A SUSPECTED CONCUSSION IN TRAINING OR COMPETITION?

- He must be immediately withdrawn from the activity and may not return to the field of play.
- She/he should not be allowed to be alone.
- She/he must always be under the supervision of a responsible individual, who is informed that the player is under suspicion of concussion.
- The player should be clinically evaluated as soon as possible.
- Must not drive a vehicle.

A suspected concussion **MUST** be taken very seriously. The Concussion Recognition Pocket-tool (CRT6) can be used to assist in the assessment of a suspected concussion and for follow-up. (Included at the end of this guide).

RESPONSIBILITIES

Responsibilities of colleagues, coaches, parents or guardians:

- Every effort **MUST be** made to ensure that the player is removed from the game in a safe manner if he/she shows any signs or symptoms of concussion or if concussion is suspected.
- **It MUST** be ensured that the player is under the care of a responsible individual, who is informed that there is a suspicion of concussion of the player.
- A player **MUST NOT be** allowed to return to competition until completion of the **GRS** if signs or symptoms of concussion are evident or if there is a suspicion that he/she is not recovered while playing, training or otherwise active.

IT IS THE PLAYER'S RESPONSIBILITY TO BEHAVE APPROPIATELY IN THE EVENT OF SUCH INJURY

Message to sportsmen and women:

- If you have symptoms of concussion or suspect concussion you should stop playing and **INFORM** the doctor and/or coach immediately.
- Be honest with yourself and those who serve you.
- Continuing on the field with the suspicion that you may have a concussion is reckless and puts your health and the health of the rest of the team at risk.
- If you have had symptoms of concussion, a clear suspicion of concussion or have been diagnosed with concussion, you should not return to training and competition until you have completed the **GRS** protocol developed and recommended by your national or international federation (if not available, the one in this Guide can be used as a reference).

THE RETURN TO THE FIELD OF PLAY – GRADUAL RETURN TO SPORT PROCESS – GRS-

Following the suspicion of concussion or actual concussion, the return to training and competition includes certain aspects that need to be considered:

- Initial rest time allows for certain activities as long as it does not cause or aggravate symptoms.
- Therefore, the player should avoid activities that require concentration or attention until symptoms have been absent for a minimum of 24 hours. That is, any of the symptoms associated with concussion, headache, light-headedness, unsteadiness, nausea, etc., are not present within 24 hours.
- **GRS,** or going back to competition, must be carried out individually with the full cooperation of the player, each stage is delimited by the lack of symptoms after the exercise period. The protocol for gradual return to sports is proposed on page 9.
- The minimum GRS period is 12 days for adults and 24 for children under 19.

- Symptoms can be masked by medications such as aspirin or paracetamol, antidepressants, sleeping medications or caffeine. For this reason, their intake should be monitored.

What to do when there's a second concussion in the same season

Players with a second concussion in less than 12 months, or repeated concussions or unusual or prolonged symptoms following a concussion should not return to play until evaluated by a multidisciplinary medical team specializing in concussion.

Players are not allowed to play until:

1. All symptoms disappear.
2. Have followed and completed the **GRS** protocol.
3. Have been medically and sportingly discharge.

PROTOCOL FOR GRADUAL RETURN TO SPORT AFTER CONCUSSION

Players, family members, coaches and managers must insist that these proposed guidelines are always followed. They should be alert to the recurrence of symptoms, even if the protocol has been successfully completed. Each stage of the protocol may take longer than the minimum time set out below. Player with concussions cannot proceed to the next stage if any symptoms appear or persist.

Players can only move from one stage to the next once they are symptom-free for the full period of each stage. If they are not fully symptom-free, they should remain in that stage until the symptoms disappear for 24 hours. We can consider going back to the previous stage when a new symptom starts or if is triggered or if an existing symptom is intensified.

