

NEUROLOGY TODAY[®]

AN OFFICIAL PUBLICATION OF THE AMERICAN ACADEMY OF NEUROLOGY

www.neurotodayonline.com

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AMERICAN ACADEMY OF NEUROLOGY[®]
 PUBLISHED BY:
 Lippincott Williams & Wilkins
 Wolters Kluwer Health

New AAN Evidence-Based Guideline on Sports Concussion

BY KURT SAMSON

Providing an update to its 1997 consensus-based practice parameter, the AAN has released a new evidence-based guideline for evaluating and treating sport concussions. The guideline is based on a comprehensive analysis of all published evidence-based research on clinical risk factors, diagnostic tools, and interventions that may reduce further concussion risk and enhance recovery.

While there has been a surge in awareness in sport concussions and mild traumatic brain injury (mTBI), much research remains to be done to better predict, diagnose, treat, and assess risk of long-term cognitive consequences of such injuries, noted study author Jeffrey Kutcher, MD, associate professor of neurology at the University of Michigan, Ann Arbor who is the immediate past chair of the AAN Sports Neurology Section.

“It is very clear now that concussion is an injury that is different in each person, and that each individual case must be considered on its own. It is impossible for one protocol to apply to all, which makes evaluating cases and assessing risk so difficult,” he said.



The updated guidance was published in the Mar. 18 online issue of *Neurology*, and its findings were discussed in a news briefing on Mar. 18 at the AAN annual meeting in San Diego.

In an accompanying editorial, AAN Sports Neurology Section Chair Anthony G. Alessi, MD, associate clinical professor of neurology at the University of Connecticut in Farmington; Thomas Mayer, MD, medical director of the National Football League Players Association; and DeMaurice Smith, JD, the league’s executive director, observed a key change that has taken place in the 15 years since the 1997 AAN Practice Parameter.

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MINIMALLY INVASIVE SURGERY PLUS tPA — THE BENEFITS FOR INTRACEREBRAL HEMORRHAGE

BY THOMAS R. COLLINS

A technique for treating intracerebral hemorrhage (ICH) stroke patients, involving minimally invasive surgery and applying recombinant tissue plasminogen activator (rtPA) with a catheter to reduce the clot size, has continued to show good results on patient function and cost compared with regular medical therapy.

The latest results from the phase 2 trial — Minimally Invasive Surgery plus tPA for Intracerebral Hemorrhage Evacuation, or MISTIE — were presented in February at the International Stroke Conference in Honolulu. The National Institute of Neurological Disorders and Stroke funded the MISTIE trial.

If the results are borne out in a larger trial, which is expected to begin in the fall of 2013, it could be a major breakthrough in the treatment of ICH patients, for whom standard surgery has not

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In Historic Joint Policy Document, the AAN and ACEP Endorse Clinical Policy on tPA for Stroke

BY KURT SAMSON

Emergency physicians and neurologists are now working from the same playbook when it comes to administering tissue plasminogen activator, or tPA, to improve functional outcomes for patients who have had an acute ischemic stroke (AIS).

In a clinical policy document developed by a joint panel of members of the American Academy of Neurology (AAN) and the American College of Emergency Physicians (ACEP) — which was published in the February *Annals of Emergency Medicine* — the groups concluded that evidence supports the three-hour treatment

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“In 1997 it was rare to see a neurologist on the sidelines or at ringside,” they wrote. “That policy has been replaced by a call to arms for neurologists to become more involved in all sports as advocates for the safety of participants.”

Sports neurology, they continued, is moving toward becoming a recognized subspecialty of neurology, and neurologists now serve in key positions on the health and safety committees of most major professional contact sports.

Before the AAN annual meeting, *Neurology Today* asked Dr. Kutcher to discuss some highlights of the evidence.

WHY DID THE AUTHORS DECIDE TO UPDATE THE 1997 PRACTICE PARAMETER AT THIS TIME?

The sheer volume of studies involved and the comprehensive review process that we undertook made this a huge undertaking. We reviewed every paper on the subject published since 1955. Close to 9,000 citations were retrieved from our literature search, selected for review, and then filtered for relevance — multiple authors on this manuscript reviewed each paper. The vast majority of the research is new;

ARTICLE IN BRIEF

 The new AAN evidence-based guideline on evaluating, treating, and managing sports concussion is based on a review of nearly 9,000 citations in the medical literature since 1955.

around 80 percent of the titles have been published since 1997.

WHAT HAS CHANGED SINCE THE LAST GUIDELINE?

I think the biggest change is that today we have a greater understanding of what we do not know, and a completely different perspective on these injuries. For example, in 1997 there was little appreciation of potential long-term consequences from concussion and repeated mTBI. There has also been a tremendous increase in awareness of these risks among athletes across all levels.

WHAT WOULD YOU SAY IS THE MOST IMPORTANT NEW INFORMATION?

