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CLINICAL REPORT

Returning to Learning Following a Concussion

abstract

FREE

Following a concussion, it is common for children and adolescents to experience difficulties in the school setting. Cognitive difficulties, such as learning new tasks or remembering previously learned material, may pose challenges in the classroom. The school environment may also increase symptoms with exposure to bright lights and screens or noisy cafeterias and hallways. Unfortunately, because most children and adolescents look physically normal after a concussion, school officials often fail to recognize the need for academic or environmental adjustments. Appropriate guidance and recommendations from the pediatrician may ease the transition back to the school environment and facilitate the recovery of the child or adolescent. This report serves to provide a better understanding of possible factors that may contribute to difficulties in a school environment after a concussion and serves as a framework for the medical home, the educational home, and the family home to guide the student to a successful and safe return to learning. *Pediatrics* 2013;132:948–957

DEFINITIONS

- Individualized education plan (IEP): a formalized educational plan protected under the Individuals with Disabilities Education Act (IDEA; Pub L No. 101-476, 1990), known commonly as special education, that provides for classification or coding of a student under 1 of 13 federally designated categories and allowances for modification of regular education without penalty to the student.
- 504 plan: under Section 504 of the Rehabilitation Act (Pub L No. 93-112, 1973) and the Americans with Disabilities Act (Pub L No. 101-336, 1990), provides for a student who is not eligible for special education under an IEP but who requires accommodations in regular education on the basis of bona fide medical need, as documented by a physician and validation by the educational home.
- Individualized health care plan: a written document created by a school nurse on the basis of information provided by the student's pediatrician to document specific health care needs in the school setting with a plan for addressing each documented need.
- Family Educational Rights and Privacy Act (FERPA): a federal law established in 1974 (Pub L No. 93-380) that protects the privacy of students' "education records," including school health records, and applies to educational agencies and institutions that receive funds under any program administered by the US Department of

Mark E. Halstead, MD, FAAP, Karen McAvoy, PsyD, Cynthia D. Devore, MD, FAAP, Rebecca Carl, MD, FAAP, Michael Lee, MD, FAAP, Kelsey Logan, MD, FAAP, Council on Sports Medicine and Fitness, and Council on School Health

KEY WORDS

head injury, mild traumatic brain injury, pediatrics, return to school, academics, return to learn, cognitive deficits

ABBREVIATIONS

AT—certified athletic trainer
FERPA—Family Educational Rights and Privacy Act
HIPAA—Health Insurance Portability and Accountability Act
IEP—individualized education plan
IDEA—Individuals with Disabilities Education Act
RTL—return to learn

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The guidance in this report does not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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- Child Find: Child Find is a continuous process of public awareness activities, screening, and evaluation designed to locate, identify, and refer as early as possible all young children with disabilities and their families who are in need of Early Intervention Program (Part C) or Preschool Special Education (Part B/619) services of the IDEA.

INTRODUCTION

Much attention has been paid to concussions in children and adolescents, particularly concussions resulting from sports. The majority of the focus on concussions has been centered on diagnosis, education of key stakeholders regarding the problem, and the timing of safe return to play (that is, to sports and other physical activity). Unfortunately, little attention has been given to academics and learning and how a concussion may affect the young student learner. Developing appropriate guidance and evidence-based recommendations

for a “return to learn” (RTL) for a student following a concussion is a challenge, given the limited research that exists in this area of concussion and its management. Because of this shortage of research, the guidance provided in this clinical report is based primarily on expert opinion and adapted from a program developed in Colorado to address the issue of RTL.¹ Data are currently insufficient to advocate the ideal way to manage the RTL in the pediatric population.

Pediatricians report that inadequate training on concussion management is among the most significant barriers to effectively counseling patients on returning to school following a concussion.² There are many published statements that discuss the importance of “cognitive rest” following a concussion.^{3–5} Cognitive rest refers to avoiding potential cognitive stressors, such as texting, video games, TV exposure, and schoolwork, as examples. However, to date, there is no research documenting the benefits or harm of these methods in either the prolongation of symptoms or the ultimate outcome for the student following a concussion. Given the disruptive nature that concussion symptoms may pose for the student and his or her family, adding additional restrictions that may not be needed has the potential to create further emotional stress during the recovery. This calls for an individualized approach for the student when a pediatrician is making recommendations for cognitive rest and the student’s RTL in the school setting.

