# SPORTS CONCUSSIONS A Complete Guide to Recovery and Management

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# *chapter twelve*

# Return to school

# When and how should return to school be organized after a concussion?

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# Introduction

Traumatic brain injury (TBI) is recognized as a significant public health concern with *mild* TBI (mTBI) as the most common presentation. There is also a growing understanding of the necessity of the student's successful return to school and provision of appropriate supports (Davis et al., 2017; Halstead et al., 2013). Beyond the statements of need, the empirical literature is growing in efforts to define the type of needs and associated supports (e.g., Ransom et al., 2016; Glang et al., 2014). Despite the recovery of most children and adolescents with mTBI within four weeks (Zemek et al., 2016), the process of returning to school

is not a simple issue. As with any other medical or neurological disorder, it requires a collaborative relationship between the health-care provider, school personnel, family, and student. To accomplish the goal of a successful and productive return, the need exists to operationalize the process for all involved (Gioia, 2016).

This chapter proposes a pathway for health-care providers and schools to standardize the practical management of the student with mTBI. School return must also be contextualized within the full continuum of mTBI care from its initial diagnosis to its final recovery. This pathway spans the point of initial communication with the school of the student's injury through to its full recovery and resumption of the student's preinjury school program. To ensure proper school reentry, the family and student must receive active and coordinated guidance across the care continuum by the informed health-care provider and the prepared school team.

Regarding terminology, we use the term mTBI in this chapter, to include the term *concussion*, defined as a TBI induced by traumatic biomechanical forces secondary to direct or indirect forces to the head. It produces a disturbance of brain function that is related to dysfunction of neurometabolism (Giza and Hovda, 2014) and neurotransmission (Smith et al., 2003) rather than macrostructural injury and is typically associated with normal structural neuroimaging findings (i.e., CT scan, MRI). The mTBI typically does not involve a loss of consciousness with only 12.9% reported in the large Canadian 5P pediatric emergency department (ED) study (Zemek et al., 2016). The injury results in a constellation of symptoms manifested in physical, cognitive, emotional, and sleep-related domains. Duration of symptoms is variable and may last for as short as several minutes and last for as long as several days, weeks, or months in some cases. The most recent estimate of time to recovery in the pediatric 5P study indicates that 30% of children and adolescents remain symptomatic past four weeks (Zemek et al., 2016).

# *Partnering in the neighborhood of mild traumatic brain injury care*

The care of children and adolescents with mTBI occurs across a number of settings, from its initial presentation and diagnosis to its final recovery. In returning the student to school, the mTBI care continuum must be understood, including the unique and complementary roles each partner plays. Active role definition and performance will not only optimize the student's positive movement toward clinical recovery but also their successful reintegration into school.

The mTBI *neighborhood* can potentially include a variety of health-care providers such as emergency and urgent care practitioners, sports medicine clinicians, as well as primary care and specialty care providers. Fundamentally, mTBI is a medical/neurological diagnosis requiring the active role of the health-care provider in defining its clinical symptom manifestation and guiding its active treatment (Gioia, 2015, 2016). This brain injury should never be viewed as simply *a concussion* with passive nonmedical management as this will increase risk of reinjury and a more complicated recovery (Terwilliger et al., 2016). In the early stage of an mTBI, important medical decisions must be made about the timing of the student's return to school, the types of tolerable daily activities that the student may engage in, and the degree of participation or restriction in physical (sport and recreation) and social activities. To ensure coordinated guidance across recovery, direct and explicit communication across the care system is critically important. The school setting though not a health-care setting per se, nevertheless, plays a particularly important role in the mTBI care continuum as the *job* of the student places physical, cognitive, and social demands on the recovering brain. For a variety of reasons, students should be reintegrated back into their school environment as soon as possible. This process must, however, be done with careful and strategic preparation. School personnel, as the experts in the educational process, is charged with the important task of facilitating this reentry, making the individualized symptom-targeted adjustments and accommodations to the student's academic, social, and physical program. At the same time, the school should not be making these programmatic adaptations in isolation. The health-care provider must provide an accurate and timely diagnosis with appropriate management guidance based on the student's unique injury presentation, providing for a smooth handoff to the school. Each of the mTBI *neighbors* must carry out their unique yet complementary roles and tasks with collaborative communication.

# Mild TBI and school learning and performance

Special education programming for students with severe TBI in the United States has existed since the 1990 amendment to P.L. 94-142 (Education for All Handicapped Children) to address their academic needs (http://idea.ed.gov/explore/view/p/,root,regs,300,A,300%252E8,c,12). In contrast, only recently have the educational needs of students with mTBI been recognized. In 2010, the CDC published its initial *Heads Up* toolkit for schools (https://www.cdc. gov/headsup/schools), providing an overview of the issues that schools might face and the types of problems and associated supports that they might be provided to the returning student. That same year McGrath (2010) began the discussion, specifically within the sport mTBI arena, providing a framework for athletic trainers to support the academic needs of student athletes who were returning to school. Sady et al. (2011) followed up with a further description of the likely effects of an mTBI on the student's academic learning and performance and also discussed the effects of excessive, unsupported cognitive activity on the student's recovery. Furthermore, system-level requirements to provide school-based supports were also discussed in this paper. At a broader organizational level, the American Academy of Pediatrics (AAP) (Halstead et al., 2013) and the Canadian Pediatric Society (CPS) (Purcell, 2014) communicated the importance of the return to school process in their statements to the North American pediatric community. Since that time, the momentum has continued with a host of authors writing about the importance of supporting the student's return (e.g., Popoli et al., 2014; DeMatteo, McCauley et al., 2015).

