Amended July 7, 2020

NFL Head, Neck and Spine Committee's Concussion Diagnosis and Management Protocol

I. Overview of Injury

A. Introduction

Concussion is an important injury for the professional football player. The diagnosis, prevention, and management of concussion is important to the National Football League (NFL), its players and member Clubs, and the National Football League Players Association (NFLPA). The NFL's Head, Neck and Spine Committee, in conjunction with the NFLPA Mackey-White Committee, has developed a comprehensive set of protocols regarding 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 its management. Ongoing education of players, NFL Club physicians, certified athletic trainers (ATCs), Unaffiliated Neurotrauma Consultants (UNCs), and Neuropsychology Consultants and other Club medical personnel regarding concussion is important, recognizing continued advances in concussion assessment and management. The objective of these protocols is to provide Club medical staffs responsible for the health care of NFL players with a guide for diagnosing and managing concussion.

This document updates and supersedes the initial "NFL Head, Neck and Spine Committee's Protocols Regarding Diagnosis and Management of Concussion," issued in July, 2013, and all subsequent amendments thereto.

B. Concussion Defined

For purposes of these protocols, the term *concussion* is defined as (adapted from McCrory et al., 2017):

Sport-related concussion (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 the following:

1. 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.
2. 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.
3. 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.

4. 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.

5. The clinical signs and symptoms cannot be explained by drug, alcohol, or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction, etc.) or other comorbidities (e.g., psychological factors or coexisting medical conditions).

C. Potential Concussion Signs (Observable) May Include (adapted from Davis, et al. 2019):

- Any loss of consciousness;
- Impact seizure or "fencing" posture
- Slow to get up from the ground or return to play following a hit to the head ("hit to the head" may include secondary contact with the playing surface)
- Motor coordination/balance problems of neurologic etiology (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);
- Behavior change (aggressive, agitated, atypically subdued, unusually emotional or frightened, etc.)
- Amnesia, either anterograde or retrograde;
- Clutching of the head after contact; or
- Visible facial injury in combination with any of the above.

D. Potential Concussion Symptoms Include:

- Headache;
- Dizziness or Light headedness;
- Balance or coordination difficulties;
- Nausea;
- Amnesia, either anterograde or retrograde;
- Cognitive slowness;
- Light/sound sensitivity;

- Disorientation;
- Visual disturbance; or
- Tinnitus;
- Vertigo

II. NFL Head, Neck and Spine Committee's Concussion Protocol

A. Emergency Action Plan

Pursuant to Article 39 of the CBA, every Club must have an Emergency Medical Action Plan (EAP), approved by the procedures set forth in that Article. Those procedures require Clubs to have certain medical professionals and to follow certain minimum procedures, including but not limited to transport to a suitable Level I or Level II Trauma Center. Every Club medical service provider and unaffiliated medical service provider must be familiar with the EAP applicable to the site in which they are performing services.

B. 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 shall provide basic facts about concussion, including signs and symptoms, as well as why it is important to report symptoms promptly when they occur. Additionally, players must be educated and encouraged to report to the medical staff concussion signs and symptoms that their teammates may experience.

2. Pre-Season Assessment
   a. Physical Examination: The Club physician should use the preseason physical examination to review and answer questions about a player's previous concussions and relevant neurological comorbidities, discuss the importance of reporting any concussive signs or symptoms, and explain the specifics regarding the concussion diagnosis and management protocol. Club doctors should also explain the various roles of the participants in the concussion protocol [e.g., UNCs, Club Neuropsychology Consultant (NPCs), and Independent Neurological Consultants (INCs)].
   b. Baseline Neurological Evaluations: Every player must be given a baseline neurological evaluation as part of his preseason physical examination which shall include a comprehensive neurological examination and, at least every other season, Baseline NFL Locker Room Comprehensive Concussion Assessment (Attachment A). Each player is also required to have baseline neurocognitive testing. Together, this information shall be used in evaluating the player if he is suspected to have sustained a concussion during the season. Neurocognitive tests have been designated for use by the NFL's Club Neuropsychology Consultants (NPCs) (see Attachment B, "NFL Neuropsychology Consultant Model and Neurocognitive Testing Program") and may include: 1) computerized

