



GUIDELINES FOR THE MANAGEMENT OF SPORT-RELATED CONCUSSION - AFL & AFLW

Developed by the AFL in collaboration with the AFL Doctors Association (AFLDA)

Issued by the AFL as a guideline under AFL Regulation 35 ('Medically Unfit Players')

March update for the 2023 Premiership Seasons

PURPOSE

To provide best practice guidelines for the diagnosis and management of concussion in the AFL, to protect the short- and long-term welfare of all AFL/AFLW players.

BACKGROUND

- The AFL Guidelines for the management of sport-related concussion (SRC) adhere to the principles outlined in the most recent International Consensus Statement (5th International Conference on Concussion in Sport, Berlin 2016, <https://bjsm.bmj.com/content/51/11/838>). The Guidelines however are continually modified and enhanced in line with evolving scientific evidence.
- The 6th International Conference on Concussion in Sport was held in Amsterdam in October 2022. The AFL was well represented at the meeting and the current update incorporates some of the key concepts presented at the meeting. Further modifications to the Guidelines may be made when the outcome of the meeting, including the Consensus Statement, updated assessment tools and systematic reviews, are published later in 2023.
- The diagnosis of SRC and subsequent return to play remains an individual decision by the club doctor following the protocols and principles set forth in this document, by utilizing good clinical judgment, reviewing video replays of the incident and evaluating all the information available at the time of the player's assessment (subject to compliance with the specific requirements stated in these Guidelines).

DEFINITION OF CONCUSSION

From the Consensus Statement of the 5th International Conference on Concussion in Sport:

"SRC is a traumatic brain injury induced by biomechanical forces. Several common features that may be utilized in clinically defining the nature of a concussive head injury

include:

- *SRC may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head.*
 - *SRC typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, signs and symptoms evolve over a number of minutes to hours.*
 - *SRC may result in neuropathological changes, but the acute clinical signs and symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.*
 - *SRC results in a range of clinical signs and symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive features typically follows a sequential course. However, in some cases, symptoms may be prolonged.*
- The clinical signs and symptoms cannot be explained by drug, alcohol, medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction, etc.), or other comorbidities (e.g., psychological factors or coexisting medical conditions, etc.).”*

DIAGNOSIS

- The diagnosis of SRC can be difficult because:
 - a. Symptoms and signs can change rapidly and may emerge and evolve over time;
 - b. Many of the clinical features are not specific to concussion;
 - c. There is no test or biomarker that can be relied on for an immediate diagnosis, particularly on the sidelines; and
 - d. Structural brain injury (e.g., contusion) can present with identical symptoms and clinical features and usually cannot be ruled out with the initial assessment.
- Consequently, the diagnosis of SRC remains a clinical decision based on the serial assessment of a range of domains commonly affected by head trauma including symptoms (e.g., headache, difficulty concentrating, feeling like in a fog, emotional lability, etc); signs (e.g., loss of consciousness (LOC), motor incoordination); cognitive impairment (e.g., confusion, slowed reaction times); and neurobehavioural changes (e.g., irritability, not feeling quite right).
- For practical purposes, a player with any neurological symptoms or signs, video features of SRC and/or any evidence of a disturbance of mental status or cognitive function following trauma, is considered to have a concussion requiring further medical assessment.

SCREENING

- All new players must undergo screening to determine the number of previous concussions sustained, history of prolonged recovery from concussion(s), and the player's previous management of concussion(s).
- All players should have annual preseason baseline testing that may include neurological assessment, SCAT5 and a computerized screening cognitive test e.g., Cognigram.
- A more extensive baseline assessment, including tests of domains commonly affected by concussion e.g., cervical spine, vestibular, oculomotor, etc, formal neuropsychological testing and/or structural MRI may also be considered.
- Annual baseline testing promotes ongoing education of players and facilitates interpretation of post-injury test scores, which may improve decisions regarding diagnosis and assessment of recovery. If baseline data are not available, the player's post-injury results may be compared to normative data. In any player where there is uncertainty regarding the diagnosis and/or clinical recovery, a conservative approach should be used.
- In the instance that a player has a significant history of SRC (either the number of concussions or a history of prolonged recovery) more detailed baseline testing - including formal neuropsychological testing, is strongly recommended.