REHABILITATION STAGE	WORKING MODEL IN EACH PHASE	OBJECTIVE	AGE CRITERIA	
			8 TO 19 YEARS	≥19 YEARS
ATHLETE ON MEDICAL LEAVE				
1. No activity	Complete physical and mental rest	Rest	24 h or until player is asymptomatic	
	Daily activities if symptoms don't increase	Gradual introduction to work/school	14 days **	7 days *
The rest day is included in the period of 14 and 7 days				
MEDICAL DISCHARGE- NON-SPORTS DISCHARGE				
2. Lights aerobic exercise (non-sport specific)	Walking, swimming or stationary bike (>70%HR max.) No power training	Increase in metabolic rate. Implementation of adaptation mechanisms	2 days At least	1 day At least
3.Individualised sport-specific exercise	Running techniques. No impact activity	Add movement	2 days At least	1 day At least
Steps 4-6 should begin after the resolution of any symptoms. Abnormalities in cognitive function and any other clinical findings related to the current concussion, including with and after physical exertion.				
4. Training exercises specific to the sport but without contact	Progression in more complex training exercises. Power training in progressive way	The exercise model, coordination and mental stimulation	2 days At least	1 day At least
The player can only move to a higher level if the absence of symptoms persist				
SPORT DISCHARGE- NOT COMPETITIONAL (not yet)				
5. After medical discharge, full-contact sporting practice	Participation in normal training activities, if there is no risk of new concussion (assessed according to sport)	Restoring confidence and assessing functional skills by coach and technical team.	2 days At least	1 day At least
HIGH COMPETITION				
6. Return to competition	Rehabilitated player	Retrieved	2 days At least	1 day At least
Days spent from concussion to competitive sports discharge after symptoms have disappeared			**≥24 days**	**≥12 days**

**An adult with a concussion or suspected concussion should be given a week's rest, as indicated in the table, and then begin the proposed recovery period of at least 5 days. Player with a second concussion within 12 months, repeated concussions or unusual or prolonged symptoms following a concussion should not return to play until assessed by a multidisciplinary team specializing in concussion.*

***In children and in adolescents, it is advisable that the initial period should always be within two weeks. There is no sporting reason to put the player's health to test and even less so in the developmental stage.*

In the concussed patient, early introduction of aerobic physical activity is beneficial. Therefore, after the first day(s) of rest, stage 1 of the **GRS,** it is good to start the introduction of light, controlled aerobic activity (stage 2 of the **GRS).**
Cervical-vestibular rehabilitation is indicated for those with neck pain, headache, dizziness and/or balance problems as part of the 1st and 2nd stages of **GRS.**

FOLLOW-UP FORM ON
GRADUAL RETURN TO DAILY LIFE AND SPORT

Name:

Age:

Day of concussion: . . . . . / . . . . ./. . . . . .

RECOVERY PERIOD	ACTIVITY	DATE OF COMPLETION
No activity (48 or 24 hours, depending on whether <19 years or >19 years)	Stage 1. Complete mental an physical rest	. . / . . . / . . .
Return to normal life (12 or 6 days, depending on whether <19 years or >19 years)	Stage1. Daily activities at home as long as the symptoms don't increase	. . / . . . / . . .
	Stage1. Limited and controlled study work from home	. . / . . . / . . .
	Stage1. Return tp school/part-time work	. . / . . . / . . .
	Stage1. Back to school/work complete	. . / . . . / . . .
Return to sport (4 or 8 days depending on whether <19 years or >19 years)	Stage 2. Light aerobic exercise (24-48h)*	. . / . . . / . . .
	Stage 3. Sport-specific exercise (24-48h)*	. . / . . . / . . .
	Stage 4. Non-contact training (24-48h)*	. . / . . . / . . .
	Stage 5. Full contact training (24-48h)*	. . / . . . / . . .
Date of the medical checkup in order to receive the sports discharge to be able to compete		. . / . . . / . . .
Return to competition (at least 2 or 1 day symptom-free depending on whether <19 years or >19 years)	Stage 6. Full contact training at competition level	. . / . . . / . . .
	TOTAL DAYS SINCE CONCUSSION	

THE ATHLETE <19 YEARS OLD ARE RECOMEMNDED A MINIMUM GRS OF 24 DAYS IN CHILDREN AND 12 DAYS IN ADULTS

Adopted from "IF IN DOUBT, SIT THEM OUT. Scottish Sports Concussion Guidance: grassroots sport and general public". 2018 version © sportscotland 2018 Published by sportscoland.

THE CHILD ATHLETE

Any child suspected of having a concussion should be removed from the playing field and evaluated by a physician. The child should **NEVER** return to play on the same day of the **suspected** concussion.