Most recently, the pediatric subgroup reviewed the available empirical literature on sport-related concussion (SRC) in children and adolescents for the 2016 International Concussion in Sport Group meeting in Berlin, Germany including the question "What factors must be considered in 'return to school' following concussion and what strategy or accommodations should be followed?" (Davis et al., 2017). Eleven articles were reviewed revealing five factors that influence the return to school process: (1) Age: adolescents tend to take longer to recover, longer to return to school and are more concerned about possible adverse academic effects than younger children; (2) Symptom load/severity: students with a greater number of and more severe symptoms tend to take longer to return to school and require more academic accommodations; (3) School resources: schools with concussion policies that focus on student/parent education demonstrate best-practice management, provide more academic supports, and are more likely to form school-based concussion management teams; (4) Medical follow-up after injury: students who receive medical follow-up are more likely to receive academic supports in their school return; and (5) Effects on certain subjects: certain subjects are more challenging during concussion recovery (i.e., math, reading/language arts). Stemming from this literature, five recommendations were generated:

- "All schools are encouraged to have a concussion policy that includes education on SRC prevention and management for teachers, staff, students, and parents and should offer appropriate academic accommodations and support to students recovering from SRC.
- 2. Students should have regular medical follow-up following an SRC to monitor recovery and help with return to school.
- 3. Students may require temporary absence from school after injury.
- 4. Clinicians should assess risk factors/modifiers that may prolong recovery and require more/prolonged/formal academic accommodations. In particular, adolescents may require more academic support during concussion recovery.
- 5. Further research is required to determine the appropriate return to school accommodations for children and adolescents with prolonged SRC symptoms." (p. 8)

Effects of mTBI on Learning and Performance. To set the scene for the operational pathway that follows, a brief description is provided of the potential effects of mTBI on the student's learning and performance in school as well as critical system issues that should be considered. The effects of mTBI on the student can take a variety of forms and are related to their particular symptom manifestation, which can be described within four basic symptom categories—physical, cognitive, emotional, and sleep. McGrath (2010), Sady et al. (2011), and the aforementioned CDC school toolkit all describe these possible academic effects. Several studies provide empirical evidence of adverse academic effects. Ransom et al. (2015) described the types of self- and parent-reported effects on academic learning and performance in elementary, middle, and high-school students diagnosed with mTBI. In comparison with students with recent mTBI who had recovered, actively symptomatic students and their parents reported significantly higher levels of concern for the impact of mTBI on school performance and significantly more school-related problems than recovered peers and their parents. 88% of students in the symptomatic group reported at least one school problem related to symptoms interfering with school performance (e.g., headaches, fatigue, problems concentrating), and 77% reported diminished academic skills (e.g., difficulty taking notes, spending more time on homework, problems studying) in comparison with a minority of students in the just recovered group. High school reported significantly more adverse academic effects than middle and elementary school students. Greater severity of post-mTBI symptoms was associated with more school-related problems and worse academic effects, regardless of time since injury. A recent paper by Ransom et al. (2016) found that higher levels of post-concussion executive dysfunction and symptom burden were significant predictors of greater academic problems. Wasserman et al. (2016) describe greater overall academic dysfunction (e.g., attention, memory problems, and increased exertion-related symptoms), using a self-report measure, at one week but not at one-month post-injury in student-athletes who sustained mTBI compared with an orthopedic injury control group. Baker et al. (2015) performed a retrospective telephone survey (14.9 months post-injury) of 13-19-year-old students and found that symptom severity was most predictive of problems in school, including the number of days missed. Certain symptoms had a greater relationship to school problems including headache, reduced concentration and memory, and fatigue. None of these studies report whether a systematic mTBI-support structure was in place at the schools, leaving unanswered the possible contribution of the school program and environment to the student's academic challenges.

Academic Supports. In addition to describing the effects of the mTBI on academic learning and performance and the Berlin summary recommendations, a number of papers provide logical guidance regarding adjustments and accommodations to support the student. As part of the support process to start, a gradual reintroduction into the school environment and academic program is recommended by a number of authors (McGrath, 2010; Gioia, 2015, 2016; Gioia et al., 2016; Sady et al., 2011; Master et al., 2012; Purcell et al., 2016; DeMatteo, Stazyk et al., 2015) although, to date, no research has provided specific evidence-informed guidelines for this gradual return. Interestingly, in the spirit of the active rehabilitation movement (Leddy et al., 2016; Collins et al., 2016; Gagnon et al., 2009), none of these more recent papers recommend that the student be withheld from school until fully asymptomatic. Most recommend an orderly progression based on the student's symptom status and the student's tolerance for engaging in academic activity. We provide an example of a 6-stage gradual return process (Gioia, 2016) with the proposed levels of acceptable school-related activity at each stage and criteria to consider in advancing the student to the next stage. Further research is needed to validate appropriate recommendations for academic support (Carson et al., 2014).