BACKGROUND

With an estimated 1.7 million traumatic brain injuries occurring annually, many of them concussions, the need for specific recommendations for returning a student to learning after concussion is necessary.⁶ Given that students typically appear well physically after

a concussion, it may be difficult for educators, school administrators, and peers of the student to fully understand the extent of deficits experienced by a student with a concussion. This lack of outward physical appearance of illness may also make it difficult for school officials to accept the need for adjustments for a student with a concussion.

Cognitive difficulties following a concussion have long been recognized and can clearly affect a student’s learning capabilities. With recent increased attention to concussions, more focus has been placed on appropriate management for this specific injury. Neurocognitive testing, particularly the commercially available computerized versions, and its use after concussion has become more widespread, but the focus has been primarily on sports-related concussions. Although these neurocognitive tests may be helpful as a tool in assessing a student after a concussion, they have not been applied systematically to determine when and how a student is ready to take on the typical cognitive demands in a school setting.

Although a concussion can have obvious direct effects on learning, there is also increasing evidence that using a concussed brain to learn may worsen concussion symptoms and perhaps even prolong recovery.^{7,8} Increasing cognitive activities are hypothesized to add additional stress to an energy-deprived brain, which may worsen symptoms. The goal during concussion recovery is to avoid overexerting the brain to the level of worsening or reproducing symptoms. Determining the appropriate balance between how much cognitive exertion and rest is needed is the hallmark of the management plan during cognitive recovery. There is insufficient research on the role of cognitive rest, although recent research suggests benefit to the concept of cognitive rest both early and late in the recovery of the student.⁹

SIGNS AND SYMPTOMS OF CONCUSSION AFFECTING STUDENTS

Many aspects of a concussion can affect the student in the classroom. The common signs and symptoms the student may experience can be physical, cognitive, emotional, or related to sleep. Fortunately, research has demonstrated that recovery for the school-age student occurs usually within 3 weeks from the injury, but school adjustments during this recovery period may be necessary.¹⁰

When evaluating the student, recognizing the common signs and symptoms of a concussion and how they may affect the student in the school setting is important (Table 1). A thorough understanding of potential problems the student can encounter will help the pediatrician make appropriate recommendations to the school, the student, and the student's family. Allowing adequate cognitive rest may help minimize a worsening of symptoms and potentially facilitate a quicker recovery without significant disruption to the student's life.

Use of symptom checklists may help not only in evaluating what symptoms the student may be experiencing but also in rating them in severity (Figs 1 and 2). These checklists can also be used serially to follow the student through his or her recovery and identify areas that may need more targeted interventions.¹¹ Because the diagnosis of concussion is largely symptom driven, it is important not only to recognize but also to inquire further about the specific nature of the symptoms reported by the student or observed by the parent because many of the symptoms reported after a concussion may not be unique to a concussion. For example, some students may have preexisting depression, chronic daily or intermittent headaches, learning disabilities, or attention-deficit/hyperactivity disorder, which can affect reporting on a symptom checklist.

TABLE 1 Signs and Symptoms of a Concussion and the Potential Problems They May Pose to the Student

Sign/Symptom	Potential Implications in School
Headache	Most common symptom reported in concussions Can distract the student from concentration Can vary throughout the day and may be triggered by various exposures, such as fluorescent lighting, loud noises, and focusing on tasks
Dizziness/lightheadedness	May be an indication of injury to vestibular system May make standing quickly or walking in crowded environment challenging Often provoked by visual stimulus (rapid movements, videos, etc)
Visual symptoms: light sensitivity, double vision, blurry vision	Troubles with various aspects of the school building Slide presentations Movies Smart boards Computers Handheld computers (tablets) Artificial lighting Difficulty reading and copying Difficulty paying attention to visual tasks
Noise sensitivity	Troubles with various aspects of the school building Lunchroom Shop classes Music classes (band/choir) Physical education classes Hallways Organized sports practices
Difficulty concentrating or remembering	Challenges learning new tasks and comprehending new materials Difficulty with recalling and applying previously learned material Lack of focus in the classroom Troubles with test taking Troubles with standardized testing Reduced ability to take drivers education classes safely
Sleep disturbances	Excessive fatigue can hamper memory for new or past learning or ability to attend and focus Insufficient sleep can lead to tardiness or excessive absences Difficulty getting to sleep or frequent waking at night may lead to sleeping in class Excessive napping due to fatigue may lead to further disruptions of the sleep cycle

Careful history taking to account for any possible preinjury conditions is useful in assessing the student with concussion, especially one with protracted postconcussive symptoms. The pediatrician should account for these preexisting conditions and continue to manage the concussion and as well as the preexisting problems concurrently. It is also worthwhile to discuss other potential stressors that may affect symptom reporting, such as family or relationship problems, pressures from coaches and teammates if the child is involved in organized sports, and the restriction from participation in important

upcoming life events. Symptom checklists and their scores may help in determining what symptoms may need to be addressed when returning to the school environment but should not be the sole determining factor in deciding when to return a child to school after a concussion.