As ii happens in adults, problems can arise during the first 24-48 hours. The child should not be left alone and should go to the hospital immediately if any of the following signs or symptoms occur:

WARNING SIGNS

- Has a new onset headache or existing headache is getting worse.
- Has persistent or increasing neck pain
- If the child is drowsy or cannot be awakened.
- Does not recognized habitual places or people
- Nausea or vomiting
- Behaves unusually, seems confused or is irritable
- Seizures (arms and/or legs move uncontrollably)
- If the child is weak, numb or feels tingling (in arm, legs or face)
- Has instability when walking or standing upright
- Has difficulty speaking
- Has difficulties speaking
- Has difficulties understanding what is being said

BACK TO SCHOOL

The child should NOT return to sport until he/she has returned to school without any problems

Concussion can have an impact on the child's cognitive ability to be attentive and learn in school. Medical clearance is desirable before a child can return to school and it is reasonable to miss a day or two of school after a concussion to recover. Fortunately, prolonged absence from school is rare. For some children, a gradual return to school program is advisable. If a particular activity worsens the symptoms, the child should refrain from that activity until it no longer causes the worsening of those or other symptoms. The use of computers and screen-based IT systems, which are common in current educational programs, should also follow a graduated and observed introduction to the extent that it does not worsen the symptoms. This gradual introduction should include communication between parents, teachers and healthcare professionals, and may vary from child to child.

The return to school program should consider:

- Extra time to complete homework/exams.
- Quiet room to complete homework or take exams.
- Avoid noisy areas such as cafeterias, auditoriums, sporting events, use of headphones, etc.
- Encourage frequent breaks during class, homework, exams.
- Do not subject the child to more than one examination per day.
- Shorter than usual and time-limited assignments and tasks.
- Insist in the process of attention and memory (repeating messages, working on immediate recall, etc.).
- Support from a classmate, guide or guardian until the child is permanently discharged.

Ultimately, to ensure the support of the teachers while the child recovers, through the adaptation of learning tasks, reduction of the workload and alternative forms of examinations.

Other measures recommended for the child/adolescent who has suffered a concussion are:

- It is important to **hydrate** well throughout the day and eat properly and in orderly fashion.

- It is important to ensure that the child **gets**, at least, **8 hours** of sleep at night and that they get a peaceful night's sleep. Mobile phone screens, tablet, etc., intense music or headphone should be avoided in the period before going to sleep, also noise or excessive light in the room should be avoided (warm, non-white light is recommended).

RETURN TO SPORT FOR CHILDREN AFTER CONCUSSION

The Child is **NOT** ready to return to sport or to the playing field until it has been successfully integrated into school.

In case of doubt, the child should be referred to a qualified health professional with expertise in the management of concussion in children.

Recommendations to be considered

- **On signs and symptoms:**
  "If you notice any change in behaviour, worsening headache, vomiting, dizziness, double vision or excessive drowsiness, please go to the hospital immediately".
  After the concussion, the child should rest for at least 24 hours.
- **On caring for the recovery environment:**
  "The child should avoid using any type of computer, phones, tablets or electronic games, especially if these activities make the symptoms worse".
  "Excessive noise and isolation from the environment (headphones) should be avoided".
  "These activities can be reintroduced when the school activity is similar to what it was before the accident".
- **On medicines::**
  "The child should not take medication, including painkillers, unless prescribed by a doctor".

PHYSICAL AND COGNITIVE REST
NO TABLETS, NO MOBILES, NO NOISE
STAR **GRADUAL RETURN TO SPORT**
FROM 14 DAYS AFTER ASYMPTOMATIC ONWARDS

POST-CONCUSSION SYNDROME

Non-recurrent concussions and mild brain injuries due to head trauma do not usually have chronic effects on the brain tissues of the sufferers. The effects of these injuries are usually short-lived, and the symptoms are relieved over a period of weeks or months.

In some subjects who have suffered a concussion or a mild traumatic brain injury, or in those who have suffered repeated concussions, symptoms may persist for more than four weeks. This process is known as **post-concussion syndrome (PCS)** and is usually characterized by at least three of the normal concussion symptoms, headache, fatigue, irritability, dizziness, balance problems, sleep disorders, poor memory and concentration, or increased sensitivity to light and noise. When symptoms persist for more than six months, it is referred to as **Prolonged PCS (PPCS).** There are numerous studies to identify imaging and fluid biomarkers that could aid in the diagnosis and are likely to lead to early intervention. However, the results of most of these studies are still very heterogeneous and inconsistent.