While there are as of yet no hard and fast evidence-based guidelines as to when a student would return to school following an mTBI, the health-care provider and the parents of the injured student must nevertheless address this issue. It is generally recommended that most students remain out of school only one or two days to facilitate the acute recovery process. In a randomized controlled trial of children and adolescents with mTBI, students who were restricted from school and other activities for only 1-2 days exhibited better recovery indicators than those who were restricted for five days (Thomas et al., 2015). Thus, most students will likely do well with restriction from school for only a brief period, whereas a small percent may require a longer period due to more significant symptom severity. This decision must be an individualized decision based on the child/ adolescent's symptom burden. Corwin et al. (2014) reported that higher symptom burden was related to a greater number of days out of school prior to return, but this sample was a higher acuity, specialty clinic sample and does not provide guidance on a general rule. It may be that certain symptom patterns have a particular relationship to the timing of school return. For example, Corwin et al. (2015) found that students with vestibular symptoms—either abnormal gaze stability (VOR) or abnormal tandem gait—took a significantly longer time to return to school (median 59 days vs 6 days, P = .001). Without an evidence-based guide to the optimal time to return to school, the severity of the symptom burden should be considered. Gioia (2016) and Halstead et al. (2013) recommend a test trial of cognitive activity prior to school return to determine if 30 minutes of school activity can be tolerated. If so, return to school—at least a partial day—is recommended. This decision on the timing of the student's return to school highlights the critical importance of a medical examination soon after the injury.

Communication. A developing literature exists to reinforce the need for active communication between the health-care provider, family, and school. Zuckerbraun and colleagues (2014) demonstrated that educating parents in the ED with explicit information about mTBI symptoms, and their management helped parents to advocate for their children in returning to school and other activities. In this study, a return to school letter provided from the ED facilitated greater academic assistance given to the student upon return to school. In addition, Grubenhoff and colleagues (2015) reported that families who pursued outpatient clinic services following a visit to the ED received greater academic accommodations than those who did not receive follow-up outpatient services, suggesting that communication between the health-care provider and school benefited the student.

# Improving the systems of mild traumatic brain injury care

Policies and Procedures. To promote the systematic delivery of individual student supports, preparation and readiness are needed by the school and health-care systems. Written policies and procedures are critical guiding organizational documents to direct the school and health-care providers in providing systematic care to students across recovery (Davis et al., 2017; Gioia et al., 2016). Implementation of active policies to provide academic supports has been advocated for students with mTBI (Sady et al., 2011; Popoli et al., 2014; DeMatteo, Stazyk et al., 2015; Baker et al., 2014). The benefits of active policies for mTBI service in the schools were demonstrated in the Brain 101 program (http://brain101.orcasinc.com/) in Oregon (Glang et al., 2014) where school administrators were directed to create mTBI management policy and procedures, resulting in student athletes and parents demonstrating significantly greater mTBI knowledge, knowledge application, and behavioral intention to implement effective mTBI management practices. Recent examples of statewide mTBI policies for supporting school return can be found in North Carolina (Newlin & Hooper, 2015; http://www.nchealthyschools. org/legislation/stateboard/) and Ontario, Canada (http://www.edu.gov.on.ca/extra/ eng/ppm/158.pdf). Ideally, school-based policies should address (1) a brief description of mTBI, (2) definition of the school receiving team to guide reentry, (3) the gradual process to assist the student's return into school life (learning, social activity, and so on), (4) a process for communicating with the health-care provider(s) and family, and (5) criteria for when students can safely return to physical activity and full cognitive activity (Gioia et al., 2016).

In the health-care field, no state or national professional body has developed formal policies or procedures to prepare their respective members to develop competencies in the return to school process. The athletic training community has been the most active in researching its members' knowledge and preparation to support the student's academic return (Kasamatsu et al., 2016; Williams et al., 2015). As previously noted, the AAP (Halstead et al., 2013) and CPS (Purcell, 2014) have written on the importance of addressing return to school needs of students with mTBI, but as of yet neither national body has been active in developing a practical training program for pediatricians.

Defining Roles. As a key element of the policy and procedure process, mTBI-specific roles should be defined within the schools to efficiently and effectively manage the return and support processes (CDC, 2012; Sady et al., 2011; Glang et al., 2014; Gioia, 2016; Gioia et al., 2016). A writing group of the National Collaborative on Childhood Brain Injury (NCCBI) proposed guidance to state and local boards of education on the essential components of a statewide educational infrastructure to support the management of students with mTBI (Gioia et al., 2016). State and local policy considerations are emphasized to promote implementation of a consistent process, including five key components: (1) definition and training of the interdisciplinary school team; (2) professional development of the school and medical communities; (3) identification, assessment, and progress monitoring protocols; (4) a flexible set of intervention strategies to accommodate students' recovery

needs; and (5) systematized protocols for active communication among medical, school, and family team members. These consensus-based elements are practical guides for effective program implementation.

A very practical example of specific school-based roles is presented by the BrainSTEPS program (www.brainsteps.net) in Pennsylvania where two primary roles are defined: (1) medical/symptom monitor and (2) an academic program monitor. The medical/symptom monitor liaisons with the community health-care provider and monitors the symptom status of the student in school, using a standardized symptom scale, and reporting this status to the academic program monitor. The academic program monitor oversees and guides the academic support process, linking the student symptom status with specific accommodations and adjustments, and liaisoning with the student, teachers, and medical/symptom monitor. These two roles do not necessarily have defined personnel as each school's resources can vary but ideally the medical/symptom monitor role would be handled by a school health person (e.g., nurse), psychologist, or athletic trainer. The academic program monitor should have knowledge and experience with academic programming, ideally defined as a guidance counselor, administrator, or teacher.