EDUCATION

- The AFL provides an annual awareness and education program regarding SRC for all AFL and AFLW players.
- Important components of the education program for players include:
 - a) Common presentations of SRC;
 - b) The importance of accurate and complete reporting by players both at the time of injury and in the recovery phase, to facilitate diagnosis and monitoring of recovery;
 - c) Understanding of the AFL protocols, including the requirement for immediate removal for assessment if there is any suspicion of concussion (observed directly, observed on video or reported by other players/staff);
 - d) Understanding of the short-term effects of SRC and potential long-term outcomes that may result from SRC and/or from repeated head impacts.
- Regular education should also be provided to coaches, high-performance staff, and other medical staff e.g., trainers.

- Coaches and club officials need to understand match-day assessment protocols as well as graded return-to-play protocols, with an emphasis on a conservative approach. Return to play following a concussion is a medical decision.
- Other medical and healthcare staff need to know how to recognise signs of a possible concussion and to report them to the club doctor.

MANAGEMENT – DAY OF INJURY

Any player diagnosed with a concussion is NOT permitted to return to play or train on the day of injury.

Head Injury Assessment

- The AFL Head Injury Assessment (HIA) form assists in the identification of concussion and facilitates a standardized process of assessment and management of players following head trauma on match day. The HIA is a rapid sideline screening tool for a suspected concussion. As such, it should be used in conjunction with the Sport Concussion Assessment tool 5th edition (SCAT5) and clinical judgement.
- Both the HIA and SCAT5 have been incorporated into the CSX App.
- **Use of the CSX App is mandatory for all assessments of concussion/suspected concussion, whether they occur at training or during matches.**
- **A HIA form must be completed for any case of suspected concussion on match-day, including incidents notified by the concussion spotter in the AFL Review Centre (ARC) to the club bench.**

Use of video

- The AFL provides all available broadcast video feeds via the HawkEye system to the club bench at match venues. This link enables the club to utilize real-time video feeds, with variable playback speeds, and multiple camera views.
- Video review allows direct observation of the mechanism of injury, identification of early/immediate signs (e.g., no protective action, impact seizure or tonic posturing) as well as signs that may occur in the time period after the injury (e.g. lying motionless, motor incoordination, dazed or blank and vacant look). Consequently, it is important to review all available video footage focusing on the player in the immediate period following the injury.
- Video signs of concussion have been validated in the AFL. Through collaborations with other national and international sporting organizations, the definitions of these have been revised (Appendix 1).
- **Sideline video review is mandatory in the assessment of a suspected concussion.**

Match-day concussion spotters

- External independent reviewers, including medically trained spotters in the ARC during AFL and AFLW games, will monitor the game for suspected head injury events. The external reviewers will flag incidents that may have been missed, to the game-day doctors either via direct contact (AFLW) or a message on Hawkeye or direct phone communication (AFL).
- When a match-day incident has been flagged by the concussion spotter, the club doctor/s must carefully review the video footage and, at a minimum, complete a HIA form for the player.