PCS must be evaluated and treated by experts in concussion and neurological disorders, and it must be assessed with the appropriate means as the presence of persistent symptoms could be indicative of further brain damage or of the risk of other secondary conditions not taken into account.

POST CONCUSSION SYNDROME (PCS)

Headache	Fatigue
Irritability	Dizziness
Balance problems, instability	Sleep disorders
Memory lapses	Difficulty concentrating
Increased sensitivity to light and noise	

At least three of the usual symptoms of concussion must be present for more than 4 weeks after the initial event.

PATIENTS WITH PERSISTENT SYMPTOMS, LONGER THAN 4 WEEKS, MUST BE ASSESSED BY PROFESSIONAL CONCUSSION EXPERTS

IMPORTANCE OF DIET IN CONCUSSION

Good nutrition helps the brain to recover well.

Throughout the process, until full recovery, excessive stimulant drinks such as coffee, tea, coke or so-called “energy” drinks with high doses of caffeine or other supposed activators should be avoided, especially in individuals who are sensitive to them.

The period of recovery from concussion is a time to restore nutritional aspects of the athlete, to provide fruits for those who did not take it, fish, vegetables and greens that offer essential nutrients for all tissues and help in the recovery of inflammatory processes and tissue restoration. The patient should have a good breakfast, a mid-morning snack, a proper two-course meal with dessert, an afternoon snack (specially from the moment he/she goes back to training) and end the day with a light dinner.

It is worth mentioning that the indication of supplementation with nutritional products, studied in processes related to aging and memory impairment, which have been experimentally studied in the field of concussion, is not unusual in the scientific and para-scientific media. Certain molecules and compounds, such as **Omega-3 oils** (DHA and EPA), **resolvins** (derivatives of the above), **creatinine, glutamine** and branched-chain amino acids, **vitamins B** and **D,** natural antioxidants such as **coenzyme Q10, Glutathione, Lutein, Zeaxanthin** or minerals such as **zinc** or **Selenium** and certain molecules with a certain anti-inflammatory and also anti-oxidative effect such as **curcumin** or **resveratrol,** are likely to be of value in the prevention and recovery from concussion in the near future. Although there still no scientific evidence to fully justify them, their contribution is part of a trend that is supported by ongoing research studies. For this reason, their orientation and recommendation at the present time should be managed by a specialist in the process, who will be the one who, if considered necessary, will indicate the most appropriate substance and guideline for each subject, as most of the substances mentioned are found naturally and habitually in a correct diet when it is carried out in an orderly manner.

NUTRITIONAL SUPPLEMENTATIONSHOULD ALWAYS BE ADVISED BY A SPECIALIST, PARTICULARLY WHEN THE COMPOSITION OF THE DIET OR THE NUTRITIONAL STATUS OF THE PATIENT IS NOT ADEQUATE.