Education and Training. Education and training of school personnel are also a critical component of an mTBI-supportive school environment. Needless to say, the knowledge of school personnel is a necessary step in providing the appropriate support services. As previously noted, the Brain 101 Concussion Playbook program (Glang et al., 2014; Oregon Center for Applied Science, 2007) demonstrated the facilitating effect of training school staff and students in mTBI knowledge and process. The knowledge and support of school administrators are also a key component in providing top-down support of returning students. Heyer et al. (2015) surveyed principals' knowledge and practices related to mTBI management, reporting that only 37% of principals had mTBI training in the past year. Those with training were more likely to promote training of other school faculty although most principals indicated a willingness to provide students with short-term academic accommodations. Only a minority, however, communicated with families using a written academic plan. Kasamatsu et al. (2016) and Williams et al. (2015) surveyed athletic trainers' practices in supporting the academic supports of student-athletes, identifying their important role in the return to school process. Importantly, the athletic trainers are employed directly by their schools and with more school-related experience were more familiar with academic supports. Finally, Davies et al. (2016) describe the importance of system-level training in mTBI management, including school psychologists, to the positive supports of students with mTBI.

# *Components of the school mild traumatic brain injury management pathway*

In the previous sections, we have lobbied hard for the need for a well-prepared collaborative partnership between the health-care provider(s) and the school to implement proper school management following an mTBI, each possessing unique and complementary areas of expertise. In the following, we specify the roles for the health-care provider(s) and the school personnel. For the school roles, we borrow heavily from the excellent BrainSTEPS program and add definition to the health-care provider role to provide a complementary, coordinated system.

Health-care Provider Role. The primary role of the health-care provider—whether primary care provider or emergency/urgent care—is to conduct the initial medical evaluation, define the student's symptom profile, and communicate this information to the school for their use in developing a plan of supports. There are a number of potential ways to communicate with the school-we recommend the use of a return to school letter (sample provided in Appendix A), as its use produced a demonstrable increase in student supports (Zuckerbraun et al., 2014). The information in this letter provides the basis for the school experts to develop a feasible educational plan to support the student's return. Key elements of the return to school letter should include (a) the proposed date of return to school (if it can be determined), (b) the student's current symptoms, and (c) necessary safety restrictions. Receipt of the return to school letter provides the school with the necessary information to translate the identified symptoms into symptom-targeted academic accommodations, providing individualized support to the recovering student.<sup>13</sup> As previously noted, the use of this return to school letter resulted in a significant positive effect in facilitating school management as with a significantly greater number of children receiving academic supports compared with the control group that did not use the letter. In addition to the earlier components in the letter, some health-care providers may be comfortable in providing specific recommendations for school adjustments and accommodations. In the spirit of collaboration, these recommendations should be given consideration by the school though not obligatory until the educational experts examine their relevance and capacity for implementation.

School Personnel Role. In the handoff from the mTBI-informed health-care provider defining the student's symptom profile—the school must be prepared to receive the injured student and translate the symptom pattern into appropriate individualized supports. Although the same goal and general process of supporting the student's successful return applies to all, each school is unique in their environment and resources (e.g., personnel, skillsets, assigned duties). In addition, the clinical manifestations of an mTBI vary from student to student. As a result, we do not advocate a *one size fits all* plan of mTBI management. The gradual return to school progression should be individually adapted (see Appendix B, ACE Gradual Return to School Guide). Each school management plan starts with a definition of the individualized medical/neurological needs of the injured student as specified by the health-care provider(s), proceeding to translate these needs into a workable educational support plan, to be implemented by a coordinated team of school personnel.

Borrowing from the excellent BrainSTEPS program, one school-based person should serve in a medical/symptom liaison role (e.g., nurse, school psychologist, or athletic trainer) who tracks symptoms periodically, monitors for improvement (or worsening), and communicates with the school team, health-care provider, and family. In addition, an academic liaison role (e.g., guidance counselor, school psychologist) should be defined to coordinate the cognitive/academic adjustments and accommodations, using an academic log to track and guide adjustments. Additional school members include the classroom teachers who must be observant of the cognitive and emotional effects of injuries detected in the classroom such as increased problems paying attention or concentrating, greater challenges remembering or learning new information, needing more time to complete tasks or assignments, greater irritability and less tolerance for stressors, and the possibility of increased headache or fatigue symptoms when doing schoolwork. Throughout the course of recovery, it is essential that students receive a consistent, positive, and supportive message from all school staff about performance expectations during recovery.

# *Implementing the school mild traumatic brain injury management pathway*

Returning students with mTBI to school is a multistep process that can be operationalized in a systematic manner, utilizing the key personnel and roles previously described. Implementing a systematic process of school supports serves the combined clinical recovery and educational goals of the student. The pathway is intended to respect the practical workflow of the school setting, implementing the proper supports standardly and effectively. Such a pathway recognizes the likely need to adapt the process to the resources of a given school setting. Figure 12.1 presents the seven-step school mTBI management