Removal from play

An injured player **must** be removed from play or training if **any** of the following clinical features are present (identified by direct observation, review of the video feed and/or initial assessment of the player. Observations reported by players or other club support staff should also be taken into consideration):

a. Clear diagnosis of concussion requiring immediate removal and no return to play or training

1. Loss of consciousness
2. No protective action in fall to ground
3. Impact seizure or tonic posturing
4. Motor incoordination
5. Dazed, blank/vacant stare or player not his/her normal self
6. Behaviour change atypical of the player
7. Confusion or disorientation (e.g. fails Maddocks questions)
8. Memory impairment
9. Player reports significant, new or progressive concussion symptoms*

b. Requires immediate removal from play or training for further assessment (including SCAT5)

10. Lying motionless (for > 2 seconds)
11. Possible no protective action in fall to ground
12. Possible impact seizure or tonic posturing
13. Possible motor incoordination
14. Possible dazed, blank/vacant stare

15. Possible behaviour changes atypical of the player
16. Any clinical impression or uncertainty from the club doctor that the player is not quite right following trauma

* Symptoms should be interpreted according to the clinical presentation of the player. It is important to note that symptoms can be due to other diagnoses e.g. post-traumatic migraine, neck injury, eye injury, etc. Moreover, the clinical signs can also be caused by other injuries (such as cervical injuries, peripheral vestibular dysfunction etc), or other comorbidities (e.g. psychological factors or coexisting medical conditions etc). Care should be taken however when ascribing post-traumatic symptoms and signs to other diagnoses without objective evidence of injury to those systems, and a conservative approach should be followed.

AFL Regulations

- When a player is removed from the field of play for concussion assessment, the AFL Interchange Official must be notified. The player cannot return to the playing surface for at least 15 minutes (including quarter breaks) after this notification. The 15-minute time-period facilitates medical assessment as it allows the SCAT5 to be completed in a quiet, distraction free environment, with the player in a resting state.

Where there is a clear diagnosis of concussion

- The player should be medically evaluated using standard emergency management principles and particular attention should be given to excluding a cervical spine injury.
- The player must not be returned to play (or training) on the day of injury.
- The player must be monitored regularly for possible signs of deterioration or other warning signs of a potential underlying structural brain injury. The SCAT5 provides a useful assessment and monitoring tool and should be used at a convenient time following the injury (e.g. major break or after the match).
- **Any player with clinical features including abnormal neurological signs or a serious or structural head and/or neck injury requires emergency management and ambulance transport to a hospital with a neurosurgical unit.**

Where there is a clinical suspicion of concussion but no clear on-field diagnosis

- The player should be removed from the field and must be assessed in a quiet distraction-free environment with the player in a resting state.
- The player should be allowed to rest while the club doctor reviews the video footage of the injury where available (paying particular attention to signs of concussion such as tonic posturing or motor incoordination).
- The player should then be fully assessed, including use of the SCAT5.
- The time taken to complete the SCAT5 is at least 10 minutes.
- If the diagnosis of concussion is confirmed following assessment, then the player must not be returned to play or training on the day.
- In cases where the club doctor may have been concerned about a possible concussion; but after the sideline assessment (including additional information from the player, the assessment itself and inspection of available video of the incident) the player has been cleared, then the club doctor can determine the disposition and timing of return to play for that player.
- The clinical features of SRC may be delayed or evolve over several hours. Consequently, in any cases where there is uncertainty about the diagnosis after an initial assessment, the player must be managed conservatively on the day of injury (i.e. not returned to play). Furthermore, **all players who have had a concussion assessment during the match and are returned to play, including those who have had an incident flagged by the concussion spotter, must be regularly medically assessed during the match and undergo repeat SCAT5 assessment at the completion of the match (or following day).**
- In cases that are withheld from play on the day of injury with a presumptive diagnosis of concussion, but on subsequent assessment over the next 24-48 hours the diagnosis is changed, the case details must be submitted to and discussed with the AFL Chief Medical Officer. This is only relevant for cases with isolated symptoms (e.g., headache) or signs (e.g., brief balance disturbance) with a clear alternate diagnosis.
- Although trainers and other staff may assist in the reporting of concussion symptoms and signs and the monitoring of a player on the field, it ultimately remains the club doctor's responsibility to oversee this process and determine the player's fitness to play.
- **The club doctor is required to provide timely and full documentation (completed HIA and SCAT5 forms) of head injury assessments to the AFL Chief Medical Officer via the CSX App. Information collected will be utilized as a part of ongoing audit/compliance, education and research activities.**

