New Concussion Guidelines: An Analysis

Introduction

At a press conference held at the American Academy of Neurology's (AAN's) 2013 Annual Meeting, the release of new AAN guidelines for the evaluation and management of sports-related concussion (SRC) were announced. The recommendations update the 1997 AAN sports concussion practice parameter and were published online in *Neurology* on March 18, 2013. The new guidelines attempt to address uncertainty and inconsistency in the management of concussion and mild traumatic brain injury (TBI) by addressing 4 clinical questions:

1. For athletes, what factors increase or decrease concussion risk?

2a. For athletes suspected of having sustained concussion, what diagnostic tools are useful in identifying those with concussion?

2b. For athletes suspected of having sustained concussion, what diagnostic tools are useful in identifying those at increased risk for severe or prolonged early impairments, neurologic catastrophe, or chronic neurobehavioral impairment?

3. For athletes with concussion, what clinical factors are useful in identifying those at increased risk for severe or prolonged early postconcussion impairments, neurologic catastrophe, recurrent concussions, or chronic neurobehavioral impairment?

4. For athletes with concussion, what interventions enhance recovery, reduce the risk for recurrent concussion, or diminish long-term sequelae?

The new AAN recommendations -- divided into preparticipation counseling; assessment, diagnosis, and management of suspected concussion; and management of diagnosed concussion -- were nicely summarized at the press event by lead authors Christopher C. Giza, MD, and Jeffrey S. Kutcher, MD. However, some areas of the guideline are open to interpretation, particularly when it comes to deciding when it is acceptable to allow an athlete with a suspected concussion to return to play. The following summary serves as a guide to the new report, highlighting the major recommendations and providing additional clarification based on comments from Drs. Giza and Kutcher.

Preparticipation Counseling

The Basics

- School-based professionals education
- Inform athletes/families of concussion risk factors
- Disseminate risk information to schools and athletic authorities
The Bottom Line

School-based professionals who may encounter SRCs should be educated by an experienced licensed healthcare provider (LHCP), defined by the guideline committee as "an individual who has acquired knowledge and skills relevant to evaluation and management of sports concussions and is practicing within the scope of his or her training experience." LHCPs -- including both sideline- and clinic-based clinicians -- should be designated by their organization as being qualified to accurately convey concussion risks to athletes and their families and should take it upon themselves to deliver this information. LHCPs can also facilitate providing concussion risk information to school systems and athletic organizations or authorities.

Suspected Concussion

The Basics

- Instruct inexperienced LHCPs in the use of standardized assessment tool
- Use standardized assessment tools
- Ensure communication between sideline LHCPs and clinical LHCPs
- Obtain baseline scores
- Remove the athlete from play
- No return to play without clearance by an LHCP
- *Don't* perform imaging to diagnose SRC
- *Do* perform imaging to rule out serious TBI

The Bottom Line

Inexperienced LHCPs should be instructed by LHCPs who have concussion experience in the appropriate use of "standardized validated sideline assessment tools." Sideline LHCPs should initially apply assessment tools and relay findings to appropriate clinical LHCPs. Obtaining baseline assessment scores to have on hand is recommended to facilitate more accurate post injury scores.

The next recommendation was a source of some confusion at the AAN 2013 press conference. The guidelines state that "any athlete suspected of having sustained a concussion" should be immediately removed from play to minimize the risk for further injury. There has long been an idea that a "second hit" in close proximity to a previous head injury may result in cumulative injury beyond the sum of the 2 single hits (in other words, 2 + 2 = 5 in terms of brain injury), but this hypothesis has not been proven in athletes.

There is also accumulating evidence that repeated mild head injury, particularly concussion, may result in chronic traumatic encephalopathy (CTE). However, research on CTE is still in its early phase, and the role of repeated concussions in the development of CTE requires better definition.
Because this is an evidence-based guideline, the above concerns regarding repetitive head injury are not the basis for the recommendation for removing the athlete from play. That recommendation is based on robust epidemiologic evidence that people who experience a single concussion are more likely to experience another one compared with people who never had one (6 class I studies\cite{2-7} and 1 class II study\cite{8}). Furthermore, that risk is particularly increased in the 10 days after the first concussion (2 class I studies\cite{9,10}). Because of this strong evidence that a single concussion predisposes to a second one, the guideline advises that players exit the game and not return until symptoms resolve.

The reason for this increased risk for a second injury is unknown. The most likely hypothesis is that impaired cognition or physical reflexes due to the first concussion increase the player’s susceptibility to injury.

The AAN guideline insists that players who experience symptoms suggestive of concussion, such as blurry or double vision, confusion, dizziness, headache, nausea, memory loss, or other cognitive or behavioral problems, must have full resolution of their symptoms (off medication) and approval for return to play by an LHCP. This approach would seem to allow players who had transient symptoms after a mild head injury to return to play if they felt better on the sidelines and had no discernible neurologic deficit. When asked about this, Dr. Kutcher explained that the player could not return to play *that day* if a concussion had been diagnosed, even if symptoms had cleared. This recommendation is echoed by the American Medical Society for Sports Medicine position statement, which clearly prohibits same-day return to play for an athlete diagnosed with a concussion.\cite{11}

A potential loophole for return to play is for the player who sustains a concussion, but denies symptoms and has no objective findings on examination. This player might be hiding symptoms, but in the absence of any neurologic findings would be able to return to play because no diagnosis of concussion was made.

