



How The NFL Is Advancing Player Health And Safety



Through its *Play Smart. Play Safe.* initiative, the National Football League is working to drive progress in the prevention, diagnosis and treatment of injuries, enhance medical protocols and further improve the way our game is taught and played.

PROTECTING PLAYERS

The NFL is making changes on and off the field in an effort to protect the health and safety of every player in the NFL.

- » **Leveraging Data:** Throughout the year, comprehensive NFL player injury data is compiled and analyzed by IQVIA, an independent, third-party company. Results are then shared with the NFL, the NFL Players Association (NFLPA) and the NFL medical and football committees. Guided by the experts at IQVIA, NFL medical committee members examine the data for trends in how, where and when injuries happen. Their analysis covers all injuries impacting players, including concussions and ACL/MCL tears, and considers how protocols and rules changes are making an impact on player safety.
- » **Rules on the Field:** The NFL continues to evaluate rules and evolve the game to try to improve protections for players. Since 2002, the league has made more than 50 rules changes intended to eliminate potentially dangerous tactics and reduce the risk of injuries. Recent rules changes include:
 - In 2009, the NFL prohibited a defender from using his helmet, forearm or shoulder to make contact with the head or neck area of a “defenseless” receiver.
 - In 2010, the NFL expanded that rule to protect all “defenseless players” from contact to the head by an opponent’s helmet, forearm or shoulder. The rule was expanded again in 2012 to include certain defensive players.
 - In 2011, the NFL moved the restraining line for the kicking team from the 30- to the 35-yard line to reduce the risk of injury on kickoffs. Further, in 2016, the NFL moved the spot of the next snap after a touchback resulting from a kickoff from the 20- to the 25-yard line.
 - In 2013, the league prohibited a runner or tackler from initiating contact against an opponent with the top or crown of the helmet.
 - In 2016, the NFL expanded the horse collar rule to include when a defender grabs the jersey at the name plate or above and pulls a runner toward the ground.
 - In 2017, the NFL prohibited the “leaper” block attempt on field goal and extra point plays, gave a receiver running a pass route defenseless player protection, and reduced the length of overtime in the preseason and regular season to 10 minutes.
 - In 2018, the NFL made it a foul if a player lowers his head to initiate and make contact with his helmet against an opponent, and modified the kickoff play for one year only.
 - In 2019, the NFL made permanent the kickoff rule changes that were implemented during the 2018 season and expanded protection to defenseless players, making it a foul if a player initiates a block when his path is toward or parallel to his own end line and makes forcible contact to his opponent with his helmet, forearm, or shoulder.

- » **The Team Behind the Team:** On average, there are 30 healthcare providers at a stadium on game day to give immediate care to players. In conjunction with the NFLPA, the league has added unaffiliated medical personnel and adopted new technology to assist in the identification and review of injuries, with a specific focus on concussions.
- **Unaffiliated Neurotrauma Consultant (UNC):** The NFL Head, Neck and Spine Committee and the NFLPA have selected and credentialed neurotrauma consultants, who are unaffiliated with either team, to staff the sidelines and monitor the broadcast feeds of every NFL game, and to assist the team medical staffs in identifying, screening and diagnosing concussions. Three UNC's are on staff at each game; two are positioned on the sidelines and one is in a booth above the field.
- **Visiting Team Medical Liaisons (VTML):** When traveling across state lines, every visiting team is required to retain a local board-certified and locally licensed emergency physician, who is typically affiliated with the trauma center nearest the NFL stadium. The VTML works with the visiting team to provide medical care for its players while they are traveling.
- **Booth ATC Spotters and the Medical Timeout:** For all preseason, regular season and postseason games, two certified athletic trainers—retained by the league and unaffiliated with any NFL teams—are stationed in a booth overseeing the field to observe the game and monitor the broadcast feed to identify potential player injuries, with an emphasis on concussions and other head and neck injuries. In what was the first rule of its kind in professional sports, the booth ATC spotter has the authority to stop the game by calling a medical timeout to permit the medical evaluation of a player who the spotter believes may have suffered a concussion or head injury, yet appears likely to remain in the game without an evaluation from the team's medical staff. This medical timeout does not count against either team. Game officials also have the authority to send a player off the field for medical evaluation.
- » **Chief Medical Officer:** In March 2017, the NFL named Dr. Allen Sills as the league's Chief Medical Officer (CMO), a new full-time position. Dr. Sills—a neurosurgeon who has specialized in the treatment of athletes—joined the NFL from Vanderbilt University Medical Center, where he serves as Professor of Neurological Surgery, Orthopaedic Surgery and Rehabilitation and Founder and Co-Director of the Vanderbilt Sports Concussion Center. In the CMO role, he works closely with team medical staffs across the league, the NFLPA and its advisors and the many medical and scientific experts who comprise the NFL's medical committees and guide the NFL's health and safety efforts.
- » **Video Monitors:** Medical staff from each team and the UNC's have access to sideline video monitors. With the Injury Video Review System (IVRS), medical staff can review the mechanism of an injury as part of their examination of the player on the sideline to focus their examination, guide their diagnosis and design the best care for a player. The sideline video and communications equipment permit both teams' medical staffs to communicate with the booth ATC spotters.
- » **Electronic Medical Records:** Every club's medical staff has instant access to their players' complete medical records via the Electronic Medical Record (EMR) system. Players can access their records at any time via a secure online portal, which remains active after the player retires. The EMR system has greatly enhanced the NFL's Injury Surveillance System, increasing the league's ability to make data-based changes in rules and permissible techniques used in play in an effort to make the game safer.
- » **Electronic Tablets:** The NFL requires clubs to use electronic tablets with specially designed applications for injury diagnosis. The X2 Biosystems' Integrated Concussion Evaluation (ICE) app, which includes a step-by-step checklist for assessing players suspected of head injury, as well as all players' concussion baseline tests and historical data, is now an established component of in-game concussion diagnosis and care.