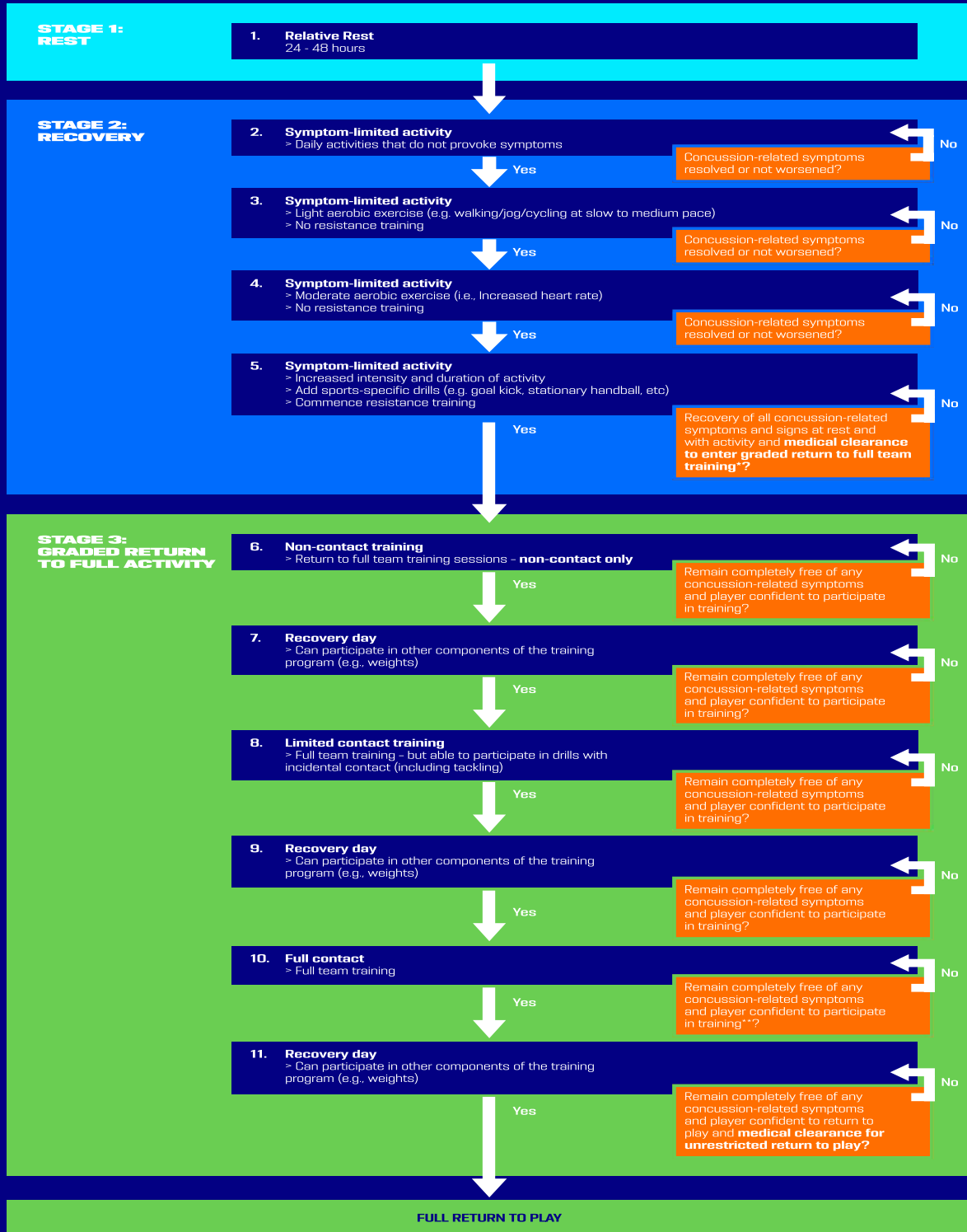
MANAGEMENT – RETURN TO PLAY

- Decisions regarding return to play following SRC rely on a multifaceted individualized clinical approach, managed by the club doctor.
- The objective is to allow the brain to recover before a graded return to play. Measurement of recovery however has significant challenges, as domains typically recover independently, many tools used to measure clinical recovery lack sensitivity, and advanced measures of physiological recovery show changes that persist beyond clinical recovery (although the clinical relevance of these changes remains unclear)
- Consequently, a **conservative approach to return to play is recommended** with incremental increases in physical +/- cognitive load and avoidance of activities with a risk of repeated head trauma until late in the return to play process.
- **The minimum requirement for return to play is that a player must have returned to baseline level of symptoms and cognitive performance (if available), had resolution of all concussion-related neurological signs, and has completed a graded loading program without recurrence of symptoms or signs of SRC.**
- The return to play program consists of three stages (outlined in figure 1):
 1. **Stage 1: REST** - A **brief period of relative rest.**
 2. **Stage 2: RECOVERY** – A **recovery period** where a symptom-limited progressive increase in physical and cognitive activity is encouraged. The recovery stage consists of four steps. In addition, the player requires **medical clearance** to enter Stage 3 of the return to play program.
 3. **Stage 3: GRADED RETURN TO TRAINING AND PLAY** - A **graded return to full activity** with monitoring. This stage consists of six steps prior to a medical clearance for unrestricted return to play. Players can only enter Stage 3 **once they have clinically recovered, including the completion of a SCAT5 demonstrating return to baseline (or within normative range) in CSX.**



CONCUSSION MANAGEMENT RETURN-TO-PLAY FLOW CHART

Figure 1. Protocol for 3-stage / 11-step return-to-play program following concussion in AFL/AFLW



* A SCAT5 demonstrating return to baseline (or within normative range) must be completed in CSX before the player is allowed to enter to the graded return to play phase