#### Completion Event Action Date Step Prior to School Return School notification of mTBI MTBI Management Team alerted 1 Injury Date: 2 Healthcare Provider a. Symptom Monitor: Reviews symptom Communication/ Return to status & contacts family School Letter b. Academic Monitor: Coordinates with b Date of Return: Symptom Monitor to construct academic management plan (e.g., STAMP) Academic Management Plan Academic Monitor: Reviews Academic 3 Management Plan with teachers to Created prepare for student's return Return to School a. Symptom Monitor: Meets with student 4 First Day of Return to School to re-assess symptom status, notes any changes b. Academic Monitor: Makes final academic management plan changes; counsels student on plan 5 Academic Management Plan a. Symptom Monitor: Arrange symptom implemented monitoring schedule b. Academic Monitor: Update teaching b team if needed a. Symptom Monitor: Periodic symptom **6a Progress Monitoring** updates with student, from family/ healthcare providers b. Academic Monitor: Collects weekly updates from teachers 6b Academic Management Plan Symptom Monitor & Academic Monitor Adj 1 Adjusted discuss changes to academic Adj 2 management plan Academic Monitor informs student/ Adj 3 teacher of changes 7a **Recovery/ Return to Full** Supports no longer required Academic Participation Referral to HCP for further assessment Complicated Recovery/ 7b Additional Supports of complicating factors, additional programming supports Assessed

#### mTBI School Management Pathway Worksheet

*Figure 12.1* mTBI school management pathway.

Sports Concussions

pathway beginning with the school's initial notification of the injury and concluding when recovery has been achieved or a more complicated, protracted recovery has been identified, necessitating referral for specialized services.

This pathway serves to build a routine support process identifying the events, actions, and tools prior to school return and then when the student returns, developing, implementing, and modifying an individualized symptom—targeted academic support plan. We recommend adopting a school mTBI management pathway worksheet such as Figure 12.1 to guide and document the actions taken.

To illustrate the use of the pathway, we describe the case of JT, a 14-year-old ninthgrade male.

JT is an active athlete who plays soccer, basketball, and lacrosse although his injury was sustained while skateboarding on a Monday afternoon. He has a history of one prior mTBI at age of 8 as a result of a fall that took 1 week to recover. He has no history of learning disabilities, attention-deficit/hyperactivity disorder (ADHD), anxiety, or depression. He also has no history of chronic headache. His recent injury resulted from falling from his skateboard and striking the back of his head on the ground. He was wearing a helmet at the time. There was no loss of consciousness, but JT does not recall 10 minutes after the injury (post-traumatic amnesia) and presented with an initial period of confusion. He was evaluated by his pediatrician that day using the acute concussion evaluation (ACE) and diagnosed with an mTBI. He recommended no school for two days. The symptom evaluation indicated physical symptoms of headaches, dizziness, fatigue, sensitivity to light, blurry vision; cognitive symptoms of fogginess, problems concentrating, and slow thinking; emotional symptoms of irritability; and sleeping more than usual. He was instructed by his pediatrician to stay home for two days with a relatively low level of activity and a likely return to school on the third day post-injury.

#### Step 1. School notification of mild traumatic brain injury

The school mTBI management pathway begins at the moment that the school is notified of a student that has sustained an mTBI. This will typically be the student's parent although it is possible that another member of the school provides the notification if the injury occurs on school grounds or in a school-sponsored activity (e.g., athletic trainer following a sport-related injury). The school must be prepared with a planned response regardless of whether it is an elementary, middle, or high-school student. The assigned mTBI medical and academic liasons are alerted and stand ready to prepare for the next steps in the development of a support plan. The injury date is noted as is the return date if known.

In JT's case, the school was notified of the injury by his mother on Tuesday with the recommendation of no return until Thursday, with a likely half-day attendance the first two days. The mTBI liasons, consisting of the symptom monitor and academic monitor were alerted. A school mTBI management pathway worksheet (Figure 12.1) is initiated.

#### Step 2. Health-care provider communication/return to school letter

The school should receive a communication from the health-care provider, typically via the family, in the form of a return to school letter, detailing the student's injury,

symptom profile, and likely date of return. Upon receipt of this communication from the health-care provider, the symptom monitor reviews the symptom status and the proposed date of return to school. The symptom monitor contacts the family and student to review the student's status and progress, and reviews the process of return (Steps 4–7) with a focus on the near-term events and actions. The academic monitor is alerted about the injury details and symptom status to be used in the development of an initial academic management plan.

The symptom monitor, upon receipt of the return to school letter calls JT's family to check in on his status and informs them that an academic management plan will be developed based on the pediatricians initial symptom evaluation. She also requests a meeting with the student and parent on the first day of his return to review the initial academic management plan. The return to school letter indicates physical restrictions including no physical education class, no contact sports, and no physical activity during recess. The academic monitor notifies JT's teaching team of the injury and alerts them to the upcoming receipt of the academic management plan.

#### Step 3. Academic management plan created by academic monitor

The academic management plan is the tool that translates the student's symptom profile into specific accommodations to support their academic program. See the symptomtargeted academic management plan (STAMP) as an example in Appendix C. This tool is set up to directly translate the specific symptoms into related accommodations and adjustments to the student's academic program so as to not exacerbate the symptoms yet allow the student optimal participation in their school program. The accommodations and adjustments are only necessary to the extent that the symptoms have an adverse effect upon the student's academic learning and performance. It is possible that a student may present with certain symptoms that do not affect their academic learning and performance (e.g., dizziness when standing from a laying down position) or are very mild (e.g., resolving headache) and do not require an active accommodation or adjustment of the student's school program.