neurocognitive tests, 2) traditional paper and pencil tests, and 3) a combination of the two (i.e., hybrid testing). The Baseline NFL Locker Room Comprehensive Concussion Assessment should be administered at least every two years, while Neurocognitive testing should be administered every three (3) years unless a player sustains a concussion in which case new baseline examinations should be administered prior to the start of the season following the season in which he sustained a concussion. A structured summary of the results of any paper and pencil testing performed by the Club NPC (Attachment C, "NFL Neurocognitive Testing Program Data Record Form") should be provided to the Head Club ATC. The paper and pencil test results Data Record Form should be sent by the Club NPC to the Head Club ATC for uploading into the designated electronic medical record (EMR) system. The Club ATC must upload the results of the computerized neurocognitive testing into the EMR.

C. Game Day Concussion Diagnosis and Management

1. Definitions/Responsible Parties

a. **Unaffiliated Neurotrauma Consultant (UNC)**

A UNC shall be a physician who is impartial and independent from any Club, is board certified in neurology, emergency medicine, physical medicine and rehabilitation, or any primary care CAQ sports medicine certified physician or board eligible or board certified in neurological surgery, and has documented competence and experience in the treatment of acute head injuries. UNCs are appointed by the NFL Head, Neck and Spine Committee in consultation with the NFLPA Mackey-White Committee and approved by the NFL Chief Medical Officer and the NFLPA Medical Director, and have undergone formal UNC training provided by the NFL and NFLPA. At each game, each Club will be assigned a UNC to be present on its sideline who shall be: (i) focused on identifying signs or symptoms of concussion and mechanisms of injury that warrant concussion evaluation, (ii) working in consultation with the Head Team Physician or his/her designee to implement the concussion evaluation and management protocol (including the Locker Room Comprehensive 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. The UNCs also will be available to assist in coordinating which physician will accompany a player who is transported to the EAP-designated trauma center for more advanced evaluation and treatment. The UNCs will work with the Club's medical staff and will assist in the diagnosis and care of the concussed player. The Club physician/UNC unit will be co-located for all concussion evaluations and management both on and off the field. The UNC may present his/her own questions or conduct additional testing and shall assist in the diagnosis and treatment of concussions. Regardless, 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 his/her physician designee responsible for the diagnosis and treatment of concussion. A UNC will also be present for sideline evaluations for neuropraxia ("stingers" or "burners") and other potential spinal and peripheral nerve injuries.

Should the sideline UNC be unavailable to participate in the sideline evaluation (i.e., the sideline UNC is treating another player in the locker room or accompanying an injured player to the hospital in accordance with the EAP), the Club physician may request to conduct the assessment with the second sideline UNC who is present on the opposing team's sideline. In the event that the opposing team's sideline UNC is unavailable, the Visiting Team Medical Liaison (VTML; see section 1.d below) who has completed the formal NFL-NFLPA UNC training) may serve as a back-up.

A third UNC will be assigned to a stadium booth with access to multiple views of video (including the live broadcast feed and audio) and replay to aid in the recognition of injury (Booth UNC). This UNC will be co-located with the Booth ATC Spotter (see below). UNCs assigned to the booth are charged with monitoring all available video feeds and the network audio to identify players who may require additional medical evaluation. Prior to the start of the game, all UNCs will introduce themselves to the medical staffs for both teams during the Pregame Medical Team Meeting (see section 2.a below) to discuss protocol and confirm that all communication devices are operational.

When the Booth UNC observes a player who is clearly unstable or displays any other Potential Concussion Signs (defined in Section I.C. above) following a mechanism of injury (e.g., a hit to the head or neck), he/she and/or the Booth ATC Spotter will contact the Club physician and sideline UNC by radio to ensure that a concussion evaluation is undertaken on the sideline. The Club medical staff will then verify to the booth medical staff that the evaluation has been performed. The Booth UNC shall note the time of his initial contact with the Club medical staff and sideline UNC alerting them of the need for further evaluation and also the time of the communication from the Club medical staff and sideline UNC confirming that an evaluation has been performed. This information is to be conveyed in the Booth UNC report following the game. If the Booth UNC observes a player who he/she has flagged for medical evaluation return to the game prior to receiving the confirmation from the Club's medical staff that an evaluation was conducted, he/she shall notify the Booth ATC Spotter who shall call a Medical Time-Out (see below). For purposes of clarity, this is intended to serve as a redundant communication from the Booth ATC Spotter with the Club physician or sideline UNC to confirm that a concussion evaluation has been

performed. If no such confirmation is provided, the Booth ATC Spotter is required to call a Medical Time-Out to assure the concussion evaluation occurs.

