Development and evaluation of pediatric concussion clinical practice guidelines

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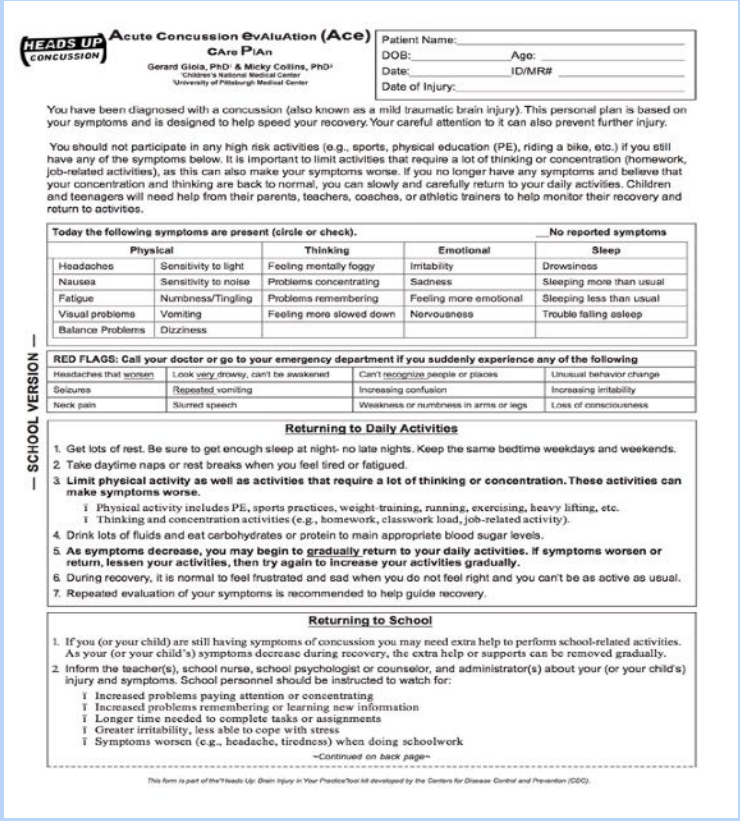
Overview and Background

- Concussion definition: Concussion is the most common type of TBI causing temporary loss of normal brain function.
  - LOC is not required, but frequently happens
  - Amnesia during/post event associated
- Zurich 2012 consensus statement, " a complex pathophysiological process affecting the brain, induced by biomechanical forces." (Maintained with additions to Berlin 2016 consensus statement.)
- Not detectable by conventional neuroimaging
  - New research into blood testing, not ready for clinical trials yet
- Diagnosed by symptoms that manifest right after injury or minutes/hours/ days later
- Yet no standard Clinical Practice Guideline developed for Pediatric Primary Care

CPG – Key Action Statements

KAS 1 Clinicians should diagnose a concussion in any child with direct or indirect head injury who presents to the primary care setting with any symptom on the CDC ACE Care Plan.

Aggregate evidence quality	Grade B
Benefits	Promotes incidence of correct diagnosis of concussion. Reduction in missed diagnosis and worsening symptoms. Increases likelihood of returning to school and/or sports sooner than a missed diagnosis.
Risks, harm, cost	No risk or harm; possible cost for training providers
Benefits-harms assessment	Preponderance of benefit
Value judgements	High value for importance of accurate diagnosis
Intentional vagueness	"Direct or indirect" is used so that clinician may use discernment when assessing and making concussion diagnosis
Role of patient preferences	None
Exclusions	Infants
Strength	Strong Recommendation



HEADS UP CONCUSSION

Acute Concussion EvAluAtion (Ace)
CAre PlAn

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Patient Name:
DOB: Age:
Date: ID/MR#
Date of Injury:

You have been diagnosed with a concussion (also known as a mild traumatic brain injury). This personal plan is based on your symptoms and is designed to help speed your recovery. Your careful attention to it can also prevent further injury.

You should not participate in any high risk activities (e.g., sports, physical education (PE), riding a bike, etc.) if you still have any of the symptoms below. It is important to limit activities that require a lot of thinking or concentration (homework, job-related activities), as this can also make your symptoms worse. If you no longer have any symptoms and believe that your concentration and thinking are back to normal, you can slowly and carefully return to your daily activities. Children and teenagers will need help from their parents, teachers, coaches, or athletic trainers to help monitor their recovery and return to activities.