Examination of the return to school letter for JT indicates five physical symptoms, three cognitive symptoms, and one emotional symptom to be addressed in his STAMP. The pediatrician also indicated that the symptoms worsen with cognitive activity although it is not yet known whether they worsen with physical activity. Translating the attention/ concentration problems into accommodations results in the recommendation for shorter assignments, breaking down the tasks/tests into chunks, and a lighter workload with less than 30 minutes of homework at night. His difficulties with processing speed were accommodated through allowances for extended time to complete his work. The fatigue and fogginess issue were addressed by allowing 10–15-minute rest breaks during classes. For the physical symptoms, interspersed rest breaks were recommended in addition to an allowance for a short nap in a quiet location, if necessary. His light sensitivity could be managed by allowing him to wear sunglasses and/or sitting away from bright lights. In addition, limiting exposure to the SmartBoard as well as other light emitting devices was recommended. His dizziness/balance problems were addressed by allowing him to transition to the next class before the bell rings to reduce walking through crowded hallways. His fatigue and lack of energy were managed by periodic rest breaks and passive participation if he could not keep up the work. Finally, irritability was addressed by attempting to reduce overall stimulation and stressors whenever possible. The STAMP was shared with JT's classroom teachers and adapted to the specific type of class and workload demands.

#### Step 4. First day of return to school

On the day that the student returns, the symptom monitor and academic monitor meet with the student and parent with several tasks to accomplish. The symptom monitor reassesses the student's symptom status for any changes in the intervening days to allow an up-to-date academic management plan. A sample symptom monitor form is presented in Appendix D. The symptom information is communicated to the academic monitor who makes the final changes to the plan, communicates the plan with the teachers, and counsels the student on the use of the STAMP to support their academic return. The student is informed that each teacher has been made aware of the adjustment/accommodation plan.

Upon JT's return on Thursday, the symptom monitor meets with he and his parent to assess his symptom status. Over the three days since the injury, several of the symptoms have reduced in their intensity including the balance/dizziness and irritability. In addition, JT reports that on the prior day, he was able to read some light text in his history book for approximately 30 minutes without worsening his headaches, fatiguing him significantly, or having troubles concentrating on the material. The academic monitor reviews the adjusted STAMP with JT and his parent and gives them each a copy of the document. They discuss how these accommodations will be implemented and that his teachers have been made aware of the plan. The symptom monitor and academic monitor sets a follow-up schedule with JT to monitor his progress. On this first day of his return, which is only a half day, they ask JT to meet with them just prior to leaving so that they can assess the success of the initial day of his program and address any questions or concerns.

#### Step 5. Implementation of the academic management plan

In this stage of the school support pathway, the academic management plan is now implemented, which involves the symptom monitor meeting with the student to monitor his symptoms and the academic monitor meeting with the student and teachers periodically to review academic progress and/or problems. These meetings can be scheduled, based on the number and severity of symptoms, as either a daily process or every several days, depending on the need. During the initial days of the students return, it is probably worthwhile to check in with the student on a daily basis to ensure effective program implementation. Students with relatively milder symptoms may require less frequent meetings to monitor their progress, whereas students with more significant symptoms will likely require a tighter schedule of monitoring to ensure that the supports are appropriate.

Given JT's relatively significant symptom profile, the decision was made to monitor his symptom status on a daily basis for the first week and then decide on the frequency after that time period. The monitoring of his academic progress was scheduled to occur on a weekly basis with JT and his teachers although the option was made available for JT to check in with the academic monitor at any point if any questions arose about the implementation of the academic management plan.

#### Step 6. Progress monitoring

Given the established schedule of progress monitoring, the student's symptom status and academic progress are monitored. The symptom monitor uses a formal symptom assessment scale (Appendix D) as gathered from the student and, in some cases, the parents

and teachers. To keep the care team fully informed, this information is communicated periodically with the parents and the health-care provider(s). In the more typical recovery scenarios, new symptoms do not emerge and instead the number and severity of symptoms decrease. At times, however, particularly with complex recoveries, new symptoms may appear (e.g., anxiety, depressed mood), which require some additional accommodations to be made. In concert with the symptom monitor, the academic monitor collects weekly progress updates (see Appendix E for a sample academic monitor form) from the teachers and student regarding their participation and success as outlined in the STAMP and the gradual return to school plan. During these periodic monitoring meetings with the student and teachers, changes to the STAMP are made (e.g., reduction or removal of accommodations).

JT's recovery over the first week was steady with a reduction in his headaches, sensitivity to light, fatigue, mental fogginess, and irritability. He began attending school full days as of the 3<sup>rd</sup> day of his return. The accommodations associated with these symptom targets were reduced and in some cases removed (e.g., no longer needing sunglasses for light sensitivity). JT's workload was gradually increased with 1 hour of homework now possible. The work that he missed was logged on the academic monitor form, with a decision by several of his teachers to excuse the less essential work assignments and quizzes.

#### Step 7. Recovery/Return to full academic participation

*Typical Recovery*: In the vast majority of cases, the student will demonstrate a gradual symptom resolution and recovery with positive movement toward full academic participation, including a full return to the school day as well as a gradual lessening of the symptom—targeted adjustments and accommodations. Given the variability in time to recovery, full return to the student's academic program may occur within a matter of several days or several weeks in the typical cases. As per the more recent epidemiological data, it is expected that up to 30% of students will not have reached full recovery by four weeks and will require some degree of continued academic supports.

