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Concussion care: Simple strategies, big payoffs

Address persistent symptoms, avoid unnecessary tests, and prevent premature return to usual activities.

Practice recommendations

- Consider any alteration of mental status that follows a trauma to be a concussion, whether or not there is also a loss of consciousness (A).
- Don't order neuroimaging routinely; it is not necessary for diagnosing concussion. Neuroimaging is important, however, for patients who exhibit prolonged unconsciousness, focal neurologic deficits, or worsening symptoms (A).
- Treat post-concussive headache, a common complaint, with acetaminophen or ibuprofen (A).

Strength of recommendation (SOR)

- A Good-quality patient-oriented evidence
- B Inconsistent or limited-quality patient-oriented evidence
- C Consensus, usual practice, opinion, disease-oriented evidence, case series

It's 7 AM and you're just finishing breakfast when you get a call from an emergency room (ER) resident telling you that Max, a 14-year-old patient of yours, has just been brought in by ambulance after a car accident. When the EMTs arrived at the scene, the car was totaled. The driver, Max's older brother, had no injuries other than a minor abrasion on his nose, but Max was unconscious.

By the time you get to the hospital, Max is sitting up and talking. He says his head aches and he's feeling dizzy. He's

having difficulty comprehending what he's doing in the ER, doesn't know how he got there, and has no memory of the accident. He has a small contusion on his forehead, but no other apparent injuries.

You question Max's brother, and he tells you he hydroplaned while driving in the rain, and skidded into a telephone pole. He was OK, but Max was slumped down in his seat and unresponsive. The driver of another car had seen the accident and called 911.

How would you evaluate Max's condition? What tests would you perform? And what would you tell his worried parents?

A diagnosis with variable—and often subtle—symptoms

Max's situation fits the American Academy of Neurology's (AAN) definition of concussion, ie, an alteration in mental status following a trauma that may or may not result in a loss of consciousness.¹ According to the AAN, this change in mental status usually lasts less than 24 hours and may be coupled with symptoms of vertigo, headache, nausea, vomiting, tinnitus, photophobia, blurred vision, and anterograde or retrograde amnesia.²⁻⁵

The presenting signs and symptoms of concussion are so variable that the condition can be difficult to diagnose. Many patients display nothing more than a so-

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called vacant stare. Others experience only minor symptoms, such as headache or nausea. Max's loss of consciousness is relatively rare, occurring in only about 10% of concussion cases.⁶

At least 1.4 million concussions occur in the United States each year, according to the Centers for Disease Control and Prevention (CDC).^{7,8} The incidence, though, is probably greater than the CDC reports, because so many cases are unrecognized or unreported. Falls, motor vehicle accidents, and sports injuries are the leading causes, with some 250,000 football-related concussions reported each year.^{4,7,9,10}

Common, yes, but challenging, too

As common as concussion is, it can—at times—be challenging to recognize. These tips can help:

Do a mental status exam. Ask the patient what his name is, what today's date is, and where he is now. See if he can repeat 3 words immediately after you say them and then 5 minutes later. Can he spell the word "world" backwards?

Get the story. If the patient can't remember the incident or isn't able to tell you about it, try to get the details from a witness. If the patient is able to talk, ask if she or he remembers what was happening just before the accident and afterwards. Does the patient seem to have difficulty concentrating on your questions? Seem alert, or confused? Can the patient (or a witness) tell you how the injury occurred, how severe the impact was, and whether there was loss of consciousness—all important factors in the diagnosis.¹ Has the patient ever had a concussion before? Were there any sequelae?

Perform a neurologic evaluation. Assess cranial nerves and cerebral, cerebellar, and peripheral nerve function. Check pupils for reactivity and symmetry. See whether the patient has full and appropriate eye movement in all directions. Assess grip strength and muscle strength in arm