REFERENCES

1. Patricios JS, Schneider KJ, Dvorak J, Ahmed OH, Blauwet C, Cantu RC, Davis GA, Echemendia RJ, Makdissi M, McNamee M, Broglio S, Emery CA, Feddermann-Demont N, Fuller GW, Giza CC, Guskiewicz KM, Hainline B, Iverson GL, Kutcher JS, Leddy JJ, Maddocks D, Manley G, McCrea M, Purcell LK, Putukian M, Sato H, Tuominen MP, Turner M, Yeates KO, Herring SA, Meeuwisse W. Consensus statement on concussion in sport: the 6th International Conference on Concussion in Sport-Amsterdam, October 2022. Br J Sports Med. 2023;57(11):695-711. doi: 10.1136/bjsports-2023-106898.
2. Echemendia RJ, Burma JS, Bruce JM, Davis GA, Giza CC, Guskiewicz KM, Naidu D, Black AM, Broglio S, Kemp S, Patricios JS, Putukian M, Zemek R, Arango-Lasprilla JC, Bailey CM, Brett BL, Didehbani N, Gioia G, Herring SA, Howell D, Master CL, Valovich McLeod TC, Meehan WP 3rd, Premji Z, Salmon D, van Ierssel J, Bhathela N, Makdissi M, Walton SR, Kissick J, Pardini J, Schneider KJ. Acute evaluation of sport-related concussion and implications for the Sport Concussion Assessment Tool (SCAT6) for adults, adolescents and children: a systematic review. Br J Sports Med. 2023;57(11):722-735. doi: 10.1136/bjsports-2022-106661.
3. Schneider KJ, Patricios JS, Meeuwisse W, Schneider GM, Hayden KA, Premji Z, Ahmed OH, Blauwet C, Broglio S, Cantu RC, Davis GA, Dvorak J, Echemendia RJ, Emery CA, Iverson GL, Leddy JJ, Makdissi M, McCrea M, McNamee M, Putukian M, Yeates KO, Black AM, Burma JS, Critchley M, Eliason PH, Räisänen AM, Tabor JB, Toomey C, Ronksley PE, Cassidy JD. Amsterdam 2022 process: A summary of the methodology for the Amsterdam International Consensus on Concussion in Sport. Br J Sports Med. 2023;57(11):712-721. doi: 10.1136/bjsports-2022-106663.
4. Echemendia RJ, Brett BL, Broglio S, Davis GA, Giza CC, Guskiewicz KM, Harmon KG, Herring S, Howell DR, Master C, McCrea M, Naidu D, Patricios JS, Putukian M, Walton SR, Schneider KJ, Burma JS, Bruce JM. Sport concussion assessment tool™ - 6 (SCAT6). Br J Sports Med. 2023;57(11):622-631. doi: 10.1136/bjsports-2023-107036.
5. Davis GA, Echemendia RJ, Ahmed OH, Anderson V, Blauwet C, Brett BL, Broglio S, Bruce JM, Burma JS, Gioia G, Giza CC, Guskiewicz KM, Harmon KG, Herring SA, Makdissi M, Master CL, McCrea M, Meehan WP 3rd, Naidu D, Patricios JS, Purcell LK, Putukian M, Schneider KJ, Valovich McLeod TC, Walton SR, Yeates KO, Zemek R. Child SCAT6. Br J Sports Med. 2023;57(11):636-647. doi: 10.1136/bjsports-2023-106982
6. McLendon LA, Kralik SF, Grayson PA, Golomb MR. The Controversial Second Impact Syndrome: A Review of the Literature. Pediatr Neurol. 2016 ;62:9-17. doi: 10.1016/j.pediatrneurol.2016.03.009
7. May T, Foris LA, Donnally III CJ. Second Impact Syndrome. 2022 Jul 4. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023
8. Yeates KO, Räisänen AM, Premji Z, Debert CT, Frémont P, Hinds S, Smirl JD, Barlow K, Davis GA, Echemendia RJ, Feddermann-Demont N, Fuller C, Gagnon I, Giza CC, Iverson GL, Makdissi M, Schneider KJ. What tests and measures accurately diagnose persisting post-concussive symptoms in children, adolescents and adults following sport-related concussion? A systematic review. Br J Sports Med. 2023 ;57(12):780-788. doi: 10.1136/bjsports-2022-106657.
9. Maddocks DL, Dicker GD, Saling MM. The assessment of orientation following concussion in athletes. Clin J Sport Medicine. 1995;5:32-33.
10. Kerrigan J, Giza C. When in doubt, sit it out! Pediatric concussion -an update. Childs Nerv Syst. 2017;33:1669-1675.
11. Mavroudis I, Kazis D, Chowdhury R, Petridis F, Costa V, Balmus IM, Ciobica A, Luca AC, Radu I, Dobrin RP, Baloyannis S. Post-Concussion Syndrome and Chronic Traumatic Encephalopathy: Narrative Review on the Neuropathology, Neuroimaging and Fluid Biomarkers. Diagnostics (Basel). 2022;12(3):740. doi: 10.3390/diagnostics12030740.
12. http://playerwelfare.worldrugby.org/?p=654&language=es
13. Feinberg C, Mayes KD, Jarvis RC 3rd, Carr C, Mannix R. Nutritional Supplement and Dietary Interventions as a Prophylaxis or Treatment of Sub-Concussive Repetitive Head Impact and Mild Traumatic Brain Injury: A Systematic Review. J Neurotrauma. 2023. doi: 10.1089/neu.2022.0498.
14. Oliver JM, Anzalone AJ, Turner SM. Protection Before Impact: the Potential Neuroprotective Role of Nutritional Supplementation in Sports-Related Head Trauma. Sports Med. 2018 ;48(Suppl 1):39-52.
15. Petraglia AL, Winkler EA, Bailes JE. Stuck at the bench: Potential natural neuroprotective compounds for concussion. Surg Neurol Int. 2011;2:146.