I think the most important thing that we now understand is the need for comprehensive neurological evaluation

CONCUSSION SCREENING TESTS

- **The Post-Concussion Symptom Scale (PCSS) and Graded Symptom Checklist (GSC)** consist of simple checklists of abnormal physical, cognitive, and emotional symptoms. Monitoring should not last less than 30 minutes. These can be administered by trained personnel, psychologists, nurses, or physicians, or be self-reported. It is likely these will accurately identify concussion caused by biomechanical forces to the head (sensitivity 64 percent–89 percent; specificity 91 percent–100 percent) based on multiple Class III studies.

- **The Standardized Assessment of Concussion (SAC)** takes approximately 5-6 minutes and can be used by nonphysicians on the sideline. It assesses four neurocognitive domains: orientation, immediate memory, concentration, and delayed recall, as well as loss of consciousness, amnesia, strength, sensation, coordination, concentration, and exertion. The SAC is likely to identify the presence of concussion in the early stages postinjury (sensitivity 80 percent–94 percent, specificity 76 percent–91 percent), based on multiple Class III studies.

- **The Balance Evaluation Scoring System (BESS)** takes about 5-10 minutes and is used to detect mild traumatic brain injury by testing static postural stability while standing on two surfaces — one flat and the other foam. An athlete performs three, 20-second balance tests on a single leg, on both legs, and with one foot in front of the other. BESS is likely to identify concussion with low to moderate diagnostic accuracy, based on multiple Class III studies.

- **The Sensory Organization Test (SOT)** identifies abnormal use of the three sensory systems involved in postural control based on an athlete's ability to maintain equilibrium while standing on a surface that can be tilted forward. Sensory cues to the patient's eyes, feet, and joints are inhibited, creating sensory conflicts. Six sensory conditions are tested with the eyes open or closed, and abnormal postural responses are then scored. The SOT is likely to identify concussion with low to moderate diagnostic accuracy, based on multiple Class III studies.

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whenever a player shows signs of having suffered a concussion or mTBI, and that they not be returned to play until this is conducted and all symptoms have resolved.

HOW EFFECTIVE ARE SIDELINE DIAGNOSTIC TOOLS?

Although these physical examination tools are widely used in sports, there is a relative lack of data that speak to their utility. They can help, but there is no replacement for a comprehensive neurological evaluation, even on the sidelines. With experience, we can do a neurological evaluation in just a few minutes.

Current diagnostic tools include, but are not limited to, graded symptom checklists, the Standardized Assessment of Concussion, neuropsychological assessments, and the Balance Error Scoring System, but these should only be used as part of a comprehensive neurological evaluation.

HOW EFFECTIVE IS NEUROPSYCHOLOGICAL TESTING?

Testing memory, reaction time, and the speed of cognitive processing can detect between 75 percent and 88 percent of sport concussions in older players, but there is insufficient evidence about its use in preadolescent players. It should also be noted that many additional factors may influence the results of these tests.

WHAT FACTORS MIGHT INCREASE OR DECREASE RECURRENT CONCUSSION RISK OR CHRONIC NEUROBEHAVIORAL IMPAIRMENT?

Not everyone who has a concussion will have problems, so the question is really why some players do while others do not. We need more study on this, especially over time. A history of concussion is a highly probable risk factor for recurrent concussion, and it is highly likely that there is an increased risk for repeat concussion within the first 10 days after an initial injury.

‘CONCUSSION QUICK CHECK’ — A NEW APP AVAILABLE FROM THE AAN

In conjunction with the Mar. 18 online publication of its updated evidence-based guideline on diagnosing, treating, and managing concussion, the AAN is releasing a new app, “Concussion Quick Check,” to help coaches, athletic trainers, parents, and athletes quickly evaluate if someone may have a concussion and needs to see a licensed health care provider.

The new app is available for the iPad, iPhone, and Android devices; a mobile version is available at www.aan.com/concussion.

Among key features, the app includes information on:

- common signs and symptoms of concussion
- things the athlete may tell you
- what to do if an athlete has a head injury during a game
- what to do if it appears the athlete has a concussion
- when it is okay for the athlete to return to the game
- where to find a neurologist near you
- state laws on concussion
- the AAN new evidence-based guideline for diagnosing, treating, and managing sports concussion

Ongoing clinical symptoms, concussion history, and younger age can help identify those at risk for prolonged post-concussion impairments, and there is evidence that risk of chronic neurobehavioral impairment may be linked to family history, prior learning disabilities, and the apolipoprotein E4 genotype. Data are

males, while soccer presents the greatest risk for females, followed by basketball. There is conflicting evidence as to whether female gender or male gender is a risk factor for more postconcussive symptoms, and insufficient evidence that age or gender is associated with chronic symptoms.