When a CT is required

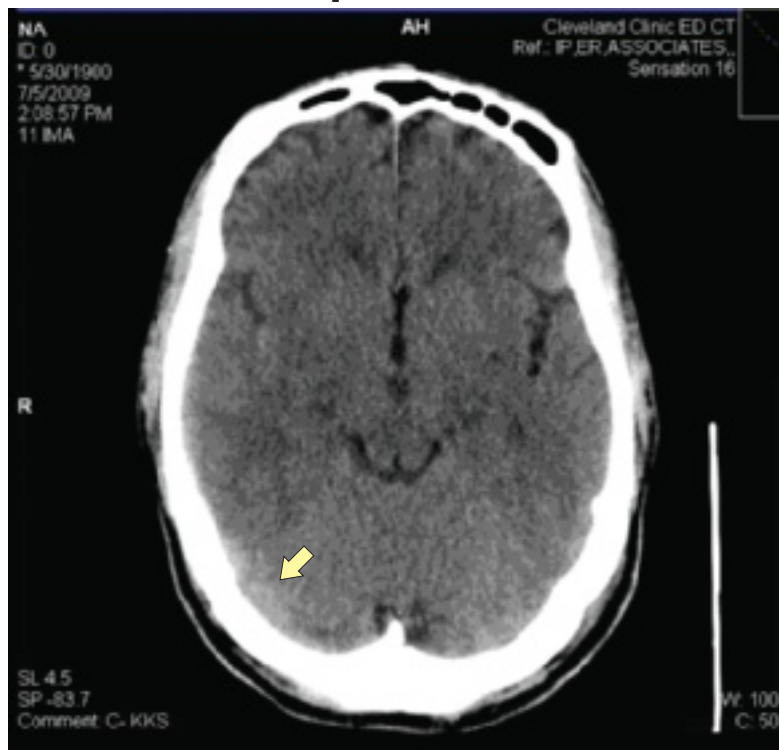


IMAGE COURTESY OF CLEVELAND CLINIC

While most cases of suspected concussion do not require imaging, it is appropriate for patients like this 52-year-old man, who had a history of assault and presented with dizziness and vomiting. His CT scan revealed mild hyperattenuation adjacent to the cranial shadow—a finding suggestive of a subarachnoid hemorrhage in the region.

and leg flexion and extension. Test for abnormalities in reactions to pinprick, temperature, and vibration in all extremities. Ask the patient to close his eyes, extend the arms with palms up, and hold the position for 20 to 30 seconds. If the patient fails this assessment for pronator drift, consider a diagnosis of muscle weakness or cerebellar disease. Check gait for ataxia and speech for fluency and coherence.

When trauma's an old story

Patients with head injury do not always seek emergency care. Whenever an office patient tells you about a head injury, however minor it seems, you should always assess for concussion. The diagnosis may be useful in guiding treatment and prevention strategies in the future. It may also help you recognize post-concussive symptoms, which can occur weeks or months after the trauma and cause significant morbidity.

FAST TRACK

Whenever a patient tells you about a head injury, however minor, assess for concussion.

CONTINUED

TABLE 1

AAN concussion grading scale¹

	GRADE 1	GRADE 2	GRADE 3
Loss of consciousness	No	No	Yes
Symptoms	Lasting <15 minutes	Lasting >15 minutes	Lasting >15 minutes

Does your patient really need imaging?

Imaging is usually not necessary for diagnosis when the mental status and neurologic examinations are negative. Abnormal imaging scans are rare in cases of suspected concussion, showing up in fewer than 10% of computed tomography (CT) scans and 30% of magnetic resonance images (MRIs).¹¹ You wouldn't order imaging for Max, as he passed his neurologic exam with flying colors. However, if he had remained unconscious for a longer period, his mental status changes had continued, or he had neurologic symptoms that persisted for more than a week, you would order neuroimaging to rule out additional pathology.^{10,12} Neuroimaging may also be indicated in cases of particularly forceful injury—a fall from a height greater than 3 feet, for example, or a pedestrian hit by a car—or for a patient with an open, depressed, or suspected basal skull fracture.

In addition, imaging studies should be done for patients with a score of less than 15 on the Glasgow coma scale, retrograde amnesia for more than 30 minutes before the accident, or more than 2 episodes of vomiting. Imaging options include a CT scan without contrast to evaluate for intracranial bleeding or an MRI without contrast to test for smaller intracranial bleeds or axonal injury.^{13,14}

CT scans are quick, generally available, and reasonably inexpensive, but may not detect all relevant abnormalities. MRIs are more sensitive and better able to detect areas of contusion, petechial hemorrhage, and axonal injury, but are less accessible in emergencies and cost a great deal more.^{13,14}

New research suggests that patients

with prolonged neurologic sequelae may benefit from single proton emission computed tomography (SPECT) or positron emission tomography (PET) in addition to conventional CT and MRI studies.^{13,15} SPECT studies use radioactive tracers that can cross the blood-brain barrier to estimate cerebral blood flow; decreased cerebral blood flow indicates areas of brain damage.¹¹ PET scans are more expensive than SPECT, but have the advantage of being able to demonstrate oxygen and glucose metabolism, which are more sensitive indicators of brain damage. While SPECT and PET images are seldom used in diagnosing concussion, they can benefit patients who continue to have neurologic deficits that require further definition of the areas of brain injury.

How to fine-tune concussion care

First, grade the concussion. Concussion scales are a useful guide for making treatment decisions.^{4,5,10} The AAN scale presented in **TABLE 1** is the most widely used. Keep in mind, though, that this scale is scheduled for revision.¹

You conclude from your examination of Max that he does have a concussion, and that his loss of consciousness indicates a grade 3, even though his symptoms of dizziness and confusion lasted less than 15 minutes.

Initiate monitoring. This essential aspect of concussion management can take place at home for most patients, with hospitalization necessary for only a few. Max can go home. You know his parents well, and they're competent to follow a monitoring protocol. For the first 24 hours, you tell them to wake Max up every 2 hours, so that they can pick up any change in his symptoms without delay. If they have difficulty waking him or he develops signs and symptoms such as vomiting or severe headache, you tell them to call you and bring Max back to the hospital.