CRT6™

Concussion Recognition Tool

To Help Identify Concussion in Children, Adolescents and Adults

What is the Concussion Recognition Tool?

A consussion is a brain injury. The Concussion Recognition Tool 6 (CRT6) is to be used by non-medically trained individuals for the identification and immediate management of suspected concussion. It is not designed to diagnose concussion.

Recognise and Remove

Red Flags: CALL AN AMBULANCE

If **ANY** of the following signs are observed or complaints are reported after an impact to the head or body the athlete should be immediately removed from play/game/activity and transported for urgent medical care by a healthcare professional (HCP):

- Neck pain or tenderness
- Seizure, "fits", or convulsion
- Loss of vision or double vision
- Loss of consciousness
- Increased confusion or deteriorating conscious state (becoming less responsive, drowsy)
- Weakness of numbness/tingling in more than one arm or leg
- Repeated Vomiting
- Severe of increasing headache
- Increasingly restless, agitated or combative
- Visible deformity of the skull

Remember

- In all cases, the basif principles of first aid should be followed: assess danger at the scene, chech airway, breathing, circulation; look for reduced awareness of surroundings of slowness of difficulty answering questions.
- Do not attempt to move the athlete (other than required for airway support) unless trained to do so.
- Do not remove helmet (if present) or other equipment.
- Assume a possible spinal cord injury in all cases of head injury.
- Athletes with known physical or developmental disabilities should have a lower threshold for removal from play.

If there are no Red Flags, identification of possible concussion should proceed as follows:

Concussion should be suspected after an impact to the head or body when the athlete seems different than usual. Such changes include the presence of **any one or more** of the following: visible clues of concussion, signs and symptoms (such as headache or unsteadiness), impaired brain function (e.g. conclusion), or unusual behaviour.

Developed by: The Concussion in Sport Group (CISG)

Supported by:

International Olympic Committee · FEI · FIA · FIFA · IIHF · World Rugby

CRT6 Concussion Recognition Tool

To Help Identify Concussion in Children, Adolescents and Adults

1. Visible Clues of Suspected Concussion

Visible clues that suggest concussion include:

- Loss of consciousness or responsiveness
- Lying motionless on the playing surface
- Falling unprotected to the playing surface
- Disorientatioon or confusion staring or limited responsiveness, or an inability to respond appropriately to questions
- Dazed, blank, or vacant look
- Seizure, fits, or convulsion
- Slow to get up after a direct on indirect hit to the head
- Unsteady on feet / balance problmes or failling over / poor coordination / wobbly
- Facial injury

2. Symptoms of Suspected Concussion

Physical Symptoms
Headache
"Pressure in head"
Balance problems
Nausea or vomiting
Drowsiness
Dizziness
Blurred vision
More sensitive to light
More sensitive to noise
Fatigue or low energy
"Don't feel right"
Neck pain

Changes in Emotions
More emotional
More irritable
Sadness
Nervous or anxious

Changes in Thinking
Difficulty concentrating
Difficulty remembering
Feeling slowed down
Feeling like "in a fog"

Remember, symptoms may develop over minutes of hours following a head injury.

3. Awareness

(Modify each question appropriately for each sport and age of athlete)

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

"Where are we today?"
"What event were you doing?"
"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 PRACTICE OR PLAY and should NOT RETURN TO ANY ACTIVITY WITH RISK OF HEAD CONTACT, FALL OR COLLISION, including SPORT ACTIVITY until ASSESSED MEDICALLY, even if the symptoms resolve.

Athletes with suspected concussion should **NOT**:

- Be left alone initially (at least for the first 3 hours). Worsening of symptoms should lead to immediate medical attention.
- Be sent home by themselves. They need to be with a responsible adult.
- Drink alcohol, use recreational drug or drugs not prescribed by their HCP.
- Drive a motor vehicle until cleared to do so by a healthcare professional.

In collaboration with:

AS&NL
ADVANCED SPORT & NUTRITIONS LAB
LEAD THE WAY
www.asnl.es

BRAICONGUIDE2023