RISK FACTORS FOR CONCUSSION

Highly Probable	Probable
<ul style="list-style-type: none"> • Prior concussion exposure is a risk factor for chronic neurobehavioral impairment across a broad range of professional sports, and there appears to be a relationship with increasing exposure (Class I and II studies). • Ongoing clinical symptoms are associated with persistent neurocognitive impairments demonstrated on objective testing (1 Class I study and 2 Class II studies). • Concussion risk is greater for females participating in soccer or basketball (multiple Class I). • A history of concussion is a risk factor for recurrent concussion (6 Class I studies, 1 Class II study), particularly within 10 days after initial concussion (2 Class I studies). • A history of concussion (4 Class I studies, 2 Class III studies) is associated with more severe and/or longer duration of symptoms and cognitive deficits. • The apolipoprotein E4 genotype is likely to be a risk factor for chronic cognitive impairment after concussion exposure (2 Class II studies), while a preexisting learning disability may be a risk factor (1 Class I study). 	<ul style="list-style-type: none"> • Persistent neurocognitive problems or prolonged return to play (RTP) are associated with early posttraumatic headache (1 Class I study, 5 Class II studies); fatigue/fogginess (1 Class I study, 2 Class II studies); and early amnesia, alteration in mental status, or disorientation (1 Class I study, 1 Class II study, 2 Class III studies). • Younger age/level of play (2 Class I studies) is a risk factor for prolonged recovery.

‘Although these physical examination tools are widely used in sports, there is a relative lack of data that speak to their utility. They can help, but there is no replacement for a comprehensive neurological evaluation, even on the sidelines.’

insufficient to show that any intervention enhances recovery or diminishes long-term problems.

DOES AGE AFFECT RISK?

Most of the available data involve college and professional athletes; there are relatively little data on injuries among younger players. We suspect that younger players are at increased risk of injury, and we feel that they should be managed more conservatively when it comes to returning them to play.

DOES GENDER AFFECT RISK?

Most of the data we have involve male players, but in some studies females have a higher concussion incidence than males, for reasons that are not clear. Football and rugby are associated with the highest risk of concussions in

ARE ANY TOOLS USEFUL IN IDENTIFYING PLAYERS AT INCREASED RISK FOR MORE SEVERE OR PROLONGED EARLY IMPAIRMENTS, CATASTROPHIC INJURY, OR CHRONIC NEUROBEHAVIORAL IMPAIRMENTS?

None of the studies were specifically relevant to predicting neurologic catastrophe or chronic neurobehavioral impairment. There was moderate to strong evidence that elevated postconcussive symptoms, lower Standardized Assessment of Concussion (SAC) scores, neuropsychological testing score reductions, deficits on the Balance Scoring Assessment System (BESS), and the Sensory Organization Test (SOT) are likely to be associated with more-severe or prolonged postconcussive impairments. [See “Concussion Screening Tests” for more about these scales.]

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ARE CLINICAL FACTORS USEFUL?

It is highly probable that ongoing clinical symptoms are associated with persistent neurocognitive impairment when demonstrated on objective testing, but this evidence has only been studied in professional athletes. Also, there is a high likelihood that a history of concussions is associated with more severe and a longer duration of symptoms and cognitive deficits, so it is very important that injured players be evaluated and managed over time. It is also probable that younger athletes are at increased risk for longer recovery, but there were insufficient data on whether or not prior concussion is associated with chronic cognitive impairment in amateur athletes.

Probable risk factors for persistent neurocognitive problems include early posttraumatic headache, fatigue or foginess, early amnesia, alteration in mental status, or disorientation.

'I think the biggest change is that today we have a greater understanding of what we do not know, and a completely different perspective on these injuries.'

CAN NEUROIMAGING BE USEFUL?

CT imaging might be helpful, but only in ruling out more serious injuries. We did not recommend it otherwise. More serious injuries include intracranial hemorrhage and skull fracture. Athletes who lose consciousness, experience persistent amnesia or altered mental status, or have a focal neurologic deficit, should be closely monitored and may benefit from CT imaging.

DO ANY INTERVENTIONS ENHANCE RECOVERY OR REDUCE LONG-TERM COGNITIVE SYMPTOMS?

The evidence was limited regarding the effect of postconcussive activity level on recovery or the likelihood of developing chronic complications. Data were also insufficient to show that

any intervention enhances recovery or diminishes long-term sequelae.

Among other organizations, the National Football League Players Association, the American Football Coaches Association, the Child Neurology Society, the National Association of Emergency Medical Service Physicians, the National Association of School Psychologists, the National Athletic Trainers' Association, and the Neurocritical Care Society endorsed the updated guidance. •

FOR FURTHER READING:

- Giza CG, Kutcher JS, Ashwal S., et al. Summary of evidence-based guideline update: Evaluation and management of concussion in sports. Report of the Guideline Development Subcommittee of the American Academy of Neurology, *Neurology* 2013; E-pub 2013 Mar. 18.
- Alessi AG, Mayer T, Smith D. Protecting the brain in sports: What do we really know? *Neurology* 2013; E-pub 2013 Mar. 18.
- American Academy of Neurology Practice Parameter: The management of concussion in sports. *Neurology* 1997;48:581-585.
- American Academy of Neurology: Sports Concussion Toolkit. www.aan.com/go/practice/concussion