THE RETURN TO LEARNING TEAM

A student returning to school after a concussion may benefit from a multidisciplinary team to maximize his or her recovery (Table 2).¹ Because state laws differ, the accessibility for some

CIRCLE ONE FOR EACH LISTED	NONE	MILD	MODERATE	SEVERE			
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred or double vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitive to light	0	1	2	3	4	5	6
Sensitive to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or anxious	0	1	2	3	4	5	6

FIGURE 1

Example postconcussion symptom score checklist (recommended for seventh grade and up).⁵ Use of the postconcussion symptom scale: the student should complete the form, on his or her own, by circling a subjective value for each symptom. This form can be used with each encounter to track progress toward symptom resolution. Many students may have some of these reported symptoms at a baseline, such as concentration difficulties in the patient with attention-deficit disorder or sadness in a student with underlying depression. This must be taken into consideration when interpreting the score. Students do not need a total score of 0 to return to play if they had symptoms before their concussion. This scale has not been validated to determine concussion severity.

CIRCLE ONE FOR EACH LISTED	NONE	RARELY	SOMETIMES	OFTEN
I have trouble paying attention	0	1	2	3
I get distracted easily	0	1	2	3
I have a hard time concentrating	0	1	2	3
I have problems remembering what people tell me	0	1	2	3
I have problems following directions	0	1	2	3
I daydream too much	0	1	2	3
I get confused	0	1	2	3
I forget things	0	1	2	3
I have problems finishing things	0	1	2	3
I have trouble figuring things out	0	1	2	3
It's hard for me to learn new things	0	1	2	3
I have headaches	0	1	2	3
I feel dizzy	0	1	2	3
I feel like the room is spinning	0	1	2	3
I feel like I'm going to faint	0	1	2	3
Things are blurry when I look at them	0	1	2	3
I see double/two of things	0	1	2	3
I feel sick to my stomach	0	1	2	3
I get tired a lot	0	1	2	3
I get tired easily	0	1	2	3

FIGURE 2

Example of postconcussion symptom score checklist (recommended for kindergarten to sixth grade).⁵

students to a school physician or a school nurse may be less likely in some communities. It remains essential that all schools recognize the importance of team management for a student after concussion and ensure that all students recovering from concussion have assigned staff who will be responsible for smooth reentry to school. Yet in the ideal situation, there is a school physician in every district and a school nurse in every school, so that a medical team in the educational home can readily work with the student's medical home toward a child or adolescent's optimal benefit and outcome.^{12,13}

Even though a student may be having symptoms, ultimately, the goal is to keep disruptions to the student's life to a minimum and to return the recovering student to school as soon as possible. The challenge of the multidisciplinary team is to balance the need for the student to be at school with the appropriate adjustments for the cognitive demands at school that have the potential for increasing symptoms. To reach the right balance at home and school, the multidisciplinary teams should be well versed in their roles and responsibilities in concussion management and keep communication open among all parties regarding decisions to progress, regress, or hold steady during the RTL process.

After a concussion, the student already has individuals in place for each of the teams described (Table 2). Ideally, at least 1 person from each team is involved in the concussion management and communicating with each other to help facilitate the recovery. The pediatrician does not need to create the teams or roles, but it will help to understand what roles and responsibilities each team has in the recovery of the student.

