

# 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

# Guideline Endorsements

This guideline is endorsed by the following:

- The American Football Coaches Association
- The Child Neurology Society
- The National Academy of Neuropsychology
- The National Association of Emergency Medical Services Physicians
- The National Association of School Psychologists
- The National Athletic Trainers Association
- The National Football Players Association
- The Neurocritical Care Society

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# Overview

- Background
- American Academy of Neurology (AAN) guideline process
- Clinical questions
- Analysis of evidence, conclusions, recommendations
- Recommendations for future research

# Background

- Concussion is recognized as a clinical syndrome of biomechanically induced alteration of brain function, typically affecting memory and orientation, which may involve loss of consciousness (LOC).
- Estimates of sports-related mild traumatic brain injury (mTBI) range from 1.6–3.8 million affected individuals annually in the United States, many of whom do not obtain immediate medical attention.<sup>1</sup>
- Variability in care provider experience and training, coupled with an explosion of published reports related to sports concussion and mTBI, has led to some uncertainty and inconsistency in the management of these injuries.

# Background, cont.

- This evidence-based guideline replaces the 1997 AAN practice parameter on the management of sports concussion.<sup>2</sup>
- It reviews the evidence published between 1955 and June 2012 regarding the evaluation and management of sports concussion in children, adolescents, and adults.

# AAN Guideline Process

- **Clinical Question**



- **Evidence**



- **Conclusions**



- **Recommendations**

# The Analytic Process

- Guideline developed using a hybrid of AAN processes (2004 and 2011)<sup>3,4</sup>
- Literature search performed
- Articles selected and rated independently by two authors
- Evidence synthesized using a modification of the Grading of Recommendations Assessment, Development and Evaluation process<sup>5</sup>

# The Analytic Process, cont.

- Confidence in evidence anchored to the studies' risk of bias
  - “Highly likely” or “highly probable” = high confidence level
  - “Likely” or “probable” = moderate confidence level
  - “Possibly” = low confidence level
  - “Insufficient evidence” = very low confidence
- Recommendations formulated
  - Evidence systematically reviewed
  - Axiomatic principles of care
  - Strong evidence derived from non–sports-related mTBI
- Clinician level of obligation assigned (modified Delphi)
  - “Must” = “Level A,” very strong
  - “Should” = “Level B,” strong
  - “Might” = “Level C,” weak

# Four Clinical Questions

1. For athletes what factors increase or decrease concussion risk?

[7,381 abstracts, 132 final articles; 27 Class I, 5 Class II]

2 (a) For athletes suspected of having sustained concussion, what diagnostic tools are useful in identifying those with concussion? (b) For athletes suspected of having sustained concussion, what diagnostic tools are useful in identifying those at increased risk for severe or prolonged early impairments, neurologic catastrophe, or chronic neurobehavioral impairment?

[1,703 abstracts, 195 final articles; 10 Class I, 7 Class II, 70 Class III]

# Four Clinical Questions, cont.

3. For athletes with concussion, what clinical factors are useful in identifying those at increased risk for severe or prolonged early postconcussion impairments, neurologic catastrophe, recurrent concussions, or chronic neurobehavioral impairment?

[3,523 abstracts, 235 final articles; 28 Class I, 25 Class II, 16 Class III]

4. For athletes with concussion, what interventions enhance recovery, reduce the risk of recurrent concussion, or diminish long-term sequelae?

[892 abstracts, 15 final articles; 4 Class III]

# Recommendations

- **Preparticipation Counseling**
- **Assessment, Diagnosis, and Management of Suspected Concussion**
- **Management of Diagnosed Concussion**

# Recommendations: Preparticipation Counseling

- School-based professionals should be educated by experienced licensed health care professionals (LHCPs) designated by their organization/institution to understand the risks of experiencing a concussion so that they may provide accurate information to parents and athletes (**Level B**).
- To foster informed decision making, LHCPs should inform athletes (and where appropriate, the athletes' families) of evidence concerning the concussion risk factors as listed below. Accurate information regarding concussion risks also should be disseminated to school systems and sports authorities (**Level B**).