Booth UNCs shall file a report of their activities following each game for review by the Chairperson of the NFL Head, Neck and Spine Committee, NFL Chief Medical Officer and NFLPA Medical Director.

For the avoidance of doubt, the responsibility for the diagnosis of concussion and the decision to return a player to a game remain exclusively within the professional judgment of the Head Team Physician or the Club physician designated as responsible for the diagnosis and management of concussion.

b. **Booth Certified Athletic Trainer Spotter ("Booth ATC Spotter")**

A certified athletic trainer will be assigned to each Club and positioned in the stadium booth with access to multiple views of video and replay to aid in the recognition of injury ("Booth ATC Spotter"). Booth ATC Spotters are charged with monitoring the game, both live and via video feed, to identify players that may require additional medical evaluation. Prior to the start of the game, Booth ATC Spotters will introduce themselves to the medical staff for both Clubs and officials to discuss protocol and confirm that all communication devices are operational. The Booth ATC Spotters, UNCs, and the Club physician responsible for concussion diagnosis and management shall be connected by radio communication. The Booth ATC Spotters shall also be connected to the on-field game officials by radio communication. The Clubs' medical personnel may initiate communication with the spotter to clarify the manner of injury. The sideline medical staff will be able to review the game film on the sidelines to obtain information on particular plays involving possible injury.

When the Booth ATC Spotter observes a player who is clearly unstable, or displays any other Potential Concussion Signs (defined in Section I.C. above) following a mechanism of injury (e.g., a hit to the head or neck), he/she will contact the Club physician and sideline UNC by radio to ensure that a concussion evaluation is undertaken on the sideline. The Club medical staff will then verify to the Booth ATC Spotter that the evaluation has been performed. The Booth ATC Spotter shall note the time of his initial contact with the Club medical staff and sideline UNC alerting them of the need for further evaluation and also the time of the communication from the Club medical staff and sideline UNC confirming that an evaluation has been performed. This information is to be conveyed in the Booth ATC Spotter's and Booth UNC's report following the game. If the Booth ATC Spotter observes a player whom he has flagged for medical evaluation return to the game prior to receiving the confirmation from the Club's medical staff that an evaluation was conducted, the Booth ATC Spotter shall call a Medical Time-Out (see below). For purposes of clarity, this is intended

to serve as a redundant communication from the Booth ATC Spotter with the Club physician or sideline UNC to confirm that a concussion evaluation has been performed. If no such confirmation is provided, the Booth ATC Spotter is required to call a Medical Time-Out to assure the concussion evaluation occurs.

Booth ATC Spotters shall file a report of their activity following each game for review by the Chairperson of the NFL Head, Neck and Spine Committee, NFL Chief Medical Officer and NFLPA Medical Director.

c. Visiting Team Medical Liaisons (VTMLs) are board-certified physicians licensed to practice medicine in the state in which the stadium is located and who work with the visiting team to provide medical care for its players, including access to leading medical centers for emergency care. As stated above (see 1.a), a VTML may serve as back-up UNCs if s/he has completed formal NFL-NFLPA UNC training.

2. Game Day Procedures

a. Pregame Medical Team Meeting. Sixty (60) minutes prior to kickoff, all medical staff will meet in the referees' locker room. Expected personnel include: Head Team Physician and Head Team ATC from each team and UNCs, both Booth ATC Spotters, lead EMS paramedic for the field, referee, VTML, and the airway management physician. The pregame medical meeting is to be led by the home team Head Team Physician. Items to be covered include: introductions of medical staff; location of the ambulance, transport cart, spine board, defibrillator, and advanced airway equipment; review of EAP medical facilities; and location of x-ray equipment. Medical staff shall confirm who is responsible for verifying a concussion evaluation of an athlete, i.e. "closing the loop." Booth ATC spotters shall review the Medical Time-Out procedures with officials.