The role and responsibility of the family team is to enforce rest and to reduce stimulation to the student during recovery. In the early phases of a concussion,

TABLE 2 Multidisciplinary Team to Facilitate “Return to Learning”¹

Team	Members of the Team
Family team	Student, parents, guardians, grandparents, peers, teammates, and family friends
Medical team	Emergency department, primary care provider, concussion specialist (primary care sports medicine physicians, neurologists, neurosurgeons, as examples), clinical psychologist, neuropsychologist, team and/or school physician
School academic team	Teacher, school counselor, school psychologist, social worker, school nurse, school administrator, school physician
School physical activity team	School nurse, athletic trainer, coach, physical education teacher, playground supervisor, school physician

All members listed for a team do not need to be involved for successful concussion management. An individual, such as an emergency department physician, may only be involved in the initial assessment and suggestion for initiating academic adjustments. Some members may serve roles on various teams. Some schools may have access to only certain individuals suggested for a team. This list is meant to serve as a framework to help pediatricians and others involved with concussion management, possible roles they can serve for a student with a concussion.

symptoms may be so severe that they may prevent the student from attending school or even accepting home tutoring. However, as symptoms become tolerable, short-lived, and/or amenable to rest and intervention, the student may return to school, often with the use of supplemental academic adjustments. Therefore, it is the parent who will ultimately make the decision when the student should return to school. It is not unusual for a student to be extremely symptomatic in the doctor’s office initially but minimally symptomatic at home within several days. Some guidance to help decision making for return to school can be found in Table 3.

The role and responsibility of the medical team is to evaluate the concussion, assess for a more serious structural or neurologic injury, and prescribe physical and cognitive rest, as appropriate, until symptoms improve. As recovery continues, the medical team should gather data from the family and from the school teams to aid in the decision of when to start to allow safe progression back to increasing physical activity.

Two school teams are involved in the recovery process for the student with a concussion, the school physical activity team and the school academic team. The roles and responsibilities of the 2 school teams are extensive and varied. In the early stages of the

concussion, the primary goal of the school physical activity team is to safeguard the student from any further potential injury to the brain. If a concussion has been suspected, it is recommended that the student be removed from physical activity and be evaluated by his or her pediatrician or other appropriate health care professionals for further diagnosis and management before returning to physical activity. Pediatricians should counsel patients on the current recommended return to activity progressions, as outlined in the clinical report from the American Academy of Pediatrics titled “Sport-Related Concussion in Children and Adolescents,” which may be applied to both athletes and nonathletes.³

Similarly, in the early phases of a concussion, the school academic team must coordinate the return of the student to cognitive exertion and help to facilitate the appropriate level of academic adjustments necessary to reduce or eliminate symptoms. Whether communication occurs directly with a single teacher or is coordinated across all teachers via the designated case manager, such as the school nurse, counselor, or school psychologist, it is essential for all adults working with the student to understand the effects of a concussion on learning and how best to reduce cognitive demands during this

TABLE 3 Sample Approach for Determining a Students’ Readiness to Return to Learning Following a Concussion¹⁷

<p>If a student/athlete experiences symptoms enough to affect his or her ability to concentrate or tolerate stimulation for even up to 30 minutes, the student should likely remain at home. The student may consider light mental activities, such as watching TV, light reading, and interaction with the family, until they provoke symptoms. Computer use, texting, and video games should remain at a minimum.</p>
<p>When the student/athlete is able to tolerate symptoms comfortably for up to 30 to 45 minutes, the parent may consider returning him or her back to learning, either through home tutoring or in-school instruction with programming adjustment as needed. However, it is the parent who should communicate with the school about the concussion and sign a release of information for school personnel to coordinate adjustments that may be needed as recommended by the primary care provider. The level of adjustments are decided collectively by the parent, school, and primary care provider based on severity, type, and duration of symptoms present.</p>

period of recovery. The parent is encouraged to return the student to school, even if the day is shortened, when the student can tolerate cognitive activity or stimulation for approximately 30 to 45 minutes. This arbitrary cutoff is based on the observation that a good amount of learning takes place in 30- to 45-minute increments. High schools with 7 to 8 consecutive classes often schedule periods at 30- to 45-minute intervals. A student with a concussion can benefit from 30 minutes of instruction and a 15-minute “rest period” before changing classes. High schools on a “block schedule” usually run 90-minute blocks (two 45-minute periods), which may require allowances for a planned rest midway through the block. The concussed student may maximize learning in 30- to 45-minute increments before needing to take a rest (Table 3). Missing instruction, however, may necessitate the need for the provision of class notes, supplemental tutoring, or an easing of assignments or course expectations.

When the student returns to school, observing which classes exacerbate

symptoms will allow for further adjustments to be made to help reduce symptom provocation. Students may be able to tolerate some classes better than others, and consideration should be given for reduced exposure for those classes that the student cannot tolerate as well by substituting a study hall period, allowing for rest periods, or making adjustments to class schedules.

