

nity, and drug-treatment settings — is critically important.

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Concussion

TO THE EDITOR: In the Clinical Practice article on concussion by Ropper and Gorson (Jan. 11 issue),¹ the discussion of sport-related concussion is outdated — especially, the definition of concussion. The review is also inaccurate regarding the risk of recurrent concussion and the second impact syndrome. The authors do not address and are at odds with recent collaborative consensus statements on concussion, which provide the following guidance.²⁻⁶ Loss of consciousness is rarely present in sport-related concussion, and a brief loss of consciousness does not correlate with the severity of the injury. The type, severity, and duration of the symptoms are the most useful criteria for determining the severity of concussion. Assessment and treatment of the concussed athlete must be individualized. Factors that must be considered include age, sport in which the injury occurred, presence or absence of a history of concussion, and if there have been previous concussions, their proximity to the current injury and their severity. Symptomatic athletes should not be allowed to return to play. Neuropsychological testing may help in evaluating the athlete's cognitive functioning and in decision making about the return to play. Physical and mental rest appear to be important for recovery. Younger athletes should be treated more conservatively than older athletes. The athlete's return to activity should be gradual and progressive.

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TO THE EDITOR: Ropper and Gorson state that loss of consciousness and amnesia define a concussion, even though loss of consciousness is relatively unusual in concussive head trauma. Current guidelines emphasize the presence of amnesia and characteristic symptoms as better predictors of concussion and its resolution.¹⁻⁴

Sports physicians have abandoned strict grading systems in favor of an individualized approach to assessment and treatment that is based on an evaluation of risk factors, such as age, presence or absence of a history of concussion, duration of symptoms, and response to exercise, and an assessment of cognitive functioning, with computed tomographic (CT) scanning reserved for patients with possible intracranial bleeding. Extensive research supports neuropsychological testing as a tool for assessing the severity of concussion.⁵ Dramatic progress and collaborative efforts regarding concussion should not be overlooked.

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TO THE EDITOR: The American Academy of Pediatrics Council on Sports Medicine and Fitness is concerned that the definition of concussion used by Ropper and Gorson will result in significant underrecognition of mild traumatic brain injury, especially in children. A more appropriate definition is a traumatically induced alteration in mental status, often manifested as confusion or amnesia that is not necessarily associated with loss of consciousness. Research has shown that young age may significantly prolong the recovery time because of the immaturity of the brain.¹

The article by Ropper and Gorson does not discuss long-term sequelae in children. Studies suggest that such sequelae include low self-esteem, loneliness, antisocial behavior,² and prolonged memory deficits. Even though the second impact syndrome has recently come under scrutiny, several reported cases fit the definition of this syndrome and have occurred only in children.³

Decisions about return to play may be particularly difficult in the case of children with concussion. Research suggests that high-school athletes have poorer memory functioning 7 days after the injury than at day 1 or day 2, making the timing of evaluations difficult. We recommend a graduated return to play, with individualized evaluations as delineated by the Prague guidelines.⁴

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TO THE EDITOR: Although Ropper and Gorson provide a comprehensive review of concussion, pediatrics is misrepresented. The authors state that "imaging is routinely recommended for children younger than 16 years," which is a broad generalization that warrants reconsideration. Such a recommendation would lead to unnecessary CT scanning and exposure to radiation, which is a special concern in pediatrics.¹

The American Academy of Pediatrics has published criteria for identifying high-risk patients in whom CT studies are warranted. These criteria include an age of less than 3 months, the presence of a skull fracture, depressed mental status, and focal neurologic deficits. The academy also identified a low-risk group of patients in whom no radiographic imaging is required.² Palchak et al.³ also showed that isolated loss of consciousness, amnesia, or the combination was not predictive of either CT evidence of traumatic brain injury or injury requiring acute intervention. Thus, Ropper and Gorson should consider modifying their broad recommendation for routine imaging in children younger than 16 years.

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TO THE EDITOR: The likelihood that the 64-year-old woman described in the vignette has a driver's license is 89%.¹ Blows to the head, even in elite athletes, can cause prolongation of reaction times for days.² The AAA Foundation for Traffic Safety reports that about 20 major decisions are needed for each mile a person drives and that drivers frequently have less than half a second to make these decisions correctly in order to avoid a collision.³

Neuropsychological testing is the gold standard, but it is costly, delays management, and is unavailable in rural areas. Self-administered screening tools, such as the CNS Vital Signs and Neuro-

Trax systems, offer rapid, affordable, objective assessment of cognitive functioning. Any patient who has concussion as a result of an unobserved injury or with witnessed confusion should undergo screening to ascertain whether further assessment or rehabilitation is needed. Patients who have good cognitive functioning should be told that they can drive, whereas those who do not have good cognitive functioning should be medically advised not to drive, with charted documentation that protects the physician from liability.⁴

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THE AUTHORS REPLY: In a field dominated by expert opinion, we sought to provide an evidence-based review and to limit comment when such evidence was absent or equivocal or when studies had serious limitations. The Prague guidelines and various symposia on sport-related concussion cited by the correspondents admirably fill a void and meet the need for conservatism and are cited in our review. They are not, however, supported by clinical evidence at this point, a problem that is reflected by the revisions based on successive national and international meetings and by the differences from one set of guidelines to another.

The points made by Cantu and colleagues are useful, and in our review, we stress the importance of the type and severity of postconcussive symptoms as well as the need to individualize

management decisions. We also indicate that brief confusion, amnesia, or headache may occur while alertness is preserved after a minor head injury. However, it is not known whether these symptoms share the same mechanism (i.e., a mechanism required for the maintenance of consciousness). Moreover, it has not been determined whether such limited symptoms have the same implications for cognitive decline or the risk of intracranial bleeding. Classifying minor symptoms as a concussion is therefore arbitrary. At the root of this uncertainty is the oldest question about the cause of the concussive symptoms: Are the cerebral hemispheres “shaken up” (*commotio cerebri*) and does this condition exist on a continuum with diffuse axonal injury, or is the effect a transient one in the thalamic-midbrain region?

We agree that the available grading systems for concussion and the guidelines of the American Academy of Neurology have limitations. (We were unsuccessful in obtaining information on a pending revision of these guidelines.) However, the guidelines do make the important point that there are no class I studies to guide treatment of concussion or decisions on the return to play — a point that remains true with the possible exception of the CT decision rules presented in our review.

As we point out in our review, the original descriptions of the second impact syndrome were lacking in quality. We found the analysis by McCrory and Berkovic¹ persuasive in questioning whether there is a risk of diffuse brain edema after a second blow.

The differences in opinion reflected in the correspondence reflect the many uncertainties involved in the management of concussion. Further research is needed to gain a better understanding of concussion, its effects, and its optimal management.

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Proceduralists — Leading Patient-Safety Initiatives

TO THE EDITOR: We have enjoyed watching the *Journal's* new procedural videos and applaud their emphasis on proper procedural techniques. This

new approach to procedural training complements a trend at a few institutions that are taking patient safety to the next level by supporting a new group