

NFL Head, Neck and Spine Committee's Protocols Regarding Diagnosis and Management of Concussion

Introduction

Concussion is an important injury for the professional football player, and the diagnosis, prevention, and management of concussion is important to the National Football League, its players and member Clubs, and the National Football League Players Association. The NFL's Head, Neck and Spine Committee has developed a comprehensive set of protocols with regard to the diagnosis and management of concussions in NFL players.

The diagnosis and management of concussion is complicated by the difficulty in identifying the injury as well as the complex and individual nature of managing this injury. Ongoing education of players, NFL team physicians and athletic trainers regarding concussion is important, recognizing the evolving advances in concussion assessment and management. The objective of these protocols is to provide medical staffs responsible for the health care of NFL players with a process for diagnosing and managing concussion.

Concussion Defined: For purposes of these protocols, the term *concussion* is defined as (reference McCrory et al BJSM '13): A complex pathophysiological process affecting the brain induced by biomechanical forces. Several common features that incorporate clinical, pathologic and biomechanical injury constructs that may be utilized in defining the nature of a concussive head injury include:

1. Concussion 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.
2. Concussion typically results in the rapid onset of transient impairment of neurologic function that resolves spontaneously. However, in some cases, symptoms and signs may evolve over a number of minutes to hours.
3. Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.
4. Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course; however, it is important to note that, in some percentage of cases, post-concussive symptoms may be prolonged.

Potential Concussion Signs (Observable)

- Any loss of consciousness;
- Slow to get up following a hit to the head ("hit to the head" may include secondary contact with the playing surface);
- Motor coordination/balance problems (stumbles, trips/falls, slow/labored movement);
- Blank or vacant look;

- Disorientation (e.g., unsure of where he is on the field or location of bench);
- Clutching of head after contact;
- Visible facial injury in combination with any of the above.

Potential Concussion Symptoms (Player reported, following direct or indirect contact)

- Headache;
- Dizziness;
- Balance or coordination difficulties;
- Nausea;
- Amnesia for the circumstances surrounding the injury (i.e., retrograde/anterograde amnesia);
- Cognitive slowness;
- Light/sound sensitivity;
- Disorientation;
- Visual disturbance;
- Tinnitus.

NFL Sideline Concussion Assessment:

The NFL Sideline Concussion Assessment is the standardized acute evaluation that has been developed by the NFL's Head Neck and Spine Committee to be used by team's medical staffs to evaluate potential concussions during practices and on game day. This evaluation is based on the Standardized Concussion Assessment Tool (SCAT2) published by the Concussion in Sport Group (McCrory '09), modified for use in the NFL in 2011, and consistent with the SCAT3 published in 2013 by the same international Concussion in Sport Group (McCrory '13) (Attachment A). The NFL Sideline Concussion Assessment can be used to aide in the diagnosis of concussion even if there is a delayed onset of symptoms. The NFL Sideline Concussion Assessment is also designed for serial testing, which allows it to be used across multiple occasions to track player recovery. Clubs shall maintain all NFL Sideline Concussion Assessment exams and a copy of the same shall be given to both the player and the team medical staff.

Being able to compare the results from the Sideline Concussion Assessment to the baseline information obtained in the preseason improves the value of this instrument. In all circumstances, the Team Physician or other physician designated by the Team Physician (e.g. neurosurgeon or Neurotrauma Consultant) shall assess the player in person. The Team Physician shall be responsible for determining whether the player is diagnosed as having a concussion

The athlete may have a concussion despite being able to complete the NFL Sideline Concussion Assessment "within normal limits" compared to their baseline, due to the limitations of a brief sideline assessment. Such limitations underscore the importance of knowing the athlete and the subtle deficits in their personality and behaviors that can occur with concussive injury.

The signs and symptoms of concussion listed above, although frequently observed or reported, are not an exhaustive list. The NFL Sideline Concussion Assessment is intended to capture these elements in a standardized format. The neurocognitive assessment in the NFL Sideline Concussion Assessment is brief and does not replace more formal neuropsychological test data. A balance assessment is an important component of the NFL Sideline Concussion Assessment, and has been validated as a useful adjunct in assessing concussive injury.