b. "No-Go" Signs and Symptoms. If a player exhibits or reports any of the following signs or symptoms of concussion, he must be removed immediately from the field of play and transported to the locker room. If a neutral sideline observer or a member of the player's Club's medical team observes a player exhibit or receives a report that a player has experienced any of the following signs or symptoms, the player shall be considered to have suffered a concussion and may not return to participation (practice or play) on the same day under any circumstances:

i. Loss of Consciousness (including Impact Seizure and/or "fencing posture")

ii. Gross Motor Instability (GMI), identified in the judgment of the Club medical staff in consultation with the sideline UNC, who observe the player's behavior, have access to the player's relevant history and are able to rule out an orthopedic cause for any observed instability

iii. Confusion

iv. Amnesia

c. **NFL Sideline Concussion Assessment (Sideline Survey)**

If a player exhibits or reports a sign or symptom of concussion (defined above), spinal cord neuropraxia or a concern is raised by the Club's athletic trainer, Club physicians, Booth ATC Spotter, coach, teammate, game official or sideline or Booth UNCs (collectively referred to as "gameday medical personnel") the player must be immediately removed to the sideline or stabilized on the field, as needed, the player's helmet must be taken away from him, and the player must undergo the entire NFL Sideline Concussion Assessment[1] which, at a minimum, must consist of the following:

i. A review of the "No-Go" criteria reviewed above (Loss of Consciousness (including impact seizure and/or "fencing posture"), Gross Motor Instability [as defined above], Confusion, and Amnesia), which, if present, requires the player to be brought to the locker room immediately and he shall not return to play;

ii. Inquiry regarding the history of the event;

iii. Review of concussion signs and symptoms (See, Section I (C and D));

iv. All Maddocks' questions;

v. Complete Video Review of the injury (detailed below), including discussion with the Booth UNC; and

vi. Focused Neurological Exam, inclusive of the following:

(A) Cervical Spine Examination (including range of motion and pain);
(B) Evaluation of speech;
(C) Observations of gait; and
(D) Eye Movements and Pupillary Exam.

The foregoing shall be: (i) conducted inside the medical evaluation tent on the sideline; (ii) performed using the tablet or other technology assigned by the NFL, and (iii) completion of each component of the Sideline Survey shall be confirmed using the same. If *any* elements of the sideline assessment are positive, inconclusive, or suspicious for the presence of a concussion, the player must be escorted to the locker room immediately for the complete NFL Locker Room Comprehensive Concussion Assessment. Also, if the player demonstrates

[1] The Club physician/sideline UNC unit will be co-located for all concussion evaluations and management both on and off the field. The sideline UNC may present his/her own questions or conduct additional testing and shall assist in the diagnosis and treatment of concussions.

worsening or progressing symptoms at any point, he is to be brought to the locker room for the complete NFL Locker Room Comprehensive Concussion Assessment. Only medical personnel deemed essential to the care of the athlete may be present for the tent and/or locker room evaluation. This includes the team physician best qualified to evaluate concussion, the Club athletic trainer, and the sideline UNC. The sideline UNC may present his/her own questions or conduct additional testing.

If, upon completing the Sideline Survey, the Club physician concludes that the player *did not* sustain a concussion, then the player may return to play.

Suggested best practices for concussion assessment include periodic checks of the player by the Club physician, sideline UNC or other medical personnel to determine whether he has developed any of the signs or symptoms of concussion that would necessitate a locker room evaluation.

UNC Involvement in Sideline Concussion Assessment:

1. The Club physician will consult in private with the members of his/her team's medical staff designated to identify, diagnose and treat potentially concussed players, the sideline UNC and, as necessary, the Club's ATC, prior to making his/her decision regarding whether the player will return to the game.

2. If the Club physician determines that the player shall <u>not</u> return to play (based on the criteria listed in Section 2.a. above) and therefore there is no need to complete the Sideline Concussion Assessment, the Club physician and the sideline UNC shall accompany the player to the locker room to evaluate the player using the NFL Locker Room Comprehensive Concussion Evaluation (see below). For serious injury, the EAP will be activated, if indicated.

3. The Club physician remains responsible for all final decisions regarding Return-to-Play. However, the Club physician will consult with his/her sideline UNC team member prior to reaching his/her decision. If the sideline UNC disagrees with the Club physician's decision to return the player to play or remove the athlete, the sideline UNC will be given an opportunity to explain the basis of his/her opinion. This will be discussed in a collegial fashion in private as to why the player should or should not be returned to the game. The Club physician will communicate his or her final decision to the player.