In the case of JT, he made a relatively typical recovery over the course of 3 weeks with gradual resolution of his symptoms and the associated adjustment of the necessary accommodations on the STAMP until none were needed, and he could participate fully in his academic program with no symptoms provoked by cognitive or physical activity. The symptom monitoring forms demonstrated this pattern of resolution of all symptoms to his preinjury baseline level, whereas the academic monitoring forms indicated JT's positive capacity to increase his amount of classwork and homework as well as his ability to now take quizzes and tests for which he was prepared.

*Complicated Recovery/Additional Supports*: In the case of students whose symptoms have not resolved within 3–4 weeks' time, continued academic supports will be necessary. However, with active and regular communication between the school, parents, and the health-care providers, referrals to mTBI specialists and/or rehabilitation services for these students should be an expected matter of course. Depending on the student's pattern of persistent symptoms, the follow-up services will be specific to the persisting issues such as the need for headache management, vestibular rehabilitation, aerobic therapy; cognitive treatments for poor concentration or memory problems; or behavior medicine services for emotional symptoms such as increased anxiety or mood problems. With these active rehabilitation services in place, it is rare that students will require any additional accommodations after a period of several months. If, however, the need exists, a more formal process of initiating a 504 plan may be needed.

#### Summary

Returning the student with mTBI to school is a central task in the care continuum, involving active communication and collaboration among the health-care, family, school, and student. To provide a smooth and effective return to school following mTBI, this neighborhood of partners must follow a shared process that is based on the needs of the student as they proceed toward recovery. To accomplish this goal, a seven-step operational pathway is described from the time of the school's first notification of the injury through to complete recovery, working with mTBI-prepared school liaisons (medical/symptom, academic) and employing a standardized process that works collaboratively with the health-care providers, family, and student to facilitate the systematic management of the student. Operationalizing and standardizing these processes by applying individualized symptom-targeted adjustments and accommodations, progress monitoring, and referral/ communication using the clinical pathway and tools will better serve the needs of students with mTBI returning to school. To ensure effective school reentry, the family and student must receive active and coordinated guidance across the care continuum by the informed health-care provider and the prepared school team. Each collaborative partner has a unique and complementary role that will not only optimize the student's successful reintegration into school but also contribute to a positive movement toward clinical recovery. Recommended actions and tools are provided to guide the school return process systematically.

Although this mTBI school management pathway provides a logical and systematic process for the health care, school, family, and student to follow, the field is still in need of further evidence to provide more precise guidance as recommended in the recent Berlin pediatric concussion statement (Davis et al., 2017). Issues requiring further study include the need to better predict the optimal timing to return the student to school incorporating as predictors the host of injury-related, personal, and environmental factors that produce the most effective recovery outcomes. The process would also benefit from further research of specific targeted interventions—specifying which adjustments and accommodations are critical for optimal school performance, at what time in the return process, delivered for how long, and tied to the student's specific clinical profile (subtype). In addition to student-centered research, the return to school process would benefit from further study of system-level interventions including demonstrating the effectiveness of team/role definition, training methods, and applications of the management pathway to different levels of schooling (elementary, middle, and high school).

# Appendices Appendix A: ACE return to school letter

#### ACE POST-CONCUSSION **RETURN TO SCHOOL LETTER**

Dear School Staff:

sustained a concussion on \_\_\_ \_. Every concussion is different and recovery typically can take between several days to several weeks. While it is important for the student to return to school as soon as they can tolerate, the key to assisting recovery is to manage their physical and cognitive activity. Too much cognitive or physical activity can make symptoms worse and possibly prolong recovery, while too little activity can unnecessarily create anxiety and cause him/her to fall behind in their school work. As symptoms resolve and the student's learning/cognitive functioning returns to normal, they can gradually progress to their normal school day.

The student is currently reporting the following symptoms. They should be viewed as the targets for classroom accommodations and adjustments.

PHYSICAL		COGNITIVE	SOCIAL/EMOTIONAL	
Headaches	Visual problems	Feeling foggy	Irritability / Easily Angered	
Sensitivity to Light	Sensitivity to Noise	Memory loss	Nervousness	
Vomiting	Nausea	Feeling slowed down	Sadness	
Fatigue	Dizziness	Difficulty concentrating	Feeling more emotional	
Balance Problems	Tingling			

Based on the current symptoms, he/she is \_\_\_\_ permitted to return to school. OR \_\_\_\_ is excused for \_\_\_\_ days. As general guidance, the student can return to school when:

(1) They can concentrate on school work for 30 minutes before symptoms worsen significantly, AND (2) Symptoms reduce or disappear with cognitive rest breaks, allowing return to activity.

The student requires the following physical restrictions until cleared by a health professional:

- \* No physical activity during recess
- No PE class
- \* No Sports Other \_\_\_\_

Health Care Provider Signature \_\_\_\_\_ Date \_\_\_\_\_

Contact information:

#### SCHOOL SUPPORTS

Students with post-concussion symptoms and/or neuropsychological dysfunction often need support to perform school related activities. The following accommodations and adjustments to the student's school program may be helpful to support the specific targeted symptoms.

Shortened day	Support for prioritizing, organization and planning coursework
<ul> <li>Shortened classes</li> </ul>	<ul> <li>No significant classroom or standardized testing</li> </ul>
• Rest breaks during the day as needed	<ul> <li>Extended time to complete coursework, assignments, tests</li> </ul>
<ul> <li>Reduced/modified homework</li> </ul>	<ul> <li>Alternative/modified grading or reduced make up work</li> </ul>

# Appendix B: ACE gradual return to school guide

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#### ACE Post-Concussion Gradual Return to School (GrRTS) Guide

Use of the Gradual Return to School Guide: Every student's recovery from concussion is different. The five progressive stages were designed to give the medical provider and school team <u>general guidance</u> to assist the student's gradual return to school. The stages should not be viewed as absolute for every student if their symptoms do not warrant it. What is important is to strike a balance between providing the student with the necessary supports for symptom relief while progressing to their normal school schedule. Students with faster recoveries may skip a stage or two. Use of the Symptom Targeted Academic Management Plan should accompany this guide.