As the concussion symptoms improve, the school academic team and the family team should feel comfortable increasing mental and social activities, as tolerated by the student, and involving the medical team only as needed, apart from preplanned follow-up visits. This may translate into parents allowing their child to attend a social gathering, watch a game, or return to driving. At school, this should translate into a teacher requiring more work from a student who is obviously feeling better and able to tolerate longer periods of time of mental exertion without provoking symptoms.

Pediatricians should encourage teachers to pick and choose the academic adjustments most amenable to their class teaching style and content and most appropriate for the phase of recovery of the concussion on the basis of a child's tolerance. Teachers and those on the school academic team should reassess progress at weekly intervals to determine the effectiveness and continued need of adjustments. Direct communication and attention to symptoms with the student is helpful, because the student may not be willing to mention problems specifically to the teacher. Communication with a student should be conducted in a private setting, because many students prefer not to be singled out or draw additional attention to themselves following the injury. Younger students may be apprehensive or not know how to effectively express their academic struggles. High-achieving students may also be unwilling to "give in" to adjustments that are offered.

STRATEGIES TO RETURN TO LEARN IN THE CLASSROOM

Returning a student to the classroom while symptomatic from a concussion requires an individualized approach. Most students will likely return to the classroom while symptomatic from their concussion. Each concussion is unique and may encompass a different constellation and severity of symptoms. Concussion symptoms may vary from student to student and even from concussion to concussion in the same individual who may sustain more than one concussion. Therefore, a "cookie-cutter" approach to managing a concussion and a return to the classroom cannot be applied. However, most of the difficulties that arise in students can be handled with similar adjustments, depending on the signs or symptoms they are experiencing.

In the first few weeks after a concussion, most interventions can be made in the general education classroom, by the general education teacher, with minimal support and check-ins with the school physician, school nurse, school counselor, school psychologist, school social worker, or certified athletic trainer (AT).^{14,15} Parents should be encouraged to follow up with the school and student to assess whether academic adjustments are occurring to minimize worsening of students' symptoms during their early recovery.

Physicians should learn educational terminology to assist them in being precise in what they are requesting of schools. The term "academic adjustment" is used intentionally to refer to nonformalized adjustments made to the student's environment during the typical 1- to 3-week recovery period that do not jeopardize the curriculum or require alterations in standardized testing. The term "academic accommodations" is used to address longer-term needs, beyond 3 weeks, which may include standardized testing arrangement,

extra time on work, changes in class schedule, for example, and access to the grade-level curriculum but still within the context of regular education and may be formalized in a 504 plan. The term "academic modification" is used when considering more prolonged and more permanent changes to an educational plan, necessitating special education with needs specified in an IEP. Teachers' understanding and putting a few reasonable adjustments in place in the early stages of the concussion will often help bring the student through recovery in the typical, expected timeframe of 1 to 3 weeks. The type of academic adjustments put in place should depend on the severity of the symptoms, the type of symptom, specific teaching styles used by a teacher in the classroom, and pattern of the symptoms (Table 4).

Concussion education can be conducted by the pediatrician via direct communication with school personnel on a case-by-case basis to facilitate better understanding among appropriate school personnel during the RTL process; restrictions and adjustments should be specifically listed on a school note at each visit and during the interim, if needed. Unfortunately, simply requesting this in written form does not guarantee the school can or will comply. It would be helpful for the pediatrician if the school could identify a "point person" or case manager to contact at the school and likewise for the school to be given a "point person" in the pediatrician's office who will communicate with each other during the RTL process. FERPA permission is needed by educational agencies, and HIPAA permission is required by medical personnel; therefore, a signed parent permission on a document that satisfies both is required for communication among team members. The school point person is often a member of the school academic team. The

medical home point person is someone with enough knowledge of the situation and of the child to communicate concerns back to the pediatrician. Parents should also be involved with this communication.

The team approach between the medical home and a school staff member is helpful in assisting the school with problems it encounters in the process and identifying solutions to these problems. A team approach also can reduce the likelihood of a pediatrician's office from receiving frequent phone calls from many individuals about the same situation. For many schools, the point person would be a guidance counselor, school psychologist, school physician, or school nurse. In schools in which a AT is present, the AT can help reinforce communication of any school or sports restrictions to safeguard

against the student-athlete beginning a return to play protocol but still having academic adjustments.¹⁵ For this reason, communication with the AT by the treating physician or a representative of the school who has been communicating with the physician is also encouraged.¹⁶ In some circumstances, the AT may be limited to support only the students in organized sports for the school rather than the student body as a whole. It would be helpful to the pediatrician to understand how ATs can assist the pediatrician with the management of their patients.