Patients who *should* be monitored

FAST TRACK

Most patients don't require neuroimaging. Reserve it for those with abnormal neurologic or mental status exams.

in the hospital are those with seizures, evidence of intracranial bleeding or cerebral edema on CT scan, or a history of taking oral anticoagulants. So should any patients whose living situation is not reliable for adequate home monitoring—homeless patients or those with a chaotic home life, for instance.

Return to usual activities: When to say Yes, when to say No. You advise Max's parents to keep him home from school and have him take a break from homework. Concentrating on schoolwork can aggravate concussive symptoms.¹² Strenuous physical activity is out, too, and he shouldn't be alone for more than short periods until all his symptoms subside.

Sports concussions have their own imperatives, based on the grade of the concussion. Patients with a grade 1 concussion can return to the playing field within 15 minutes, as long as their neurologic exam is normal and they have no symptoms. With a grade 2 concussion, the player should be asymptomatic for 1 week before going back to normal activities. A grade 3 concussion requires that the player stay off the field until he or she has been asymptomatic for 2 weeks.⁴ This recommendation would apply to Max, who had a grade 3 concussion.

■ When symptoms linger

Most concussion patients will recover fairly rapidly. Unfortunately, however, some 38% of patients who have experienced a concussion with loss of consciousness continue to be plagued with what is called post-concussive syndrome (PCS).¹⁶ The *International Classification of Diseases* (ICD-10, 2nd ed.) defines PCS as a combination of signs and symptoms that occur within 4 weeks of head trauma with loss of consciousness. These include headache, fatigue, depression, emotional lability, difficulty concentrating, insomnia, and a preoccupation with symptoms with a fear of brain damage. The incidence of PCS using criteria in the *Diagnostic and Statistical Manual of*

TABLE 2

**Multiple concussions:
When can your patient return to play?¹**

SYMPTOM SEVERITY	SECOND CONCUSSION	THIRD CONCUSSION (OR MORE)
Concussive symptoms lasting <15 minutes	Return to play when asymptomatic for 1 week	Return to play when asymptomatic for 1 week
Post-traumatic amnesia <30 minutes, without loss of consciousness	Return to play when asymptomatic for 2 weeks	Return to play when asymptomatic for 1 month
Post-traumatic amnesia >30 minutes or loss of consciousness	Return to play when asymptomatic for 1 month	Discourage return to play indefinitely

Mental Disorders (DSM-IV) is similar to that documented with the ICD-10, which suggests that either definition could be used to evaluate for PCS.¹⁷

By far the most common of these post-concussive symptoms is headache, reported by nearly 80% of patients with PCS and occurring most often in those who are headache-prone.¹⁸ That's the case with Max, who has always had a problem with headaches and returns to your office a month after the accident complaining of persistent head pain.

Most post-concussive headaches resolve with rest and over-the-counter medications such as acetaminophen or ibuprofen. You may also consider prescribing antidepressants, particularly the selective serotonin reuptake inhibitor sertraline, which has been shown to decrease the vertigo, blurred vision, visual changes, and headache often associated with PCS.^{16,19,20} Start sertraline at a dosage of 25 mg/d, then titrate after a week to the recommended 50 mg/d.¹⁹ If symptoms persist, slowly titrate to the maximum dose of 200 mg/d while carefully monitoring for potential side effects.¹⁹

Patients with post-concussive status migrainosus, a headache lasting longer than 3 days that is unresponsive to conventional treatment, may benefit from a short course of corticosteroids.⁴ Additional treatment options include trip-

FAST TRACK

Teach parents, teachers, coaches, and players the signs and symptoms of concussion and the importance of avoiding premature return to play.

tans, anticonvulsants, and β -blockers, although none of these options has been backed up by a large-scale, randomized controlled trial.^{16,20}

■ **Vigilance needed in cases of repeated trauma**

Patients who experience repeated head trauma require particular attention. They are more likely to have detectable signs and symptoms and PCS.²¹ Also, they are more likely to incur second impact syndrome (SIS), a cascade of symptoms that can occur within 2 to 5 minutes of sustaining a second blow. SIS patients experience a rapid and diffuse cerebral edema, which can lead to brain herniation and death.³ SIS is a primary risk in sports like football, when players are allowed to return to the field too early. **TABLE 2** sets out the special diagnostic criteria the AAN has formulated for managing patients who experience repeated concussions.

■ **Help prevent concussion**

In your role as educator, you can inform patients, school officials, and community leaders about the importance of protective equipment such as sports helmets, seat belts, and air bags in reducing the incidence of concussion.^{9,15} As a family physician, you have a special opportunity to teach parents, teachers, coaches, and players to recognize the signs and symptoms of concussion, understand the risks, and stop players from returning to sports activities prematurely.⁴ ■

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FAST TRACK

Repeated head trauma increases the risk of second impact syndrome, a rapid cascade of symptoms that can lead to brain herniation and death.