** The player must have completed a Cognigram test (or equivalent) demonstrating return to baseline (or within normative range) before they are allowed to return to full contact training.

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- Players must be monitored medically as they progress through the return to play program. There should be 24 hours (or longer) for each Step of the progression. If any symptoms recur, the player athlete should go back to the previous symptom-free Step.
- Attention should be given to the early identification and treatment of confounding and coexisting pathologies e.g., cervical spine injury, vestibular deficits, and psychological factors, which may contribute to ongoing symptoms.
- **The player must have a medical assessment and clearance prior to**
 - a) **Entering Stage 3 – graded return to training and play; and**
 - b) **Being cleared for unrestricted return to play** (this includes an assessment of the player’s level of confidence and subjective level of performance with full training).
- In following these guidelines, the **earliest** that a player can return to play after a concussion is on the 12th day from which the concussion was sustained. The ultimate timing of return to play however will be dictated by the **duration of the recovery Stage**, which is variable from injury to injury.
- **A more conservative approach is important in cases with “modifying” factors, including:**
 - a) **young players,**
 - b) **history of learning disorders or mood disturbance,**
 - c) **history multiple concussions, particularly those with prolonged recovery, and previous concussion/s in the same season,**
 - d) **High symptom burden in the first few days after injury.**

In these cases, the graduated loading program should be conducted over a longer period of time (e.g. by extending the number days between progressions, or increasing the number of days held at each Stage/Step of the graded return to play).
- The final determination regarding concussion diagnosis and/or fitness to play is a medical decision based on clinical judgment. The club doctor is in best position to make this clinical decision as they have training and experience in the assessment and management of SRC and have a detailed knowledge of the player (including typical presentation and affect), which can assist in identifying subtle behavioural changes that may accompany SRC.