4. As soon as practical, following the evaluation, the sideline UNC shall notify the booth medical personnel that an evaluation was conducted ("close the loop").

c. NFL Locker Room Comprehensive Concussion Assessment (Locker Room Exam)

The NFL Locker Room Comprehensive Concussion Assessment is the standardized acute evaluation tool that has been developed by the NFL's Head Neck and Spine Committee to be used by Clubs' medical staffs and designated UNCs to evaluate potential concussions during practices and on game day (see Attachment A). This evaluation is based on the Standardized Concussion Assessment Tool (SCAT 5) published by the International Concussion in Sport Group (McCrory, et al., 2017), modified for use in the NFL (Attachment A). The NFL Locker Room Comprehensive Concussion Assessment can be used to aid in the diagnosis of concussion even if there is a delayed onset of symptoms. The ongoing use of the Locker Room Comprehensive Concussion Assessment in conjunction with the preseason baseline and post-injury testing provides detailed data regarding each athlete's injury and recovery course. Being able to compare the results from the NFL Locker Room Comprehensive Concussion Assessment to the baseline information obtained in the preseason improves the value of this instrument. Clubs shall maintain and upload to the EMR all NFL Locker Room Comprehensive Concussion Assessment exams and a copy of the same shall be given to both the player and the team medical staff.

In all circumstances, the Club physician responsible for concussion evaluation shall assess the player in conjunction with the sideline UNC. The Club 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 Locker Room Comprehensive Concussion Assessment "within normal limits" compared to baseline, due to the potential limitations of the 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 (Section I, C and D), although frequently observed or reported, are not an exhaustive list. The NFL Locker Room Comprehensive Concussion Assessment is intended to capture these elements in a standardized format. The neurocognitive assessment in the NFL Locker Room Comprehensive Concussion Assessment is brief and does not replace a more comprehensive neurological evaluation or more formal neurocognitive testing. The

modified Balance Error Scoring System (mBESS) is an important component of the NFL Locker Room Comprehensive Concussion Assessment and has been validated as a useful adjunct in assessing concussive injury.

3. Medical Time-Out

In the event the Booth ATC Spotter: (i) has clear visual evidence that a player displays obvious signs of disorientation, is clearly unstable, or displays other obvious sign of concussion; or (ii) is notified by the Booth UNC that the Booth UNC has requested that a sideline evaluation be conducted; and (iii) it becomes apparent that the player will remain in the game and not be attended to by the Club's medical or athletic training staff, then the Booth ATC Spotter will take the following steps:

1. If the player does not receive immediate medical attention, the Booth ATC Spotter will contact the Side Judge over the Official-to-Official communication system to identify the player by his team and jersey number. The exact wording is "MEDICAL TIME OUT" repeated three times. The ATC-Spotter will confirm this at the 60-minute meeting. If the referee does not respond, the ATC-Spotter shall call the Field Communicator ("teal hat").
2. The Booth ATC Spotter will contact the medical staff of the player involved and advise them the player appears to need medical attention.
3. The Booth ATC Spotter shall remain in contact with the medical staff until the medical staff confirms that a concussion evaluation has occurred or is underway. It is the Booth ATC Spotter's responsibility to confirm that a concussion evaluation has occurred prior to the player returning to play. As detailed above, if a Booth ATC Spotter observes a player returning to the game without receiving express confirmation that an evaluation has occurred, the Booth ATC Spotter shall signal to the official for a Medical Time-Out.

Upon being called by the Booth ATC Spotter, the Side Judge will immediately stop the game, go to the player in question, and await the arrival of the Club's medical personnel to ensure that the player is attended to and escorted off the field. The game and play clock will stop (if running) and remain frozen until the player is removed from the game. Both clocks will start again from the same point unless the play clock was inside 10 seconds, in which case it will be reset to 10 seconds. The Club of the player being removed will have an opportunity to replace him with a substitute, and the opponent will have an opportunity to match up as necessary. No communication via coach-to-player headsets will be permitted during the stoppage; no member of the coaching staff may enter the playing field; and no player other than the player receiving medical attention may go to the sideline unless a substitute player has replaced him.