In the pre-season and post-injury, more formal neuropsychological test data may be very useful in assessing the neurocognitive sequel of concussion. However, it should be noted that there are limitations to neuropsychological testing, and neuropsychological testing should not be used in isolation to make the diagnosis of concussion or as the sole determinant for return to play. Instead, neuropsychological testing should be considered as one component of the assessment.

Emergency Medical Action Planning

An Emergency Medical Action Plan (EAP) must be developed, written, discussed, practiced and reviewed by the medical staff for all practice and game venues, as well as conditioning and training sites. The EAP is available to the visiting team.

Preseason

1. Education: Players and Club personnel must be provided with, and must review, educational materials regarding concussion, including the importance of identifying and reporting signs and symptoms to the medical staff. These educational materials provide basic facts about concussion, including signs and symptoms, as well as why it is important to report symptoms promptly. Additionally, players must be educated and encouraged to report to the medical staffs concussion signs and symptoms that their teammates may experience.

2. Pre-Season Assessment:

A. Physical Examination. The preseason physical examination allows the team physician and athletic trainer the opportunity to review and answer questions about a player's previous concussions, discuss the importance of reporting any concussive signs or symptoms, and explain the specifics regarding the concussion diagnosis and management protocol. The baseline physical examination to be conducted as part of the preseason physical examination shall include a traditional neurological examination and Baseline NFL Sideline Assessment (Attachment B). This information is helpful if a player subsequently sustains a concussion during the season.

B. Neuropsychological testing. Each player is required to have a baseline neuropsychological test. Computerized forms of neuropsychological testing are used, but it is also acceptable to perform standard paper and pencil testing or to utilize a combination of the two.

Practice and Game Day Concussion Management

1. Emergency Medical Action Plan. As referenced above, the EAP is available at, and specific to, each venue (practice, conditioning, training and/or game venue). The EAP is to be reviewed with the visiting team prior to each game.

2. **The Player Presenting Signs/Symptoms of Concussion.** If a player exhibits or reports signs or symptoms of concussion on the field and does not require emergent transport for more serious brain injury and/or cervical spine injury, he must be removed and evaluated by the Club medical team. This evaluation shall include a sideline and/or locker room examination utilizing the NFL Sideline Concussion Assessment Tool. The entire assessment is to be completed, compared to the baseline assessment and subsequently entered into the player's medical record. Same-day return to practice or play in a case of a diagnosed concussion is strictly prohibited.
3. **Unaffiliated Neurotrauma Consultant.** During games, each team will be assigned an Unaffiliated Neurotrauma Consultant. Each Unaffiliated Neurotrauma Consultant shall be a physician who is impartial and independent from any Club, is board certified or board eligible in neurology, neurological surgery, emergency medicine, physical medicine and rehabilitation physician, or any primary care CAQ sports medicine certified physician and has documented competence and experience in the treatment of acute head injuries. An Unaffiliated Neurotrauma Consultant shall be present on each sideline during every game and shall be (i) focused on identifying symptoms of concussion and mechanisms of injury that warrant concussion evaluation, (ii) working in consultation with the Head Team Physician or designated TBI team physicians to implement the Club's concussion evaluation and management protocol (including the Sideline Concussion Assessment Exam) during the games, and (iii) present to observe (and collaborate when appropriate with the Team Physician) the Sideline Concussion Assessment Exams performed by Club medical staff. These unaffiliated consultants also will be available to assist in transportation to an appropriate facility for more advanced evaluation and/or treatment as needed based on the EAP. These consulting physicians will work with the team's medical staff and will assist in the diagnosis and care of the concussed player. The responsibility for the diagnosis of concussion and the decision to return a player to a game remains exclusively within the professional judgment of the Head Team Physician or the Team physician assigned to managing TBI.
4. **Booth ATC.** An athletic trainer serving as a "spotter" for both teams will be present in the stadium booth with access to multiple views of video and replay in order to aid in the recognition of injury. The ATC "spotter" will introduce him/herself to the medical staff for both teams prior to the game to discuss protocol. Communication between the athletic trainer and the medical personnel on the sideline is available so that the athletic trainer in the booth can report any plays that appear to involve possible injury. The teams' medical personnel may also initiate communication with the spotter to clarify the manner of injury. The sideline medical staff will be able to review the instant replay on the sidelines so that particular plays involving injury can be reviewed.
5. **Madden Rule.** On game day, per the Madden Rule, a player diagnosed with a concussion must be removed from the field of play and observed in the locker room by qualified medical personnel. The Madden Rule is intended to protect the players by providing a quiet environment, with appropriate medical supervision, to permit the player time to recover without distraction. Once a player is diagnosed with a suspected concussion, he is not permitted to meet or talk to the press until his is medically cleared.