Role of neuropsychological testing and other investigations

- Computerized screening cognitive tests provide a practical method to assist with the assessment of cognitive recovery. A number of computerized test platforms have been validated for use following SRC and are readily available (e.g., Cognigram, ImPACT).
- It is important to remember that neuropsychological testing is only one component of assessment, and therefore should not be the sole basis of management decisions. Neuropsychological testing does not replace the need for a full history and clinical/neurological examination.
- Given that concussion affects multiple domains, and there are currently no single objective tests of recovery, consideration should also be given to assessment using psychological screening tools, advanced imaging, formal neuropsychological assessment, and other biomarkers such as VOMs testing. Ideally, novel biomarkers for the diagnosis and assessment of recovery following SRC should be conducted within an overarching research program to help advance the knowledge base and improve the management of SRC.
- There are currently many different tools and technologies (e.g. App based platforms, oculo-motor assessment tools, blood and saliva biomarker assays) claiming to assist with diagnosis of concussion and/or track player recovery available on the market, and whilst the AFL are committed to advancing the science and trialing select devices in a research context, evidence-based application of such proposed solutions in clinical practice is recommended to be undertaken in collaboration with the AFL Concussion team.

Role of imaging

- Conventional imaging (e.g. CT or MRI) should be considered in cases where there is concern regarding an underlying structural head/brain injury.
- If structural MRI is requested to assess for concussive injuries, such as microhaemorrhages, it is necessary that, at a minimum, the following sequences are obtained (and that the MRI facility, and reporting radiologists, are sufficiently experienced in neuroimaging): Sagittal T1, Axial T2, Axial DWI, Axial FLAIR, Axial SWI (or similar sequence), and Axial dual echo T2.
- Advanced imaging and investigation techniques (such as Diffusion Tensor Imaging, functional MRI, Magnetic Resonance Spectroscopy, quantitative EEG, etc.) have demonstrated changes in brain function, activation patterns and white matter fibre tracts in some studies of SRC. The clinical significance of these changes remains unclear.

MANAGEMENT OF DIFFICULT OR COMPLICATED CASES

- Difficult or complicated cases or decisions regarding retirement due to concussion should be managed in a multi-disciplinary manner.
- The AFL has established a network of clinicians with experience and expertise in the management of SRC (for details please contact the AFL Chief Medical officer).
- It is strongly recommended that the club doctor involve an independent clinician with expertise in concussion management, to assist in management decisions, including the return to play decision, in any case:
 - a) where symptoms or clinical signs persist beyond 10-14 days
 - b) With multiple concussions, especially if they occur in a single season, or if there is a concern about a lowered threshold to repeat injury.
- Formal neuropsychological testing is strongly recommended for players with recurrent concussions and in cases where there may be uncertainty about a player's clinical or cognitive recovery.
- MRI is also strongly recommended as part of the assessment in difficult or complicated cases. See above for sequence recommendations for structural imaging.
- Advanced imaging and investigation techniques in approved research projects should be considered in difficult or complicated cases.
- The AFL has also established Concussion Panels to provide a mechanism for a timely and efficient expert multidisciplinary assessment of complex cases of concussion.
- Indications for an independent assessment (including Concussion Panels) include:
 - Decisions regarding retirement;
 - More than 2 concussions in any one season (including pre-season training),
 - Any case where symptoms persist beyond 4 weeks;
 - Any case where there is concern regarding increasing or recurrent symptoms with less trauma.
- Referral to the Concussion Panels can be made by contacting the AFL Chief Medical Officer.

STRATEGIC APPROACH TO CONCUSSION AND HEAD TRAUMA

- The AFL has formulated a five-year Strategic Plan (2022-2026) for research and management of SRC and repeated head impacts in Australian Football. The plan sets out the strategic pillars including Education, Prevention, Detection, Recovery, Support

and Innovation and identifies key priorities, objectives and actions for each of these pillars. The plan covers all levels of the game.

- Important components of the action plan to highlight for AFL and AFLW include:

- a) Prevention of concussion and repetitive head impacts.