Encouraging parents to communicate with the school, especially the designated case manager, about how recommended adjustments are being applied can be helpful. Pediatricians should also encourage parents to communicate with their child to make sure any adjust-

ments that are being offered are also being used, as needed, and are helping.

PROLONGED SYMPTOMS

Fortunately, most students with a concussion will recover within the first 3 weeks from their injury.¹⁰ For students with symptoms lasting longer than 3 weeks, further medical management considerations and accommodations, rather than academic adjustments, may be needed. Schools currently have in place a system for accommodations (504 plan) for students expected to have temporary interference with learning or modifications (IEP) for students with a classifiable chronic condition. However, applying these systems to concussions, in some schools, may be a newer concept. Although healing may be considered "protracted" with some concussions, the expectation is still for a full recovery that no longer would require academic adjustments, accommodations, or modifications. Referral to a concussion specialist (licensed physician, such as a pediatrician, neurologist, primary care sports medicine specialist, or neurosurgeon with expanded knowledge and experience in pediatric concussion management) should also be considered, if not already initiated, for the student with prolonged symptoms.

Because laws, regulations, policies, and practices vary among states, districts, and schools, it is important that the pediatrician be familiar with the level of flexibility and creativity that a particular school will provide or permit. Differences also exist among long-term modifications, midterm accommodations, and short-term adjustments. Pediatricians should understand that the IDEA provides for longer-term accommodations. For example, there are provisions for school-based problem-solving teams to determine the appropriateness of an IEP for a child in need of long-term modifications through special education on the basis of a given classification.

TABLE 4 Signs and Symptoms of a Concussion and the Strategies to Help in the School Setting

Sign/Symptom	Potential Adjustments in School Setting
Headache	Frequent breaks Identifying aggravators and reducing exposure to them Rests, planned or as needed, in nurses office or quiet area
Dizziness	Allow student to put head down if symptoms worsen Give student early dismissal from class and extra time to get from class to class to avoid crowded hallways
Visual symptoms: light sensitivity, double vision, blurry vision	Reduce exposure to computers, smart boards, videos Reduce brightness on the screens Allow the student to wear a hat or sunglasses in school Consider use of audiotapes of books Turn off fluorescent lights as needed Seat student closer to the center of classroom activities (blurry vision) Cover 1 eye with patch/tape 1 lens if glasses are worn (double vision)
Noise sensitivity	Allow the student to have lunch in quiet area with a classmate Limit or avoid band, choir, or shop classes Avoid noisy gyms and organized sports practices/games Consideration of the use of earplugs Give student early dismissal from class and extra time to get from class to class to avoid crowded hallways during pass time
Difficulty concentrating or remembering	Avoid testing or completion of major projects during recovery when possible Provide extra time to complete nonstandardized tests Postpone standardized testing (may require that 504 plan is in place) Consider 1 test per day during exam periods Consider the use of preprinted notes, notetaker, scribe, or reader for oral test taking
Sleep disturbances	Allow for late start or shortened school day to catch up on sleep Allow rest breaks

In addition, a 504 plan is available through the Rehabilitation Act of 1973 and Americans with Disabilities Act of 1990 for a child who needs longer-term academic accommodations in regular education but does not qualify for special education through 1 of the 13 classifications available via an IEP. Most adjustments can and should be short term and through the child's educational team, with guidance from the medical home and approval by the principal and family team. The key to this process is that the pediatrician provides the school with medical documentation based on persisting signs and symptoms that might significantly limit a child's ability to access full instruction. It is also helpful for the pediatrician to realize that, often, schools will not allow a child to participate in extracurricular activities until he or she is fully participating in curricular activities.

Early in the recovery, a student may need simple academic adjustments in the classroom. Students who do not respond in the first few months may need a more targeted level of intervention. At this level, school teams may need to brainstorm and problem solve what other interventions may be helpful and decide whether more formalized assessments need to occur. Often, the family team is a critical part of the problem-solving process, as is the medical team. All 3 teams must be actively involved in managing the concussion on behalf of the recovering student. At this level, some of the interventions can no longer be easily applied in the general education classroom without formal intervention. For example, students may require some amount of pullout from the regular classroom for a small-group intervention, tutoring, or 1-on-1 instruction. Customized plans at this point may be more formalized into an Individualized Health Plan, a learning plan, or a 504 plan. Interventions at this level are

usually accommodations to the environment (ie, large-print books, extra set of books at home, audio books, extended time on tests, note takers).