Once removed from the field, the Club medical staff will conduct an evaluation of the player as required by this protocol before making any decision regarding the player's eligibility to return to play. The Club medical staff in consultation with the UNC will make the return-to-play decision consistent with the NFL Head, Neck and Spine Committee's Concussion Diagnosis and Management Protocol. In no instance will this evaluation period last less than one play, unless there is an extended delay unrelated to the player's removal from the game (i.e., timeout, two-minute warning, penalty, etc.). An injury timeout will not be charged to a team who has a player removed during this process.

Following the game, both the sideline UNC and Club physician are required to document each step outlined above and their conclusions regarding the player's status. The sideline UNC report shall detail each evaluation, including interactions with players and members of the Club medical staff, and will be sent to the NFL Chief Medical Officer and NFLPA Medical Director following the game.

4. 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. The player is not permitted to drive on the day of injury.

5. Additional Evaluations and Follow Up

A player diagnosed with concussion should have the entire sideline exam performed on the day of injury unless medically contraindicated. The components of the NFL Locker Room Comprehensive 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 emergency department), and an assessment should be repeated prior to discharge home or prior to transportation home following an away game.

a. Performing serial concussion evaluations may be useful because concussive injury can evolve and may not be apparent for several minutes or hours. Even if a player performs at baseline or better on 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 Locker Room Comprehensive Concussion Assessment may be utilized in the performance of such evaluations:

i. The results of subsequent exams by the Club physician should be communicated to the sideline UNC in the spirit of "concussion team" cooperation and patient safety, especially if the sideline UNC is not immediately present.

ii. Should the sideline examination reveal a change in the player's condition, the Club physician/sideline UNC team will be re-assembled and perform subsequent locker room evaluation.

iii. It is important to recognize that players may be able to equal or exceed their performance on the Locker Room Comprehensive 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 Locker Room Comprehensive Concussion Assessment results, the player is to be removed from practice or play. 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.

iv. All players who undergo any concussion evaluation on game day shall have a follow up concussion evaluation done the following day by a member of the Club medical staff. This includes players with both a "positive" and a "negative" initial game-day assessment. The follow up exam should ideally be performed by the same physician who saw the patient on game day, but this may not always be possible. If not, then another member of the Club's medical staff may see the patient, who should coordinate their findings with the initial examining physician.

    At a minimum, the follow up exam should consist of: a) focused neurological examination, and b) complete symptom checklist. If symptoms and/or neurological examination are abnormal when compared to baseline, the Locker Room Concussion Evaluation should be performed.

v. A player diagnosed with concussion should not operate a motor vehicle on the day of injury. Athletes may return to drive on a subsequent day based on the advice of team medical staff.

III. NFL Concussion Game Day Checklist

The NFL Concussion Game Day Checklist is intended to provide a clear summary of the steps required by NFL Head, Neck and Spine Committee's Concussion Diagnosis and Management Protocol, with regard both to Sideline Survey and the Locker Room Exam. The NFL Concussion Game Day Checklist (Attachment C) is incorporated herein by reference. The application of the NFL Concussion Game Day Checklist to evaluate potential concussions during NFL preseason and regular season games is *mandatory*. Designated medical personnel (Club physicians and athletic trainers, sideline and Booth UNCs, and Booth ATC Spotters must complete their designated steps in the NFL Concussion Game Day Checklist and record the same using the designated technology. A Club medical team's failure to properly apply the NFL Concussion Checklist may subject their Club to discipline.

IV. Return to Participation Protocol

Introduction

Each player and each concussion is unique. Therefore, there is no set timeframe for return to participation or for the progression through the steps of the graduated exertion program set forth below. Recovery time will vary from player to player. The decision to return a player (hereinafter referred to as the "player-patient"), to participation remains within the professional judgment of the Head Club Physician or Club physician designated for concussion evaluation and treatment, performed in accordance with these Protocols.

All return to full participation decisions are to be confirmed by the Independent Neurological Consultant (INC).The INC is an impartial and independent neurotrauma physician, and must be board certified or board eligible in neurology, neurological surgery, emergency medicine, physical medicine and rehabilitation, or any primary care CAQ sports medicine certified physician and has documented competence and experience in the treatment of acute head injuries). Each Club must designate at least one INC at the start of the League Year, which must be approved by the NFL Chief Medical Officer and NFLPA Medical Director. For the avoidance of doubt, a UNC may also serve as an INC. Neither a UNC nor an INC may have any affiliation with an NFL team. The role of the INC is described below (see Section IV).