# Recommendations: Preparticipation Counseling, cont.

## *Risks for concussion*

- **Type of sport.** Among commonly played team sports with data available for systematic review, there is strong evidence that concussion risk is greatest in football, rugby, hockey, and soccer.
- **Gender.** Clear differences in concussion risk between male and female athletes have not been demonstrated for many sports; however, in soccer and basketball there is strong evidence that concussion risk appears to be greater for female athletes.
- **Prior concussion.** There is strong evidence indicating that a history of concussion/mTBI is a significant risk factor for additional concussions. There is moderate evidence indicating that a recurrent concussion is more likely to occur within 10 days after a prior concussion.

# Recommendations: Preparticipation Counseling, cont.

## *Risks for concussion*

- **Equipment.** There is moderate evidence indicating that use of a helmet (when well fitted, with approved design) effectively reduces, but does not eliminate, risk of concussion and more-serious head trauma in hockey and rugby; similar effectiveness is inferred for football. There is no evidence to support greater efficacy of one particular type of football helmet, nor is there evidence to demonstrate efficacy of soft head protectors in sports such as soccer or basketball. Mouth guards protect against dental injuries but not against concussions.
- **Age or competition level.** There is insufficient evidence to make any recommendation as to whether age or competition level affects the athlete's overall concussion risk.
- **Position.** Data are insufficient to support any recommendation as to whether position increases concussion risk in most major team sports.

# Recommendations: Suspected Concussion

## *Use of screening tools*

- Inexperienced LHCPs should be instructed in the proper administration of standardized validated sideline assessment tools. This instruction should emphasize that these tools are only an adjunct to the evaluation of the athlete with suspected concussion and cannot be used alone to diagnose concussion. These providers should be instructed by experienced individuals (LHCPs) who themselves are licensed, knowledgeable about sports concussion, and practicing within the scope of their training and experience, designated by their organization/institution in the proper administration of the standardized validated sideline assessment tools (**Level B**).
- In individuals with suspected concussion, these tools should be utilized by sideline LHCPs and the results made available to clinical LHCPs who will be evaluating the injured athlete (**Level B**).

# Recommendations: Suspected Concussion, cont.

## *Use of screening tools*

- Team personnel (e.g., coaching, athletic training staff, sideline LHCPs) should immediately remove from play any athlete suspected of having sustained a concussion, in order to minimize the risk of further injury (**Level B**).
- Team personnel should not permit the athlete to return to play until the athlete has been assessed by an experienced LHCP with training both in the diagnosis and management of concussion and in the recognition of more-severe traumatic brain injury (TBI) (**Level B**).
- LHCPs caring for athletes might utilize individual baseline scores on concussion assessment tools, especially in younger athletes, those with prior concussions, or those with preexisting learning disabilities/ADHD, as doing so fosters better interpretation of postinjury scores (**Level C**).

# Recommendations: Suspected Concussion, cont.

## *Use of neuroimaging*

- CT imaging should not be used to diagnose sport-related concussion but might be obtained to rule out more serious TBI such as an intracranial hemorrhage in athletes with a suspected concussion who have loss of consciousness, posttraumatic amnesia, persistently altered mental status (Glasgow Coma Scale <15), focal neurologic deficit, evidence of skull fracture on examination, or signs of clinical deterioration (**Level C**).

# Recommendations: Diagnosed Concussion

## *Return to play – risk of recurrent concussion*

- In order to diminish the risk of recurrent injury, individuals supervising athletes should prohibit an athlete with concussion from returning to play/practice (contact-risk activity) until an LHCP has judged that the concussion has resolved (**Level B**).
- In order to diminish the risk of recurrent injury, individuals supervising athletes should prohibit an athlete with concussion from returning to play/practice (contact-risk activity) until the athlete is asymptomatic off medication (**Level B**).

# Recommendations: Diagnosed Concussion, cont.

## *Return to play – age effects*

- Individuals supervising athletes of high school age or younger with diagnosed concussion should manage them more conservatively regarding return to play (RTP) than they manage older athletes (**Level B**).
- Individuals using concussion assessment tools for the evaluation of athletes of preteen age or younger should ensure that these tools demonstrate appropriate psychometric properties of reliability and validity (**Level B**).