If symptoms remain severe or prolonged, typically longer than 5 to 6 months, more intensive intervention may be needed. In these cases, a potentially more permanent disability is considered, necessitating most school districts to trigger their Child Find (a component of IDEA) obligations, provide appropriate testing, and develop an IEP. The family team and medical team should continue to be involved and consulted during the development of the IEP. Interventions at this level are often considered modifications of the curriculum, implying that the student may not be held responsible for the regular education curriculum required of all other same-age peers. Instead, the student may be taught without penalty on a level appropriate for him or her, often at a level lower than peers, and will only be held accountable for his or her own personal academic growth rather than being compared with typical grade-level peers.^{17,18} In addition, the concussion would be so severe at this level as to potentially necessitate specialized instruction and/or specialized programming. It is uncommon, however, for the student with a concussion to need an IEP.

When considering the implementation of a 504 plan or IEP, involving the school academic teams or special education teams is beneficial and necessary. The school academic team, including the school psychologist, can provide formal recommendations to the school to make the creation of the 504 plan or IEP that is most relevant to the particular student's greatest needs in the academic setting. Regardless of the problems, it is essential the medical team, the school team, and the family team work together, if further testing seems indicated to help in the development of an educational program through an IEP

or 504 plan. In the majority of these assessments, the recommendations and development of an IEP or 504 plan will be developed by the schools. A medical diagnosis of concussion can prompt the school academic team to collect other sources of information and consider developing a 504 plan or IEP. Importantly, 504 plans and IEPs are governed by different laws. A 504 plan can be provided when a school determines the concussion to substantially limit one or more major life activities, such as learning. On the other hand, an IEP can be provided if it is determined that the concussion results in total or partial impairment that adversely affects educational performance such that a student cannot benefit from regular education alone and requires modification of curriculum, specialized instruction, programming, and/or placement.

Although not expected or common after a concussion, a student with prolonged symptoms who does not seem to be responding to various interventions should also be evaluated for issues related to anxiety about school or school avoidance. This may be more likely in the child who sustained a concussion from an incidence of bullying or assault. Keeping a child out of school and away from friends for extended periods also may risk development of fear and isolation in a child or adolescent on attempting to return to school and might require the assistance of a mental health specialist in extreme cases.

EDUCATION

Given the large number of concussions occurring each year, both in and out of formal sport activities, most schools will encounter a child who is dealing with symptoms from a concussion. Education of all individuals involved is paramount to helping students who may need assistance in the school setting.

Education regarding concussion, generally, and the role of cognitive and

physical rest and return to school, specifically, is essential for the teams of individuals helping a student with concussion during assessment, management, and recovery. This education should extend to both school personnel (eg, administrators, athletic directors, teachers, guidance counselors, school psychologists, coaches, school physicians, school nurses, ATs) and individuals likely not employed by the school (eg, primary physicians, sports/team physicians, emergency department physicians, parents, and other caregivers). Even in states with legislation for concussion education and management, nonathletic personnel in schools are often left out of concussion education efforts. However, a comprehensive team approach to care may help reduce mistakes in management, which could potentially risk reinjury during the healing phase, lengthen recovery, or result in untoward long-term outcomes. Education, on a larger scale, should be conducted to instruct school groups on the concepts of concussion management, particularly when introducing models of cognitive rest. Education can be tailored to various school personnel as needed. Education sessions are especially helpful as sport seasons begin in the fall, winter, and spring. Several groups have developed educational materials, such as online tutorials, relevant to this topic and provide excellent resources for schools, parents, students, and health care providers (see Resources).

FUTURE DIRECTIONS

Given the paucity of studies that have been conducted thus far regarding the effects and role of cognitive rest after concussion, further research is needed. Future research is also needed to clarify best practices for RTL. Developing a better understanding of the best methods to assist a student in the school environment, determining whether cognitive rest can assist in speed

of recovery, and evaluating written and educational resources on this topic are all areas that require additional research and review. Studies comparing outcomes in school settings that have concussion management teams with case management versus those that do not would also be of value.

Continued education of all individuals involved with a student with a concussion should help facilitate better outcomes and less resistance to developing appropriate concussion management guidelines and programs.