- » **Emergency Action Plans:** Every club is required to design and implement an Emergency Action Plan to follow in instances of severe trauma. These plans are reviewed by the NFL and NFLPA and must be approved by third-party experts prior to the start of each season. This plan, which the club is required to practice prior to the start of the season, also requires the home team to designate a Level One Trauma Center and to retain two certified crews of paramedics and advanced life support ambulances.
- » **Concussion Protocol:** NFL medical professionals follow the step-by-step NFL concussion protocol when they are identifying, diagnosing and treating player concussions. The first version was developed in 2011 by the NFL Head, Neck and Spine Committee, a board of independent and NFL-affiliated physicians and scientists, including advisors to the NFLPA. The concussion protocol is reviewed each year in an effort to ensure players are receiving care that reflects the most up-to-date medical consensus on the identification, diagnosis and treatment of concussions. The 2017 NFL Concussion Diagnosis and Management Protocol and the corresponding “Concussion Game Day Checklist” were adapted from the 2017 consensus statement from the Berlin Conference on Concussion in Sport. In December 2017, the NFL and NFLPA, in conjunction with the Head, Neck and Spine Committee, made additional enhancements to the protocol, including the requirement that a player who exhibits gross motor instability or significant loss of balance must be taken to the locker room for evaluation if it is not diagnosed as an orthopaedic injury. In an effort to ensure consistent implementation of the protocol, the NFL and NFLPA have developed an enforcement policy. The NFL and NFLPA follow a strict and fair process to investigate incidents and determine appropriate discipline, including club fines and possible forfeiture of draft picks, for clubs that fail to follow the protocol. In 2018, the NFL Concussion Diagnosis and Management Protocol was published in the *British Journal of Sports Medicine* (BJSM), which marked the first sports league protocol of its kind to be published in a peer-reviewed medical journal.
- » **Return-to-Participation Protocol:** The NFL and NFLPA have established a five-step process that every NFL player diagnosed with a concussion must follow before being cleared to fully practice or participate in an NFL game. This process, developed from internationally accepted guidelines, seeks to ensure that every player in the NFL receives consistent treatment. After a player has progressed through the five-step process, and is cleared for full participation by his club physician, he must be seen and separately cleared by an Independent Neurological Consultant (INC), who is jointly approved by the NFL and NFLPA and who is not affiliated with any NFL club. Until cleared by this independent physician, a player may not return to contact practice or play in an NFL game.
- » **Sideline Medical Exam Tents:** NFL games now feature sideline medical examination tents to allow for immediate evaluations of players in private following an injury.
- » **Health and Safety Education:** The NFL and NFLPA, with their medical advisors and committees, developed a standard preseason health and safety presentation that is to be shown by every team to every player at the start of training camp. The presentation was developed by subject matter experts and includes information on exertional heat stroke, concussion diagnosis and management, mental health, infection control, substance abuse and performance-enhancing substances.
- » **Protective Equipment and Field Surface Safety:**
 - The NFL, in collaboration with the NFLPA, through their respective appointed biomechanical experts, coordinates extensive laboratory research to evaluate which helmets best reduce head impact severity in the tested conditions. Each year, the results of the laboratory tests are displayed on a poster and shared with NFL players, and club medical, training, coaching and equipment staffs to help inform equipment choices. The results of the helmet study should not be extrapolated beyond the NFL, including to collegiate, high school or youth football. In 2019, based on the results of this study, discontinuation of certain helmets by the manufacturer, and/or the opinions of the biomechanical experts involved, the NFL and NFLPA will prohibit 11 helmet models from being worn by NFL players. In previous seasons, NFL players could choose any helmet as long as the helmet passed current National Operating Committee on Standards for Athletic Equipment (NOCSAE) certification standards.