The INC should be informed when a concussion occurs and, if (s)he was not serving as the UNC who observed the initial diagnosis on the field, should examine the player as soon as possible following diagnosis and should be updated throughout the process to facilitate the clearance process at the final Phase of the Return to Participation (RTP) protocol. The Club physician may consult with the INC as often as desired during the concussion recovery period. The INC will be consulted specifically to answer the question of the player-patient's neurological health and his full return to competitive participation (see Phase 5 below). The final clearance for return to play is a decision made by the Club's medical staff and must be confirmed by the INC.

After a player-patient has been diagnosed with a concussion, he must be monitored daily, or more frequently if clinically indicated in the opinion of the Club physician, through the Return-to-Participation Protocol (described below). Team medical staff should consider the player-patient's current concussive injury, including an in-depth consideration of past exposures, medical history, family history, and future risk in managing the player-patient's care.

After having been diagnosed with a concussion, the player-patient must progress through the following protocol to return to participation. A player-patient may proceed to the next Phase in the protocol only after he has demonstrated tolerance of all activities in his current Phase without recurrence of signs or symptoms of concussion being observed or reported. Should the activities of any Phase trigger recurrence of signs or symptoms of concussion, those activities should be discontinued and the player-patient returned to the prior Phase in the protocol. The player-patient must remain at his pre-concussion baseline level of signs and symptoms during the exertion itself, as well as for a reasonable period of time afterward. What constitutes a reasonable amount of time shall be determined on a case-by-case basis by the Club physician. Depending on the severity of the concussion and the time required for return to baseline, the progression through the steps may

be accelerated. Communication between the Club medical staff and the player-patient is essential to determining the progression through the Phases of the protocol.

Neurocognitive testing is administered to assess the player-patient's level of cognitive function and identify any acute / subacute deficits that would affect his ability to resume normal activities. Neurocognitive testing can be introduced any time after completing Phase Two (see below) and prior to the initiation of contact activities. Otherwise, the specific timing of neurocognitive testing is up to the Club physician with consultation from the Club's NPC. The post-injury neurocognitive testing must include a focused, face-to-face clinical interview and the designated NFL paper and pencil test battery (Attachment B), and if done at baseline, the computerized neurocognitive test. All neurocognitive tests are to be interpreted by the Club's NPC, with the results communicated to the team physician.

The Return-To-Participation Protocol:

Phase One: Symptom Limited Activity

The player-patient is prescribed rest, limiting or, if necessary, avoiding activities (both physical and cognitive) which increase or aggravate symptoms. During this Phase, the player-patient may engage in activities of daily living as well as limited stretching and balance activities as tolerated at the discretion of the Club medical staff. Phase 1 may include LIGHT aerobic activity. Should additional medical issues present, the Club physician should consider external consultation or additional diagnostic examinations.

If the player-patient does not experience an increase in his symptoms and does not develop signs of concussion on neurological examination, he may be cleared to proceed to the next Phase.

Phase Two: Aerobic Exercise

Phase Two involves the initiation of a graduated exercise program. Under the direct oversight of the Club's medical staff, the player-patient should begin graduated cardiovascular exercise (e.g., stationary bicycle, treadmill) and may also engage in dynamic stretching and balance training. The duration and intensity of all activity may be gradually increased so long as the player-patient does not increase or aggravate signs or symptoms while performing the activity and for a reasonable period thereafter. If there is any increase or aggravation of signs or symptoms, the activity should be discontinued. He may, however, attend regular team meetings and engage in film study.

Once the player-patient has demonstrated his ability to engage in cardiovascular exercise without an increase or aggravation of signs or symptoms, he may proceed to the next Phase.

Phase Three: Football Specific Exercise

The player-patient continues with supervised cardiovascular exercises that are increased and begin to mimic sport specific activities, as well as supervised strength training. The player-patient is allowed to practice with the team in sport specific exercise for 30 minutes or less, with ongoing and careful symptom monitoring by the medical staff. If neurocognitive testing was not administered after Phase

Two, it should be administered during Phase Three. If a player-patient's initial neurocognitive testing is not interpreted as back to baseline by the NPC, the tests will be repeated at a time interval agreed upon by the Club physician and NPC (typically 48 hours). The player-patient should not proceed to contact activities until their neurocognitive testing is interpreted as back to their baseline level by the NPC or, if a decrement is still present, until the Club physician has determined a non-concussion related cause. The determination of when to proceed with contact activities is ultimately made by the Club physician.