CONCLUSIONS AND GUIDANCE FOR PHYSICIANS

1. Students with a concussion may need academic adjustments in school to help minimize a worsening of symptoms.
2. Given that most concussions resolve within 3 weeks of the injury, adjustments may often be made in the individual classroom setting without formal written plans, such as a 504 plan or IEP.
3. Students with symptoms lasting longer than 3 to 4 weeks may benefit from a more detailed assessment by a concussion specialist (licensed physician, such as a pediatrician, neurologist, primary care sports medicine specialist, or neurosurgeon with expanded knowledge and experience in pediatric concussion management) and recommendations specific to the educational environment. Considerations should be given to developing a 504 plan or, subsequently, but unlikely, an IEP, in the student with a lengthy recovery.
4. A team approach consisting of the medical team, the school team, and the family team to assist the student in his or her return to learning is ideal.
5. Students should be performing at their academic “baseline” before returning to sports, full physical activity, or other extracurricular activities following a concussion.

6. Education of all individuals involved with students who sustain a concussion is necessary to provide adequate adjustments, accommodations, and long-term program modifications for the students.
7. Additional research is necessary to strengthen and provide more evidence-based recommendations for appropriate adjustments for students following a concussion.

RESOURCES

- Brain 101: Concussion Handbook: <http://brain101.orcasinc.com/1000>
- REAP (Reduce/Educate/Accommodate/Pace) Program: a community-based concussion management program: <http://www.rockymountainhospital-forchildren.com/sports-medicine/concussion-management/reap-guidelines.htm>
- CDC Foundation Online Training for Clinicians: <http://preventingconcussions.org/>
- Centers for Disease Control and Prevention: Fact Sheet for School Professionals on Returning to School after a Concussion: http://www.cdc.gov/concussion/pdf/TBI_Returning_to_School-a.pdf
- Centers for Disease Control and Prevention: Heads Up for Schools: <http://www.cdc.gov/concussion/HeadsUp/schools.html>
- Centers for Disease Control and Prevention: Online Coaches Training: http://www.cdc.gov/concussion/HeadsUp/online_training.html
- Dr. Mike Evans Concussions 101 Video: <http://www.myfavouritemedicine.com/concussions-101/>
- Frequently Asked Questions about 504 Plans: <http://www2.ed.gov/about/offices/list/ocr/504faq.html>
- Sample Return to Learning Note for Physicians: <http://www.aap.org/en-us/>

about-the-aap/Committees-Councils-Sections/Council-on-sports-medicine-and-fitness/Documents/returntoschool.pdf and <http://www2.aap.org/sections/schoolhealth/returntoschool.pdf>

LEAD AUTHORS

Mark E. Halstead, MD, FAAP
Karen McAvoY, PsyD
Cynthia D. Devore, MD, FAAP

CONTRIBUTING AUTHORS

Rebecca Carl, MD, FAAP
Michael Lee, MD, FAAP
Kelsey Logan, MD, FAAP

COUNCIL ON SPORTS MEDICINE AND FITNESS EXECUTIVE COMMITTEE, 2012–2013

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Keith J. Loud, MDCM, MSc, FAAP

Kody A. Moffatt, MD, FAAP
M. Alison Brooks, MD, FAAP
Stephanie S. Martin, MD, FAAP

LIAISONS

Andrew Gregory, MD, FAAP – *American Medical Society for Sports Medicine*
Lisa K. Kluchurosky, MEd, ATC – *National Athletic Trainers Association*
John F. Philpott, MD, FAAP – *Canadian Paediatric Society*

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Anjie Emanuel, MPH

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Marc Lerner, MD, FAAP
Mark Minier, MD, FAAP
Jeffrey Okamoto MD, FAAP
Thomas Young, MD, FAAP

LIAISONS

Carolyn Duff, RN, MS – *National Association of School Nurses*
Linda M. Grant, MD, MPH, FAAP – *American School Health Association*
Veda Johnson, MD, FAAP – *School-Based Health Alliance*
Mary Vernon-Smiley, MD, MPH, MDiv – *Centers for Disease Control Division of Adolescents and School Health (DASH)*

CONSULTANTS

Gerry Giola, PhD
K. Brooke Pengel, MD, FAAP
Keith Yeates, PhD

STAFF

Madra Guinn-Jones, MPH

ORGANIZATIONS THAT HAVE ENDORSED THIS REPORT

American Medical Society for Sports Medicine
Brain Injury Association of America
Canadian Paediatric Society
National Association of School Nurses
National Association of School Psychologists
National Federation of State High School Associations

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