A second situation not addressed by the guidelines, and pointed out by some reporters attending the press conference, is the player who has a head injury but whose concussive symptoms don’t appear until after the game. This player would have been allowed to resume play, potentially putting him or her at risk for a second head injury. Because the diagnosis of concussion requires symptoms or signs, in both of these scenarios the players could return to play, even after witnessed collisions involving their heads. Although concussion symptoms may take hours to days to manifest, most concussive symptoms appear within minutes to hours, according to Dr. Kutcher.

Less open to interpretation are the AAN’s recommendations for neuroimaging in athletes with a suspected concussion. They state that CT is not appropriate in diagnosing SRC, because SRC is a clinical diagnosis that does not depend on radiologic findings. However, CT can be obtained to rule out more severe TBI, including intracranial hemorrhage in cases of suspected concussion and loss of consciousness, posttraumatic amnesia, focal neurologic deficits, persistently altered mental status, potential skull fracture, or signs of clinical deterioration.
**Diagnosed Concussion**

**The Basics**

- Return to play is prohibited until concussion has resolved
- Return to play is prohibited until the player is asymptomatic off medication
- High-school age or younger athletes: Take a more conservative approach to return to play
- Preteen athletes: Ensure appropriate assessment tools
- Consider neurocognitive testing
- Consider individual management plans
- Consider cognitive restructuring
- There is no indication for "absolute rest" after a concussion

**The Bottom Line**

In athletes with a diagnosed concussion, the AAN recommendations prohibit return to play or to practice until an LHCP is convinced the concussion has resolved and the player is asymptomatic off medication. This caution is intended to diminish the risk for recurrent or additional injury; athletes with residual reflex or cognitive impairment are potentially at higher risk for another concussion. A more conservative return-to-play approach is recommended in athletes of high school age or younger, because younger athletes seem to take longer to recover than older athletes. Ensuring that assessment tools are age-appropriate is encouraged.

In determining whether a concussion has resolved, LHCPs can use supplemental neurocognitive testing, including comparisons with age-matched normal profiles or a patient's baseline profile. Furthermore, LHCPs can consider using individualized management and return-to-play plans with careful monitoring. Cognitive restructuring -- a form of psychological counseling that includes education, reassurance, and reattribution of symptoms -- is also recommended, because data suggest that it may lessen the risk for developing postconcussion syndrome.

**Multiple Concussions/Persistent Impairment: Retirement From Play Decisions**

**The Basics**

- Professional athletes: Refer for neurologic and neuropsychological assessment
- Amateur athletes: Perform formal neurologic/cognitive assessment, and offer risk factor counseling
- Professional contact-sport athletes with chronic impairment: Recommend retirement

**The Bottom Line**

When determining whether retirement from play should be considered in professional athletes with a history of multiple concussions and persistent neurobehavioral impairments, LHCPs can
consider referring for neurologic and neuropsychological testing. In amateur athletes with multiple concussions and continued impairment, formal neurologic and cognitive assessment tools are also recommended. This population of athletes should be counseled on the risk for developing chronic neurobehavioral or cognitive impairment. For professional athletes with chronic impairment who play a contact sport, retirement is recommended.

**Conclusions**

Concussion remains a clinical syndrome that depends on a clinical history of head injury or sudden force, typical symptoms, and findings on physical examination. The AAN guideline represents an important first step to highlight the importance of recognition and management of concussion in amateur and professional athletes. These guidelines provide a basis for a consistent approach to amateur and professional athletes with mild head injuries, which should facilitate daily management at the sidelines and ringside.

Although concussions in professional athletes receive most of the press, concussions in youth sports are actually more numerous. Coaches, parents, physicians, and schools will benefit from these practical guidelines in addressing the frequent occurrence of sports-related mild head injuries.

It seems that the AAN has chosen the term "licensed healthcare provider" in order to include all medical practitioners who participate in sports medicine, acknowledging that those likely to assess athletes may not necessarily be physicians. These may include certified athletic trainers, neurologists, neuropsychologists, neurosurgeons, orthopedists, physician assistants, pediatricians, sports medicine doctors, and others. The guideline also asserts that these LHCPs must be "trained in diagnosing and managing concussion," which emphasizes the need for proper training regardless of one's specialty or degree. Ultimately, the management of each athlete with a concussion must be individualized.

Many questions remain regarding the pathophysiology of concussion and the best approach to facilitate brain healing. For example, what exactly is the nature of the injury at the tissue and cellular level that accounts for a patient's symptoms? What is it about a first concussion that predisposes to a second? How much "healing" takes place after a concussion vs "rerouting" of signaling to compensate for the injury? Does rapid return to play after symptom resolution engage the brain and promote healing or is prolonged rest a better approach? Can helmet technology be improved to prevent concussions? Now that concussion is on everyone's radar, perhaps research efforts will receive additional impetus, and the answers to these and other important questions will be forthcoming sooner rather than later.
References