# Recommendations: Diagnosed Concussion, cont.

## *Return to play – concussion resolution and graded physical activity*

- Clinical LHCPs might use supplemental information, such as neurocognitive testing or other tools, to assist in determining concussion resolution. This may include but is not limited to resolution of symptoms as determined by standardized checklists and return to age-matched normative values or an individual's preinjury baseline performance on validated neurocognitive testing (**Level C**).
- LHCPs might develop individualized graded plans for return to physical and cognitive activity, guided by a carefully monitored, clinically based approach to minimize exacerbation of early postconcussive impairments (**Level C**).

# Recommendations: Diagnosed Concussion, cont.

## *Return to play – cognitive restructuring*

- LHCPs might provide cognitive restructuring counseling to all athletes with concussion to shorten the duration of subjective symptoms and diminish the likelihood of development of chronic postconcussion syndrome (**Level C**).

# Recommendations: Diagnosed Concussion, cont.

## *Retirement from play after multiple concussions*

- LHCPs might refer professional athletes with a history of multiple concussions and subjective persistent neurobehavioral impairments for neurologic and neuropsychological assessment (**Level C**).
- LCHPs caring for amateur athletes with a history of multiple concussions and subjective persistent neurobehavioral impairments might use formal neurologic/cognitive assessment to help guide retirement-from-play decisions (**Level C**).

# Recommendations: Diagnosed Concussion, cont.

## *Retirement from play after multiple concussions*

- LHCPs should counsel athletes with a history of multiple concussions and subjective persistent neurobehavioral impairment about the risk factors for developing permanent or lasting neurobehavioral or cognitive impairments (**Level B**).
- LHCPs caring for professional contact sport athletes who show objective evidence for chronic/persistent neurologic/cognitive deficits (such as seen on formal neuropsychological testing) should recommend retirement from the contact sport to minimize risk for and severity of chronic neurobehavioral impairments (**Level B**).

# Recommendations for Future Research

- Additional investigations into factors affecting concussion risk, natural history, and outcome.
- Concussion assessment, natural history, and recovery studies of younger ages (pre–high school).
- Clinical trials of different postconcussion management strategies and RTP protocols, as well as treatments for chronic postconcussive symptoms.
- Additional studies of diagnostic and assessment tools, including gait stability, sideline tests, and neuroimaging.
- Inclusion of suspected concussion group as well as control (no concussion) and clinically diagnosed concussion groups in research study designs.
- Further definition and investigation of significant complications such as second-impact syndrome and chronic traumatic encephalopathy.

# References

1. Langlois JA, Rutland-Brown W, Wald MM. The epidemiology and impact of traumatic brain injury: a brief overview. *J Head Trauma Rehabil* 2006;21:375–378.
2. American Academy of Neurology. Practice Parameter: The management of concussion in sports (summary statement). Report of the Quality Standards Subcommittee. *Neurology* 1997;48:581–585.
3. American Academy of Neurology. 2004. *Clinical Practice Guideline Process Manual*, 2004 Ed. St. Paul, MN: The American Academy of Neurology.
4. American Academy of Neurology. 2011. *Clinical Practice Guideline Process Manual*, 2011 Ed. St. Paul, MN: The American Academy of Neurology.
5. Guyatt GH, Oxman AD, Schunemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: A new series of articles in the *Journal of Clinical Epidemiology*. *J Clin Epidemiol* 2011;64:380–382.

# References, cont.

For a complete list of references, please access the full guideline at [www.aan.com/guidelines](http://www.aan.com/guidelines).

# Question-and-Answer Period

- Questions/comments?

# Closing

- To access the complete guideline and related guideline summary tools, visit [www.aan.com/concussion](http://www.aan.com/concussion).
- If you have questions or feedback regarding this slide presentation, please contact [guidelines@aan.com](mailto:guidelines@aan.com)
- Thank you for your participation!