Today the following symptoms are present (circle or check). ___No reported symptoms

Physical		Thinking	Emotional	Sleep
Headaches	Sensitivity to light	Feeling mentally foggy	Irritability	Drowsiness
Nausea	Sensitivity to noise	Problems concentrating	Sadness	Sleeping more than usual
Fatigue	Numbness/Tingling	Problems remembering	Feeling more emotional	Sleeping less than usual
Visual problems	Vomiting	Feeling more slowed down	Nervousness	Trouble falling asleep
Balance Problems	Dizziness			

— SCHOOL VERSION —

RED FLAGS: Call your doctor or go to your emergency department if you suddenly experience any of the following

Headaches that worsen	Look very drowsy, can't be awakened	Can't recognize people or places	Unusual behavior change
Seizures	Repeated vomiting	Increasing confusion	Increasing irritability
Neck pain	Slurred speech	Weakness or numbness in arms or legs	Loss of consciousness

Returning to Daily Activities

1. Get lots of rest. Be sure to get enough sleep at night- no late nights. Keep the same bedtime weekdays and weekends.
2. Take daytime naps or rest breaks when you feel tired or fatigued.
3. **Limit physical activity as well as activities that require a lot of thinking or concentration. These activities can make symptoms worse.**
   - Physical activity includes PE, sports practices, weight-training, running, exercising, heavy lifting, etc.
   - Thinking and concentration activities (e.g., homework, classwork load, job-related activity).
4. Drink lots of fluids and eat carbohydrates or protein to main appropriate blood sugar levels.
5. **As symptoms decrease, you may begin to gradually return to your daily activities. If symptoms worsen or return, lessen your activities, then try again to increase your activities gradually.**
6. During recovery, it is normal to feel frustrated and sad when you do not feel right and you can't be as active as usual.
7. Repeated evaluation of your symptoms is recommended to help guide recovery.

Returning to School

1. If you (or your child) are still having symptoms of concussion you may need extra help to perform school-related activities. As your (or your child's) symptoms decrease during recovery, the extra help or supports can be removed gradually.
2. Inform the teacher(s), school nurse, school psychologist or counselor, and administrator(s) about your (or your child's) injury and symptoms. School personnel should be instructed to watch for:
   - Increased problems paying attention or concentrating
   - Increased problems remembering or learning new information
   - Longer time needed to complete tasks or assignments
   - Greater irritability, less able to cope with stress
   - Symptoms worsen (e.g., headache, tiredness) when doing schoolwork

~Continued on back page~

This form is part of the "Heads Up: Brain Injury in Your Practice" tool kit developed by the Centers for Disease Control and Prevention (CDC).

CPG – Key Action Statements Cont.

KAS 2 Clinicians should recommend proper safety equipment for playing sports and educate patients and families on its importance.

Aggregate evidence quality	Grade C
Benefits	Promotes ownership in safety training for the child. Prevents injuries and decreases chances for concussions.
Risks, harm, cost	No risk or harm; possible cost of time when providing education for the child/teen athlete
Benefits-harms assessment	Preponderance of benefit
Value judgements	High value in prevention of injury and promotion of safety
Intentional vagueness	No specific types of safety equipment mentioned, so clinicians can tailor information to specific activities
Role of patient preferences	Limited to what the patient is willing to wear and what is required by the sporting laws
Exclusions	None
Strength	Recommendation

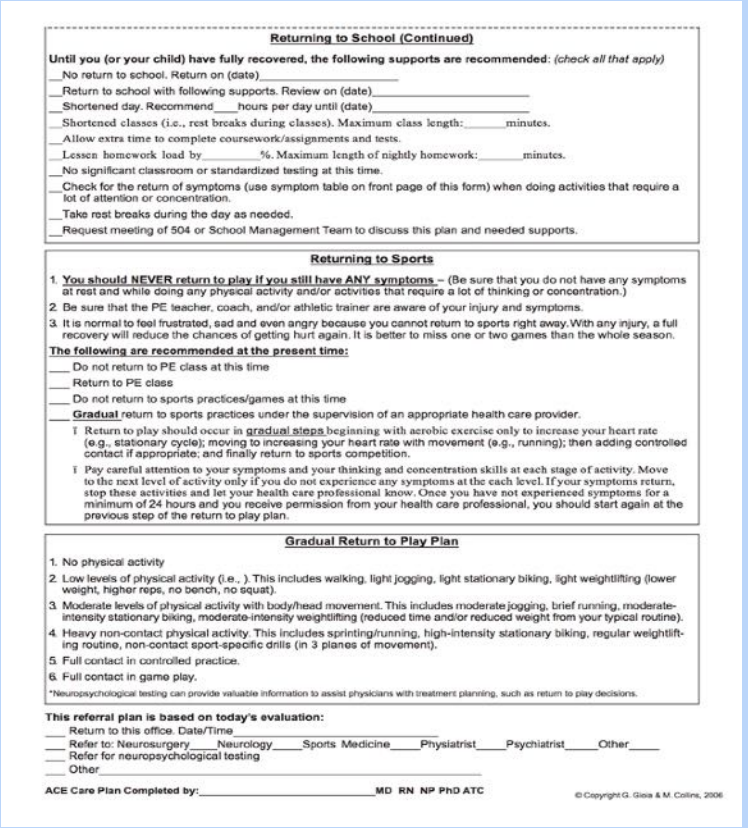
KAS 3a Clinicians should recommend no more than 1-3 days of physical and cognitive rest following a concussion diagnosis.

