Parents, athletes, doctors, and coaches are learning to err on the side of caution when it comes to concussions.

It was the day before Mother’s Day, says Julie Mattson Ostrow of Minneapolis. That’s the sort of detail a mother remembers about a day when her 14-year-old son’s head is hit so hard during a soccer scrimmage the thud is heard in the bleachers.

Matt Ostrow, who was playing goalie, had moved forward to get the ball. An offensive player on the other team didn’t—perhaps wouldn’t, says his mother—stop. They collided, with Matt’s head hitting some part of the other kid’s leg. The impact sent Matt flying backward, and he apparently lost consciousness for a few seconds. When he came to, his head hurt and so did his rib cage. But he could answer the ref’s questions and walked off the field, spending the rest of the game on the sidelines.

As Mattson Ostrow watched her son the next day, she was initially more concerned about the pain in his ribs than in his head. But when Matt mentioned that he had ringing in his ears and that his vision was a little off, she got worried and took him to an urgent care clinic.

Chest X-rays revealed no broken ribs. The physician who saw him told his parents that Matt probably had a concussion and predicted that the headaches would go away after about a week. But, she cautioned, if the headaches got worse, they should take Matt to the emergency room.

By midweek, the headaches were worse, and the family took him to Methodist Hospital in St. Louis Park, where an ER physician said that Matt might have postconcussive syndrome—a mild traumatic brain injury characterized by headache, irritability, inability to concentrate, and psychomotor abnormalities. He advised the family to seek further care if Matt’s symptoms persisted longer than a week.

The term was a new one to Mattson Ostrow, who had scoured the Internet for information on concussions. “Nobody talked about this as a possibility, but that’s what happened,” she says. “He really wasn’t getting better.”

Matt stayed home from school several weeks, struggling with fatigue and recurring headaches. He didn’t want to read and couldn’t play his guitar. Normally a strong student, he was also struggling with math.

The Ostrows took Matt to a clinic at Hennepin County Medical Center that specializes in mild-to-moderate brain injuries. There he was seen by Sarah Rockswold, M.D., the clinic’s medical director. “He had a host of symptoms,” says Rockswold, a physical medicine and rehabilitation physician. In addition to the cognitive deficiencies and headaches that his mother knew about, Matt disclosed to Rockswold that he got light-headed and had balance problems.

The constellation of symptoms was a bright red flag for Rockswold, who maintains that kids have to be symptom-free before they can return to play. “You can’t send someone back, especially a child or adolescent, who’s symptomatic in any way.”

Rockswold says such kids are at a significantly higher risk of reinjury if they return to play before they are asymptomatic. She explains that a recurrent brain injury is usually worse than the first one because it results in more severe and prolonged symptoms. Rockswold also points to work by David Hovda, Ph.D., of the University of California, Los Angeles, for example, who has found that PET scans of the brains of a severely injured player and a player who was merely stunned were identical.

That research suggests to her that all head injuries need to be taken seriously.

During the next few months, Rockswold tested and retested Matt Ostrow. He, meanwhile, missed playing in the middle school city championship baseball game and was sidelined for the summer soccer season. He reported feeling fine, but he wasn’t performing up to par on neuropsychological tests such as repeating a sequence of numbers.

His frustration level grew as the months dragged on, his mother says. “There were times that he said, ‘Boy, if we’d just stayed with those other two docs I could play.’”

When Can I Play?

Determing when an athlete who has had a concussion can go back into the game is a decision that’s often made by a committee, says Mark Gormley, M.D., a physical medicine and rehabilitation physician at Gillette Children’s Specialty Healthcare in St. Paul who often cares for children with brain injuries. “It’s not clear,” he says. “There’s lots of volatile discussion.”

Gormley says the question is the most difficult to answer when patients’ injuries are mild to moderate. “The ones I don’t see are on the sidelines,” he says. “They don’t need to see me. Those are the stealthy kind of concussions that get underneath the radar, and those players are returning sooner than they should.”

The concern from the physician’s point of view, Gormley says, is reinjury. Even a small bump might trigger the response.

Athletes, however, might have other concerns. “They want to go back and play. They’ll tell you anything so they can play again,” says Tim Tinus, Ph.D., a psychologist in Sauk Rapids, who became interested in the issue of sports concussions while he was teaching at St. Cloud State University.

Gormley notes that there is pressure on high-performance athletes to keep playing. He cites the case of one high school football star who was being scouted by Division 1 college teams. The young man came to Gillette after taking a hard hit. Gormley discovered he had another older injury that had caused bleeding in the brain. “He didn’t know that was a significant problem.”
brain injury,” Gormley says. “Luckily, he didn’t rebleed into that area.” But the player had to quit football.

**Computer-Aided Care**

Brad Reed, a certified athletic trainer at Moorhead High School, understands the pressures student athletes face—and the pressures coaches feel to get a star athlete back in the game. Several years ago, his school began using a software program, Impact (Immediate Post-Concussion Assessment and Cognitive Testing), that gives coaches, athletic trainers, and even physicians additional evidence on which to base their decisions about whether an athlete should return to play. Before the start of the sports seasons, Moorhead’s football, hockey, wrestling, and soccer players sit down before a computer screen and take a series of neurocognitive tests that assess such things as memory and reaction time. The athletes’ scores are recorded and serve as a baseline. If a player gets injured, he is retested and the scores are compared.

Tinius says the goal of the Impact program, which was developed by researchers at the University of Pittsburgh Medical Center, is to get neurological information into the hands of the people making decisions about the player. But he notes that only a few schools in the state have the means to do this. One of the limiting factors, he says, has been access to computers. The University of Minnesota and Minnesota State University Mankato are among the state’s universities currently using Impact software for their football and hockey teams.

Reed says the program does not dictate whether a player can play—physicians, he says, make the ultimate decision—but it is a useful tool for everyone involved. “It is tangible evidence for coaches and players when a player is not quite ready to play.”

HCMC’s Rockswold thinks the software is a good thing. “It helps guide people when to send [athletes] back to play. ... It would be really nice to have baseline testing on everybody.”

That might have been helpful late last summer as she was trying to assess whether Matt Ostrow’s failure of neuropsychological testing was the result of his injury.

Rockswold finally gave him the all-clear to return to sports last fall. He’s back on his soccer team and doing fine as a freshman at South High School in Minneapolis. His mother says that although she is happy that her son is back in the game, it scares her to watch him play. “I cringe when he goes for the ball.”—Carmen Peota

**Return-to-Play Guidelines**

More than 20 concussion—management guidelines have been published during the last 30 years that, although well-intended, have created as much confusion as clarity, according to Tim Tinius, Ph.D., a Sauk Rapids psychologist who has worked with athletes at St. Cloud State University. “Everybody says to use them,” he says. “But they’re no good.” For example, he notes that length of unconsciousness, which has been used to indicate the severity of an injury, has no predictive value for when a player can return to play.

In 2001, a group of physicians, neuropsychologists, and sports administrators in Vienna, Austria, produced the following recommendations for the diagnosis and management of concussions in sports, which are now considered the standard.*

Removal from contest following signs/symptoms of concussion (cannot recall play, dizzy, foggy or slow thinking, headache)

No return to play in current game

Medical evaluation following injury
a. Rule out more serious intracranial pathology
b. Neuropsychological testing or proper post-injury assessment

Stepwise return to play
a. No activity and rest until asymptomatic
b. Light aerobic exercise
c. Sport-specific training
d. Non-contact drills
e. Full-contact drills
f. Game play

*Source: Vienna Concussion Conference, 2001