

Versatile Concussion Testing with the iPad2

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Every time the Kansas football team takes the field, whether for practice or a game, the training staff wheels out a trunk full of just about every kind of medical tool imaginable.

Slings for shoulder injuries. Splints for broken bones. Rolls upon rolls of tape.

Now, it includes technology to better deal with head injuries.

The school is testing a new system called C3 Logix, which has been under development the past two years by the Cleveland Clinic's Innovation Group. Using an iPad2 as the assessment tool, the C3 system incorporates elements of the widely used ImPACT test and other neurocognitive exams with balance and vision tests to present what developers hope is a more comprehensive picture of head injuries.

"We take our iPad out to practice. We bring it on the road when we travel. It's right there in the sideline trunk to be administered if we have a student-athlete with some issues," said Murphy Grant, the director of sports medicine at Kansas. "I think it's great technology."

The system, which was born out of research into Parkinson's disease, isn't billed as something that can reveal with absolute certainty whether someone has a head injury. But it does provide more information for trained medical staff to make that determination.

It is just part of a booming business centered on the diagnosis and treatment of head injuries, and comes at a time when the issue has never been a bigger part of the public consciousness.

Just this month, the NFL and its players' association reached a \$765 million settlement after more than 4,500 former players accused the league of concealing long-term dangers of concussions and rushing players back onto the field. The settlement ended two months of court-ordered mediation. As that lawsuit was being settled, three former college football players filed suit against the NCAA saying it didn't do enough to prevent, diagnose and treat brain injuries.

The issue has even trickled down to the high school level, where parents wonder whether playing football — or even soccer, which also produces plenty of head injuries — is worth the risk.

Jay Alberts, director of the Cleveland Clinic Concussion Center, was developing a system to better collect data on Parkinson's disease patients, and he began to realize it might also be useful in examining concussion patients.

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"They were saying they have these problems with balance, with multitasking, some motor, and it didn't sound like some of those symptoms were all that different from what patients with Parkinson's experience," Alberts said. "So we said, 'Why don't we expand our algorithms and our approaches to include individuals with traumatic brain injury or concussions?'"

Like other concussion tests, C3 Logix works by putting athletes through a baseline test and comparing the results to those following a possible concussion. It includes the same kind of questions that are found in systems such as SCAT2, which asks the individual to rate on a scale how dizzy they are, or how severe a headache they might have. But it also uses the iPad2's technology to take guesswork out of measuring balance and visual acuity, which also tend to be affected by a head injury.

The data is stored in the system and can be accessed by anybody involved with the treatment of the injury, whether that's the on-site training staff or even a specialist in another city. Alberts grew up in a small Iowa town so he has an interest in developing a system that is not only affordable but also can be deployed to rural or underserved populations.

So while C3 is getting a test run at Kansas, along with such places as Barrow Neurological Institute in Phoenix and the Andrews sports medicine center in Birmingham, Ala., it's also being used at Rock Valley/Boyden Hull High School in Rock Valley, Iowa — population 3,354.

"Our athletic staff and medical partners like the product because it takes the subjectivity out of concussion assessment," said Chad Janzen, superintendent of the Rock Valley Community School district.

Questions remain about whether any concussion assessment tool truly works. Systems such as ImPACT have been criticized for unreliability, and athletes including the Denver Broncos' Peyton Manning have admitted to sandbagging baseline testing in order to keep themselves on the field.

Still, Alberts and his team believe the C3 system represents another step toward better management of head injuries.

"The way I look at it, the iPad or these consumer electronic devices really provide a great platform for delivery," he said. "I think we need to do more science with it. There are still lots of questions there. But hopefully our next phase is to be rolling it out."

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