A comprehensive prevention strategy will involve incorporating an evidence-based approach with broad industry consultation, to consider the prevention of head trauma through education programs, protective equipment, training practices, policy, and rules and/or rule enforcement.

This program will be underpinned by important research on the measurement of head trauma, which currently includes a collaborative study between HITiQ, Monash University and the AFL on mouthguard impact sensors in AFL and AFLW.

- b) The AFL Brain Health Initiative

A longitudinal program is being developed to monitor the brain health of AFL and AFLW players across their career in football (from recruitment to retirement) and into later life. It will examine factors associated with recovery from sport-related concussion (SRC) and return to play, and long-term brain health and player wellbeing.

Appendix 1. Definitions of video signs to identify a possible concussion

	Yes	No
Lying motionless	Lying without purposeful movement on the playing surface, for >2 seconds*. Does not appear to move or react purposefully, respond or reply appropriately to the game situation (including teammates, opponents, umpires or medical staff). Concern may be shown by other players or match officials.	Reacts, responds or replies appropriately. Video shows no clear view of player on ground.
Tonic posturing	Involuntary sustained contraction of one or more limbs (typically upper limbs), so that the limb is held stiff despite the influence of gravity or the position of the player. The tonic posturing could involve other muscles such as the cervical, axial, and lower limb muscles. Tonic posturing may be observed while the athlete is on the playing surface, or in the motion of falling, where the player may also demonstrate no protective action	No clear evidence of tonic movements. Video shows no clear view of player on ground
No protective action - floppy	Falls to the playing surface in an unprotected manner (i.e., without stretching out hands or arms to lessen or minimise the fall) after direct or	Any motor response from player in process of falling. The player's arms are being held, so that they are unable to move to protect themselves.

	indirect contact to the head. The player demonstrates loss of motor tone (which may be observed in the limbs and/or neck*) before landing on the playing surface.	Insufficient time to react – rapid momentum carries the player to ground. Video shows no clear view of player falling.
Impact seizure	Involuntary clonic movements that comprise periods of asymmetric and irregular rhythmic jerking of axial or limb muscles	No clear evidence of clonic movements. Video shows no clear view of player on ground.
Slow to get up	Remains (sitting or lying) on the ground (without being held down by an opponent) despite play continuing (i.e. not upright on feet).	Return to feet (within an appropriate period of time) and continued to participate in the match (and/or the ball is not in play). Video shows no clear view of player on ground.
Motor incoordination	Appears unsteady on feet (including losing balance, staggering/stumbling, struggling to get up, falling), or in the upper limbs (including fumbling). May occur in rising from the playing surface, or in the motion of walking/running/skating.	Able to stand/walk/run in usual fashion. If assisted off the ground – does not have any signs of motor incoordination No attempts to move (e.g. stretchered off). Video shows no clear view of player.
Blank / Vacant Look	Player exhibits no facial expression or apparent emotion in response to the environment. <i>(*May include a lack of focus/attention of vision.</i>	Any facial expressions. Video does not show clear view of face.

Blank/vacant look is best appreciated in reference to the athlete's normal or expected facial expression)

Clutching at head/face	Reaches for head/face with one or both hands, and maintains hand(s) on head for more than 1 sec (not a simple wiping motion).	Does not reach for head. Wipes head/face with hand(s). Video shows no clear view of player. Holding cloth/dressing on head or face to manage bleeding
Facial Injury	Any facial laceration, facial bleeding, blood coming from mouth, epistaxis/nose bleed or apparent eye injury.	No visual signs of facial injury. Video shows no clear view of player's face.

adapted from

1. International Consensus Definitions of Video Signs of Concussion in Professional Sports. Gavin Davis et al. British J Sports Medicine. doi.org/ 10.1136/bjsports-2019-100628
2. The reliability and validity of video analysis for the assessment of clinical signs of concussion in Australian football. Makkissi and Davis. Journal of Science and Medicine in Sport. DOI 10.1016/j.jsams.2016.02.015.