

Back Ground Information

In the United States, the annual incidence of sports-related concussion is estimated at 300,000. Estimates regarding the likelihood of an athlete in a contact sport experiencing a concussion may be as high as 19% per season. Although the majority of athletes who experience a concussion are likely to recover, an as yet unknown number of these individuals may experience chronic cognitive and neurobehavioral difficulties related to recurrent injury. Such symptoms may include chronic headaches, fatigue, sleep difficulties, personality change (e.g. increased irritability, emotionality), sensitivity to light/noise, dizziness when standing quickly, and deficits in short-term memory, problem solving and general academic functioning. This constellation of symptoms is referred to "Post-Concussion Syndrome" and can be quite disabling for an athlete. In some cases, such difficulties can be permanent and disabling. In addition to Post-Concussion Syndrome, suffering a second blow to the head while recovering from an initial concussion can have catastrophic consequences as in the case of "Second Impact Syndrome," which has led to approximately 30-40 deaths over the past decade.

In summary, athletes that are not fully recovered from an initial concussion are significantly vulnerable for recurrent, cumulative, and even catastrophic consequences of a second concussive injury. Such difficulties are prevented if the athlete is allowed time to recover from concussion and return to play decisions are carefully made. No athlete should return to sport or other at-risk participation when symptoms of concussion are present and recovery is ongoing. In summary, the best way to prevent difficulties with concussion is to manage the injury properly when it does occur.

Importantly, however, the recognition and management of concussion in athletes can be difficult for a number of obvious reasons:

- Athletes who have experienced a concussion present with a wide variety of symptoms. Although the classic symptoms of loss of consciousness, confusion, and/or memory loss may be present in some athletes with mild concussion, there may or may not be obvious signs that a concussion has occurred. Symptoms of concussion are typically quite subtle and may go unnoticed by the athlete, team medical staff, or coaches.
- Current management guidelines (i.e. Grade 1, 2, 3 of concussion) are not evidenced-based and little to no scientific data support the arbitrary systems that are in place to manage concussion. As a result, there are currently 19 different management criteria available for concussion management. As a result, they are often misused and misinterpreted.
- Traditional neurological and radiologic procedures, such as CT, MRI, and EEG, although helpful in identifying more serious concerns (e.g. skull fracture, hematoma, contusion), are not useful in identifying the effects of concussion. Such tests are typically unremarkable or normal, even in athletes sustaining a severe concussion. The reason for this issue is that concussion is a metabolic rather than structural injury. Thus, structural neuroimaging techniques are insensitive to the effects of concussion.

- Most importantly, athletes may not understand the potential consequences of concussion and often minimize or deny symptoms so that they can return to play. Such under-reporting of symptoms is a common practice at all levels of sport participation.

Given these outlined concerns and inherent difficulties in managing concussion, individualized and comprehensive management of concussion is optimal. At the forefront of proper concussion management is the implementation of baseline and/or post-injury neurocognitive testing. Such evaluation can help to objectively evaluate the concussed athlete's post-injury condition and track recovery for safe return to play, thus preventing the cumulative effects of concussion. In fact, neurocognitive testing has recently been called the "cornerstone" of proper concussion management by an international panel of sports medicine experts. ImPACT is a user-friendly computer based testing program specifically designed for the management of sports-related concussion. The instrument has been designed after approximately 10-years of University-based, grant-supported research. ImPACT is currently the most widely utilized computerized program in the world and is implemented effectively across high school, collegiate, and professional levels of sport participation.