Aggregate evidence quality	Grade C
Benefits	Standard recommended time to rest and then return to social activities. Promotes a realistic time of physical and mental rest. Does not set the youth up for failure by requiring unrealistic expectations and promotes reintegration to social activities.
Risks, harm, cost	Risk of continuing symptoms that may not resolve in 1-2 days, but longer rest periods are not associated with quicker symptom resolution; Harm, none; Cost, missed school/work for parents
Benefits-harms assessment	Preponderance of benefit over risk
Value judgements	High value in research supporting shorter rest periods and returning to social activities to promote better recovery
Intentional vagueness	None
Role of patient preferences	None
Exclusions	None
Strength	Recommendation

CPG- Key Action Statements Cont.

KAS 3b Clinicians should fill out and use CDC ACE Care Plan for school accommodations when concussed children are returning to school.

Aggregate evidence quality	Grade C
Benefits	Reduction in missed school and social integration by providing accommodations. To promote better resolution of symptoms, accommodations will allow for the student to remain in class. Prevents protracted recovery when students feel isolated. Promotes further communication between educators and clinicians to discuss progress and symptoms.
Risks, harm, cost	No risk or harm; possible cost of paper and time for filling out form
Benefits-harms assessment	Preponderance of benefit
Value judgements	High value placed on the importance a standard accommodation form and returning to school as soon as possible
Intentional vagueness	None
Role of patient preferences	Form can be modified and selected to best suit the patient's needs
Exclusions	Non-school-aged patients
Strength	Recommendation



Returning to School (Continued)

Until you (or your child) have fully recovered, the following supports are recommended: *(check all that apply)*

__No return to school. Return on (date)_____
__Return to school with following supports. Review on (date)_____
__Shortened day. Recommend____hours per day until (date)_____
__Shortened classes (i.e., rest breaks during classes). Maximum class length:_____minutes.
__Allow extra time to complete coursework/assignments and tests.
__Lessen homework load by_____%. Maximum length of nightly homework:_____minutes.
__No significant classroom or standardized testing at this time.
__Check for the return of symptoms (use symptom table on front page of this form) when doing activities that require a lot of attention or concentration.
__Take rest breaks during the day as needed.
__Request meeting of 504 or School Management Team to discuss this plan and needed supports.

Returning to Sports

1. **You should NEVER return to play if you still have ANY symptoms** – (Be sure that you do not have any symptoms at rest and while doing any physical activity and/or activities that require a lot of thinking or concentration.)
2. Be sure that the PE teacher, coach, and/or athletic trainer are aware of your injury and symptoms.
3. It is normal to feel frustrated, sad and even angry because you cannot return to sports right away. With any injury, a full recovery will reduce the chances of getting hurt again. It is better to miss one or two games than the whole season.

The following are recommended at the present time:

___ Do not return to PE class at this time
___ Return to PE class
___ Do not return to sports practices/games at this time
___ **Gradual** return to sports practices under the supervision of an appropriate health care provider.

- Return to play should occur in gradual steps beginning with aerobic exercise only to increase your heart rate (e.g., stationary cycle); moving to increasing your heart rate with movement (e.g., running); then adding controlled contact if appropriate; and finally return to sports competition.
- Pay careful attention to your symptoms and your thinking and concentration skills at each stage of activity. Move to the next level of activity only if you do not experience any symptoms at the each level. If your symptoms return, stop these activities and let your health care professional know. Once you have not experienced symptoms for a minimum of 24 hours and you receive permission from your health care professional, you should start again at the previous step of the return to play plan.