Once the player-patient has demonstrated his ability to engage in cardiovascular exercise and supervised strength training without an increase or aggravation of signs or symptoms, he may proceed to the next Phase.

<u>Phase Four</u>: Club-based Non-contact Training Drills

The player-patient may continue cardiovascular conditioning, strength and balance training, team-based sport-specific exercise, and participate in non-contact football activities such as throwing, catching, running and other position-specific activities, progressing to participation in non-contact team practice activities To be clear, all activities at this Phase remain non-contact (i.e.., no contact with other players or objects, such as tackling dummies or sleds).

If the player-patient is able to tolerate all football specific activity without a recurrence of signs or symptoms of concussion and his neurocognitive testing has returned to baseline, he may be moved to the next Phase in the sequence. For clarity; all signs, symptoms, and neurological examination (including neurocognitive testing and balance testing) must return to baseline status before returning to full football activity/clearance. Exceptions to the neurocognitive component may be considered by the Club physician responsible for the diagnosis and treatment of concussion (in consultation with the NPC) on a case-by-case basis in player-patients with documented ADHD or learning disabilities.

<u>Phase Five</u>: Full Football Activity/Clearance

After the player-patient has established his ability to participate in non-contact football activity including team meetings, conditioning and non-contact practice without recurrence of signs and symptoms and his neurocognitive testing is back to baseline, the Club physician may clear him for full football activity involving contact in practice. If the player-patient tolerates full participation practice and contact without signs or symptoms and the Club physician concludes that the player-patient's concussion has resolved, s/he may clear the player-patient to return to participation. For the avoidance of doubt, if a player-patient cannot participate in practice or full contact with other players due to the time of year and/or rules imposed by the Collective Bargaining Agreement, simulated contact activity will suffice to satisfy this Phase. Upon clearance by the Club physician, the player-patient must be examined by the INC assigned to his Club. The INC must be provided a copy of all relevant reports and tests, including the sideline and booth UNC reports, the Booth ATC Spotter report and team injury reports, and have access to video of the injury, where applicable, and the player-patient's neurocognitive test results and interpretations. If the INC confirms the Club physician's conclusion that the player-patient's concussion has resolved, the player-patient is considered cleared and may participate in his Club's next game or practice.

634 **Table 1. An Example of a Graduated Exertion Protocol[*] [#]**

Phases	Activity	Objective
1. Symptom Limited Activity	Routine daily activities as tolerated, with the introduction of light aerobic activity (e.g., 10 minutes on a stationary bike or treadmill with light to resistance supervised by the team's athletic trainer.	Recovery and light cardiovascular challenge to determine if concussion signs or symptoms are provoked
2. Aerobic Exercise	≥20 minutes on a stationary bike or treadmill with moderate to strenuous resistance supervised by the team's athletic trainer. Duration and intensity of the aerobic exercise can be gradually increased over time if no aggravation of symptoms or signs return during or after the exercise.	Strenuous cardiovascular challenge to determine if there are any recurrent concussion signs or symptoms.
3. Football Specific Exercise	With continued supervision by the athletic trainer, introduction of non-contact sport specific conditioning drills (e.g., changing direction drills, cone drills). Introduction of strength training supervised by the athletic trainer.	Add strength training and more complex movements to determine if there are any aggravation of concussion signs or symptoms.
4. Club-based Non-contact Training Drills	Participation in all non-contact activities for the typical duration of a full practice.	Increasing football specific demands to determine if there is any aggravation concussion signs or symptoms. Add the cognitive engaging in football drills.

5. Full Football Activity / Clearance	Full participation in practice and contact without restriction.	Tolerance of all football activities without any recurrent concussion signs or symptoms.

*This Table serves as a guideline. Specifics will depend on each player's situation. There is no set timeline for return to play or progression through the protocol

#Adapted from McCrory et al., 2017

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 participation requirements, provide a comprehensive approach to concussion diagnosis and management for the NFL player.

References

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Attachments

Attachment A: Baseline NFL Locker Room Comprehensive Concussion Assessment
Attachment B: NFL Neuropsychology Consultant Model and Neurocognitive Testing Program
Attachment C: NFL Neurocognitive Testing Program Data Record Form