6. Performing the NFL Sideline Concussion Assessment. A player diagnosed with concussion should have the entire sideline exam performed on the day of injury. The components of the NFL Sideline Concussion Assessment may be performed at different times on the day of the injury depending on the individual situation (e.g., exceptions for a player who is transported to the ER), and an assessment should be repeated prior to discharge home or prior to transportation home following an away game.
7. Additional Triggers for Medical Evaluation. As set forth above, in situations in which the player exhibits or reports signs/symptoms of concussion, the full NFL Sideline Concussion Assessment examination is mandatory. In the event the occurrence of a concussion is unclear, or a player sustains a mechanism of injury (“big hit”) that is reasonably expected to give rise to a concussion, and/or a concern is raised by another player, coach, game official, ATC spotter, or Unaffiliated Neurotrauma Consultant, the player shall be removed immediately from the field by Club medical personal. The Team Physician best qualified to evaluate concussion shall assess the player by, at a minimum, performing a focused neurological examination that includes, asking what happened, reviewing the “Go-No-Go” signs and symptoms and asking the Maddock’s questions to discern the status of the player and whether a more thorough evaluation is required. If the medical staff concludes that the player *did not* sustain a concussion, then the video replay *must* be reviewed prior to the player returning to play. If after performing the above evaluations and reviewing the video there remains any doubt as to whether a concussion has occurred, then the full NFL Sideline Concussion Assessment *must* be performed.
8. Additional Best Practices
 - a. Performing serial concussion evaluations (e.g., every 20 minutes for 60 minutes; every hour for 3 hours) is useful because concussive injury can evolve and may not be apparent for several minutes or hours. Even if a player passes an initial concussion assessment and is returned to practice or play, he must be checked periodically during practice or play and again before leaving the venue. Components of the NFL Sideline Concussion Assessment may be utilized in the performance of such evaluations.
 - b. It is important to recognize that players may be able to equal or exceed their performance under the Sideline Concussion Assessment compared to their baseline level yet still have a concussion; underscoring the importance of the physicians’ knowledge of the player. If there is any doubt about the presence of a concussion, regardless of the Sideline Concussion Assessment results, the player is to be removed from practice or play.
 - c. A player diagnosed with concussion will be given “take home” information (e.g. signs and symptoms to watch for, emergency phone numbers) as well as follow up instructions.

Return-to-Participation Process

After a concussion has occurred in practice or play, the concussed player must be examined and monitored in the training room on a daily basis or as decided by the medical staff. Components of the NFL Sideline Concussion Assessment can be utilized to check for symptoms as well as continue to monitor the other aspects of the examination. The following measures must occur in order for a player to return to play:

- a. A player returns to baseline status of symptoms and neurologic exam, including cognitive and balance functions.
 - i. Repeat neuropsychological evaluation is performed before return to practice or play with interpretation of the data by the team neuropsychology consultant. The team neuropsychology consultant reports the findings back to the team physician.
- b. A graduated exercise challenge, followed by a gradual return to practice and play, is initiated when the player returns to baseline status. The RTP protocol following a concussion follows a stepwise process to be outlined in the NFL Head, Neck and Spine Committee's Return to Participation Protocol.
- c. Prior to return to practice or play, not only must the team physician clear the player, but the Independent Neurological Consultant with expertise in concussion must also evaluate and clear the player for return to practice and play.
- d. A player may be considered for return to practice and play only after the player has returned to baseline status with rest and exertion, has repeat neuropsychological testing which is interpreted by the team neuropsychology consultant as back to baseline levels of functioning, and has completed the Return to Participation Protocol referenced above and is cleared by the Team Physician and the Independent Neurological Consultant.

Summary

In summary, these protocols for the diagnosis and management of concussion including pre-season education and assessment, practice and game management protocols, and return to play requirements, provide a comprehensive approach to concussion diagnosis and management for the NFL player.