- The NFL Musculoskeletal Committee has coordinated extensive research on athletic shoe safety and performance. The committee has developed laboratory tests that evaluate which cleats better permit release from synthetic turf during potentially injurious loading. The results of those tests are displayed on a poster and shared with NFL players, club equipment managers, club medical, training and coaching staffs to help inform equipment choices. The results of the cleat pattern study should not be extrapolated beyond the NFL, including to collegiate, high school, or youth football.
 - The NFL requires players to wear thigh and knee pads during games to better protect them from leg injuries. As with helmets and shoulder pads, players not wearing the mandatory protective equipment are not permitted onto the playing field and may be fined.
 - In 2016, the NFL and NFLPA established the Field Surface Safety & Performance Committee to perform research and advise on injury prevention, improve testing methods and adopt tools and techniques to evaluate field surface performance and playability. It also oversees the NFL stadium inspection program, which includes testing of NFL playing surfaces by engineers retained by the NFL, under observation by NFLPA experts.
- » **Limits on Practices:** The 2011 collective bargaining agreement between the NFL and the NFLPA eliminated two-a-day practices in training camp and contact practices were significantly reduced. The CBA limits NFL teams to only 14 days of full-contact football practice during the 17-week season.

ADVANCED TECHNOLOGY

The NFL is championing new developments in engineering, biomechanics and material science designed to better protect against injuries in sports and recreation, as well as for the military. In order to advance this effort, the league is collaborating with the NFLPA and bringing in the world's foremost biomechanical engineers and material scientists as advisors.

- » **The Engineering Roadmap:** The NFL allocated \$60 million from the *Play Smart. Play Safe.* initiative toward the Engineering Roadmap, a comprehensive effort—funded by the NFL and managed by Football Research, Inc. (FRI)—to improve the understanding of the biomechanics of head injuries in professional football and to create incentives for helmet manufacturers, small businesses, entrepreneurs, universities and others to develop and commercialize new and improved protective equipment, including helmets.
- » **HeadHealthTECH Symposium:** In November 2016, the NFL and FRI hosted a first-of-its-kind educational conference. Hundreds of world-class biomechanical and biomedical engineering experts educated innovators—from inventors to equipment manufacturers to engineering students—on the latest knowledge regarding the causes of concussion in professional football, including the best tools available for assessing and optimizing the design and manufacture of protective equipment. As part of the Engineering Roadmap, periodic symposia, webinars and other educational efforts allow experts to share the most up-to-date biomechanical and biomedical information.
- » **Comprehensive Video Review:** As part of the Engineering Roadmap, biomechanical engineers completed a comprehensive video review of all reported concussions sustained in NFL games during the 2015 and 2016 seasons to better understand concussion-causing impacts. The data is shared widely with helmet manufacturers, designers, innovators, entrepreneurs, universities and others to stimulate new ideas and designs for protective equipment.
- » **HeadHealthTECH Challenges:** The NFL and FRI created the HeadHealthTECH Challenges, which are attracting innovative grant proposals from institutions, individuals and corporations that are interested in designing the next generation of protective equipment. These proposals range from concepts to commercially-ready products for use by athletes. The TECH Challenges are structured to stimulate research and innovation, as well as encourage connections with mentors and/or venture capitalists, with the goal of spurring developments in

engineering, biomechanics, advanced sensors and material science. The TECH Challenges are operated and managed by Duke University's Clinical and Translational Science Institute, which provides constructive feedback for all applicants. Thus far, the NFL and FRI have awarded grants totaling more than \$1.6 million to help advance the development of 13 new technologies.