Gradual Return to Play Plan

1. No physical activity
2. Low levels of physical activity (i.e.,). This includes walking, light jogging, light stationary biking, light weightlifting (lower weight, higher reps, no bench, no squat).
3. Moderate levels of physical activity with body/head movement. This includes moderate jogging, brief running, moderate-intensity stationary biking, moderate-intensity weightlifting (reduced time and/or reduced weight from your typical routine).
4. Heavy non-contact physical activity. This includes sprinting/running, high-intensity stationary biking, regular weightlifting routine, non-contact sport-specific drills (in 3 planes of movement).
5. Full contact in controlled practice.
6. Full contact in game play.

*Neuropsychological testing can provide valuable information to assist physicians with treatment planning, such as return to play decisions.

This referral plan is based on today's evaluation:

___ Return to this office. Date/Time_____
___ Refer to: Neurosurgery____Neurology____Sports Medicine____Physiatrist____Psychiatrist____Other____
___ Refer for neuropsychological testing
___ Other_____

ACE Care Plan Completed by:_____**MD RN NP PhD ATC**

CPG- Key Action Statements Cont.

KAS 3c Clinicians should refer to specialty care when patients present to the primary care setting with symptoms of HA, Dizziness and/or visual disturbances lasting longer than one week.

Aggregate evidence quality	Grade C
Benefits	Reduction in protracted recovery. Improved return to normal activities when referred for these symptoms.
Risks, harm, cost	Risk of referral when symptoms are within normal limits; no harm; Cost of referral and specialty care, deductible cost and insurance coverage variability
Benefits-harms assessment	Preponderance of benefit over risk
Value judgements	Early specialty care for sustained symptoms to promote better symptom resolution
Intentional vagueness	No specific type of care noted
Role of patient preferences	Limited to what patient and family are willing to participate in and what benefits they perceive
Exclusions	None
Strength	Recommendation

KAS 4a Clinicians should discuss with patients and parents the importance of the RTP steps and of the need for written clearance prior to full participation in sports.

Aggregate evidence quality	Grade B
Benefits	Standardized and formulaic steps to appropriately stress the body in levels and prevent returning to full contact sports or vigorous training too early. Prevents re-injury and promotes a safe return to full activity.
Risks, harm, cost	Risk and harm of non-compliance and return to play too soon, although written clearance is designed to assure proper RTP; cost of time and appointments for frequent training and check-ups to assess progress
Benefits-harms assessment	Preponderance of benefit over harm
Value judgements	High value placed on the importance of a set of therapeutic management criteria.
Intentional vagueness	None
Role of patient preferences	Patient able to be cleared/followed by specialty care, PCP or sports trainer
Exclusions	Children not in competitive sports or younger
Strength	Strong Recommendation

CPG- Key Action Statements Cont.

KAS 3c Clinicians should refer to specialty care when patients present to the primary care setting with symptoms of HA, Dizziness and/or visual disturbances lasting longer than one week.

Aggregate evidence quality	Grade C
Benefits	Reduction in protracted recovery. Improved return to normal activities when referred for these symptoms.
Risks, harm, cost	Risk of referral when symptoms are within normal limits; no harm; Cost of referral and specialty care, deductible cost and insurance coverage variability
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Value judgements	Early specialty care for sustained symptoms to promote better symptom resolution
Intentional vagueness	No specific type of care noted
Role of patient preferences	Limited to what patient and family are willing to participate in and what benefits they perceive
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Benefits-harms assessment	Preponderance of benefit over harm
Value judgements	High value placed on the importance of a set of therapeutic management criteria.
Intentional vagueness	None
Role of patient preferences	Patient able to be cleared/followed by specialty care, PCP or sports trainer
Exclusions	Children not in competitive sports or younger
Strength	Strong Recommendation

CPG- Key Action Statements Cont.

KAS 4b Clinicians may recommend pre- and post-injury neuropsychological testing for children/athletes that participate in sports.

Aggregate evidence quality	Grade C
Benefits	Baseline information on neuropsychological testing can be compared with post-injury testing to aid in determining recovery status.
Risks, harm, cost	Risk of intentional poor performance on pre-test; no harm; cost of testing.
Benefits-harms assessment	Preponderance of benefit over risk
Value judgements	Value in a quantifiable score to aide in assessing recovery
Intentional vagueness	No specific testing named, there may be more than one type
Role of patient preferences	None
Exclusions	Children under 8, neuropsychological testing not made for this age range
Strength	Recommendation

Conclusions:

CPG addresses gap in practice and research

CPG brings unified voice to therapy

CPG allows for individual therapy recommendations

Appraisers recommended CPG for clinical use

Used in clinical setting with favorable recommendations

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