- » **Head Health Initiative:** In 2013, GE and the NFL teamed up to launch the Head Health Initiative, a four-year, \$60 million collaboration that has accelerated innovations designed to improve prevention, diagnosis and treatment for traumatic brain injury. The initiative included the following:
 - A four-year, \$40 million research and development program to develop next-generation brain imaging technologies. This includes substantial clinical trials at seven leading research centers across the country where individuals with head injuries participate in a rigorous test methodology to learn more about imaging and brain injury. The initiative has fostered the development of several novel technologies.
 - An open innovation challenge fund to invest up to \$20 million in grants to scientists, academics, experts and entrepreneurs worldwide across three innovation challenges to help spur advancements to better understand, diagnose and protect against traumatic brain injury. Under Armour and the National Institute of Standards and Technology (NIST) are also supporting this effort.
 - More than 1,000 applicants submitted ideas through the challenge's three parts, resulting in innovations in equipment and technology:
 - New diagnostic tools—such as blood tests, biomarkers and MRI technologies—to aid in the detection of traumatic brain injury.
 - Helmet and turf technologies designed to absorb impact.
 - Rate-dependent tethers that attach to a player's helmet and torso designed to provide high-force resistance during collisions.
 - Advanced materials designed to better absorb or mitigate force from helmets, pads and other sports and consumer products.
- » **1st and Future:** Each year since 2016, the NFL has teamed with partners to host the 1st and Future Super Bowl start-up competition to drive innovation and spur technology advancements in athlete safety and performance. Partner organizations have included Stanford's Graduate School of Business and TechCrunch (2016), Texas Medical Center (2017), Comcast NBCUniversal and Mayo Clinic (2018), and Arrow Electronics and Georgia Institute of Technology (2019). Innovators and entrepreneurs compete and showcase their technologies in categories ranging from advancements in protective equipment to new therapies to speed recovery. In 2019, the NFL Punt Analytics Competition was added to 1st and Future, tapping the data science community to analyze NFL data sets to propose rule changes designed to reduce player injury during punt plays while maintaining the integrity of the game.

MEDICAL RESEARCH

The NFL is investing in and supporting preeminent experts and institutions to advance progress in the prevention, diagnosis and treatment of head injuries.

- » **Funding Neuroscience:** In 2016, through the *Play Smart. Play Safe.* initiative, the NFL allotted \$40 million in funding for medical research primarily dedicated to neuroscience. The NFL assembled a Scientific Advisory Board (SAB)—chaired by Peter Chiarelli, U.S. Army General (Retired)—comprising leading independent researchers, experts, doctors, scientists and clinicians to develop and lead a clear process to identify and support compelling proposals for scientific research to be funded. The SAB's goal was to seek innovative translational research being conducted by investigative teams focusing on the diagnosis and treatment of

concussion (mild traumatic brain injury) and associated comorbid conditions, including chronic traumatic encephalopathy (CTE), in addition to the natural history of concussion and associated comorbid conditions.

In November 2018, the NFL announced the funding of five research projects recommended by the SAB. The projects being funded are as follows:

- *Prevalence of Brain Health versus Neurodegeneration in Professional Football Retirees* led by researchers at the University of Pittsburgh and University of Pittsburgh Medical Center (UPMC)
 - *A Prospective, LONGitudinal and Translational Study for Former National Football League Players* led by William P. Meehan III, MD at Boston Children’s Hospital and Harvard Medical School
 - *Surveillance in High Schools to Reduce Concussions in Youth* led by Carolyn Emery, PhD at the University of Calgary
 - *Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI Longitudinal)* led by Geoff Manley, MD, PhD at the University of California – San Francisco
 - *The Spectrum of Concussion: Predictors of Clinical Recovery, Treatment and Rehabilitation, and Possible Long-Term Effects* led by Grant Iverson, PhD at Spaulding Rehabilitation Hospital and Harvard Medical School
- » **Foundation for the National Institutes of Health (FNIH):** The NFL contributed approximately \$14 million to the Foundation for the National Institutes of Health to advance medical research on brain injuries, especially among athletes and veterans. The grants included:
- \$12 million for pathology studies through the Sports and Health Research Program (SHRP): two \$6 million cooperative agreements dedicated to defining the long-term changes that occur in the brain after a head injury or multiple concussions.
 - The Boston University School of Medicine and U.S. Department of Veterans Affairs received \$6 million for a study on CTE and post-traumatic neurodegeneration.
 - Mount Sinai Hospital and the University of Washington received \$6 million for a study on the neuropathology of CTE and Delayed Effects of TBI.
 - Six pilot projects totaling more than \$2 million, to provide support for the early stages of sports-related concussion projects.
- » **Government-Funded Projects to Advance Neuroscience Research:** In January 2018, the NFL allocated \$16.3 million to a series of government-funded projects—including prospective, longitudinal, multi-site, peer-reviewed efforts to answer leading questions on traumatic brain injury, concussion and provide insights on neurodegenerative diseases, including CTE, as well as other cognitive impairments related to aging:
- \$7.65 million to the Department of Defense to support the Concussion Assessment Research and Education (“CARE”) Consortium Grand Alliance, which monitors all athletes for concussive injuries at 30 university sites.
 - \$7.65 million to support TRACK-TBI (Transforming Research and Clinical Knowledge in TBI), an NIH-funded study that collects detailed information on patients with head injuries and their outcomes.
 - \$2.25 million to support the National Institute of Aging, the branch of the NIH focused on aging processes and age-related diseases.
- » **Concussion Symposium at University of Pittsburgh Medical Center (UPMC):** In October 2015, UPMC held a first-of-its-kind two-day symposium, funded by a grant from the NFL Foundation, that brought together leading concussion clinicians and researchers from around the country to propose guidelines for treating concussions and consider areas for further research. As a result of their discussions, the experts published a Statement of

Agreement in the journal *Neurosurgery* designed to propose and share nationally the participants' agreement on the best practices, protocols and active therapies for treating concussions.

- » **International Professional Sports Concussion Research Think Tank:** The league hosted its second international think tank on concussions in October 2015, convening representatives of the world's major sports leagues and concussion experts to share best practices and protocols and collaborate on ways to advance progress, such as a new study on the potential long-term effects of concussions in sports. These meetings have identified research priorities that are being addressed through several joint research initiatives:
 - The NFL collaborated with the Canadian Football League (CFL) to jointly examine how an eye-movement test—the King-Devick test—may improve concussion diagnosis on the sideline.
 - Scientists at the University of North Carolina at Chapel Hill and the Medical College of Wisconsin received a \$2.6 million grant from the NFL for a study, one of the first of its kind, that will examine the efficacy of two clinically supervised management strategies, including both the international concussion return-to-play protocol and early therapeutic interventions on concussions.
 - The NFL announced a partnership with the International Concussion and Head Injury Research Foundation (ICHIRF) to fund research into the potential long-term effects and risk factors associated with high-impact sports, including horse racing.

SHARING PROGRESS

Where appropriate, the NFL is sharing applicable learnings across all levels of football—and to other sports and society at large.

- » **Heads Up Football:** USA Football's grant program has awarded nearly \$2 million in resources to benefit youth athletes in 2018, including new equipment, uniforms and other supplies. Grants are valued up to \$1,000 each and are distributed based on merit, need and a school's or sports organization's commitment to coaching education and best practices. More than 600,000 coach certifications have been completed through USA Football's Heads Up Football program since its 2012 inception. The Heads Up Football Program strives to improve player safety for youth and high school players by training and certifying coaches on safety fundamentals; teaching proper tackling techniques; appointing Player Safety Coaches for every youth league to enforce safety protocols; helping ensure proper equipment fitting; and teaching coaches, parents and players how to recognize and respond to injuries, including concussions. Sixteen of the country's 20 largest school districts enrolled in Heads Up Football in 2018. USA Football, the sport's national governing body and a member of the U.S. Olympic Committee has awarded more than \$14 million in grants to school-based and youth football programs since 2006.
- » **Increasing Access to Athletic Trainers:** Nearly two thirds of high schools lack a full-time athletic trainer (AT) and almost 30 percent of high schools do not have any athletic trainer at all. In 2014, the NFL Foundation established a matching grant program designed to help NFL teams increase access to ATs in their communities. To date, 22 NFL clubs have used this grant to support local schools and leagues. In October 2016, the NFL Foundation, in collaboration with Gatorade, the National Athletic Trainers' Association (NATA), the Korey Stringer Institute (KSI) and the Professional Football Athletic Trainers Society (PFATS), launched a pilot program in four states (Arizona, Illinois, Oklahoma, Oregon) which has provided funding to more than 70 public high schools with football programs that have limited or no access to an AT. Grants, each in the amount of \$35,000, have been awarded over a three-year period to help fund an athletic training program.
- » **Raising Awareness about Concussions:** A poster and related player fact sheet were developed by the NFL, in partnership with the CDC and others, to educate NFL players about the symptoms and possible consequences of concussions and advise them to report any related symptoms they may experience. A similar poster,

endorsed by 16 national governing bodies for sport, was developed for young athletes and made available through the CDC to display in youth team locker rooms, gymnasiums and schools nationwide.

- » **Youth Concussion Laws:** In 2010, NFL Commissioner Roger Goodell took up the cause to advocate for every state to pass a youth sports concussion law. These laws are modeled after Washington's Lystedt Law, which includes three components: 1) concussion education for parents, coaches and players; 2) immediate removal from play of an athlete who has sustained a concussion; and 3) clearance by a licensed medical professional before a young athlete may return to play or practice. By 2014, all 50 states and the District of Columbia had enacted return-to-play laws. In October 2017, a study was released from researchers affiliated with the Center for Injury Research and Policy at Nationwide Children's Hospital, Temple University's Beasley School of Law, and the Colorado School of Public Health at the University of Colorado—the study found state laws that address concussions in youth sports can help reduce the rates of recurrent concussions.
- » **NFL Foundation Grassroots Program:** In 2018, the NFL Foundation Grassroots Program, a partnership between the NFL Foundation and the Local Initiatives Support Corporation, provided grants to 14 cities to improve the quality, safety and accessibility of football fields in underserved areas. Grants totaled more than \$3 million to build or refurbish neighborhood football fields. Since 1998, the NFL Foundation has provided nearly \$68 million to refurbish 551 fields nationwide for youth athletics.
- » **NFL PLAY 60:** NFL PLAY 60 is the League's national youth health and wellness campaign to encourage kids to get physically active for at least 60 minutes a day. Since PLAY 60 launched in 2007, the NFL has committed more than \$352 million to youth health and fitness through PLAY 60 programming, grants and media time for public service announcements. The NFL and its clubs have supported programs in over 73,000 schools and constructed more than 265 youth fitness zones nationwide—giving more than 38 million children an opportunity to boost their activity levels. Research conducted by The Cooper Institute through its NFL PLAY 60 FitnessGram® Project revealed annual improvements in aerobic capacity and body mass index for students participating in NFL PLAY 60 programming when compared to schools not utilizing NFL PLAY 60 programs. Visit NFL.com/PLAY60 for more information.
- » **NFL FLAG:** Flag football is a great way for boys and girls of all ages to learn the fundamentals of the game. In April 2019, the NFL, USA Football, GENYOUth and Fuel Up to Play 60 announced the expansion of the NFL FLAG-In-Schools program with a nearly \$1.5 million commitment from the NFL Foundation to reach 4,200 new schools and 2.3 million additional students. Since 2014, the partners' efforts have resulted in 9.1 million students becoming more active before, during and after school through the NFL FLAG-In-School program.

\$100 MILLION

Play Smart. Play Safe. began with a pledge of an additional \$100 million in support of independent medical research and engineering advancements—building on the \$100 million that the NFL and its partners are already spending on medical and neuroscience research—and a commitment to look at anything and everything intended to protect our players and make our game safer.

\$40 MILLION

More than \$40 million in funding has been allotted for medical research over five years, primarily dedicated to neuroscience.

\$60 MILLION

\$60 million goes toward championing new developments in engineering, biomechanics and material science designed to better protect against injuries in sports and recreation, as well as for the military.