Stage	Description	Level of Activity	Move to stage 2 when:
1	Return to School, Partial Day (1–3 hours)	Attend 1–3 classes. Intersperse rest breaks.     Scheduled rest breaks: Rest breaks/ day in quiet area AM PM When symptoms worsen ("flash pass") min.     Expectations for productivity: Minimal.     No classroom/ standardized tests. No homework.     Attendance is primary goal     Excused from Physical Education (PE) class. No recess.	<ul> <li>Symptom status improving</li> <li>Tolerates 4 – 5 hours of activity-rest cycles</li> <li>2–3 cognitive rest breaks built into school day</li> </ul>
Stage	Description	Level of Activity	Move to stage 3 when:
2	Full Day, Maximal Supports (required throughout day)	Attend most classes with 2–3 rest breaks (20–30 min).     Scheduled rest breaks: Rest breaks/ day in quiet area AM PM     When symptoms worsen ("flash pass") min.     Expectations for productivity: Minimal – moderate.     No classroom/ standardized tests.     Homework < 60 minutes.     Excused from Physical Education (PE) class. No recess.	<ul> <li>Symptom number &amp; severity improving</li> <li>Needs 1–2 cognitive rest breaks built into school day.</li> </ul>
Stage	Description	Level of Activity	Move to stage 4 when:
3	Return to Full Day, Moderate Supports (provide in response to symptoms)	Attend all classes with 1–2 rest breaks (20–30 min).     Scheduled rest breaks:Rest breaks/ day in quiet area AM PM    When symptoms worsen ("flash pass") min.     Expectations for productivity: Moderate.     No classroom/ standardized tests. Begin quizzes.     Moderate homework 60–90 minutes.     Design schedule for make-up work. Consider reducing or waiving missing/     outstanding work. Assign essential learning tasks.     Excused from Physical Education (PE) class. No recess.	<ul> <li>Continued symptom improvement</li> <li>Needs no more than 1 cognitive rest break per day</li> </ul>
Stage	Description	Level of Activity	Move to stage 5
			when:
4	Return to Full Day, Minimal Supports (Monitor final recovery)	<ul> <li>Auteria all classes with 0 – 1 rest breaks (20–30 min) OR when symptoms worsen ("flash pass")</li> <li>Expectations for productivity: Moderate – maximum.</li> <li>Begin modified classroom tests (allow breaks, extra time, alternate formats). Number of classroom tests per day</li> <li>Homework 90+ minutes.</li> <li>Begin to address make-up work.</li> <li>Excused from Physical Education (PE) class. No recess.</li> </ul>	<ul> <li>No active symptoms</li> <li>No exertional effects across the full school day.</li> </ul>
0.1	Description		Dete of full wetering
Stage	Full Return	Eevel of Activity     Full class schedule, no rest breaks.	Date of full return:
5	No Supports Needed	Maximum expectations for productivity.     Address make-up work.	

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# Appendix C: Symptom-targeted academic management plan (STAMP)

To be completed by the Academic Monitor



Date: \_



#### Symptom Targeted Academic Management Plan (STAMP)

Below, please see the symptoms they are currently experiencing. To promote recovery, the student will be provided with the following classroom accommodations that support their academic learning and performance:

Symptom (check)	Functional school problem	Accommodation/ management strategy (select)		
Cognitive Symptoms				
Attention & concentration difficulties	Short focus on lecture, classwork, homework	Shorter assignments (odd/even problems, requiring outline or bullet points instead of full written responses) Break down tasks and tests into chunks/segments Lighter work load: Max. nightly homework (including studying): min		
Working memory (short-term memory)	Trouble holding instructions, lecture, reading material, thoughts in mind during tasks	Repetition Written instructions Provide student with teacher generated class notes		
Memory consolidation/ retrieval	Retaining new information Accessing learned information	Smaller chunks/segments to learn, repetition Recognition cues		
Processing speed	Unable to keep pace with work load Slower reading/writing/calculation Difficulty processing verbal information effectively	Allowances for extended time to complete coursework, assignments, tests Reduce/slowdown verbal information and check for comprehension		
Cognitive Fatigue/ Fogginess	Decreased arousal, mental energy; trouble thinking clearly, formulating thoughts	Rest breaks during classes Homework, and examinations in quiet location		
Physical Symptoms				
l la sela sela se	Interferes with concentration	Intersperse rest breaks, shortened day if symptom does not subside		
Headaches	Increased irritability	Allow for short naps in quiet location (e.g., nurse's office)		
Light/ noise	Symptoms worsen in bright or loud	Wear sunglasses/hat, seating away from bright sunlight Limit exposure to SMART board, computers, provide class notes Avoid noisy/crowded environments such as lunchroom, assemblies.		
sensitivity	environments	chorus/music class, and hallways. Leave class early. Allow student to wear earplugs as needed		
Dizziness/ balance/ nausea	Unsteadiness when walking Nausea or vomiting	Elevator pass Class transition before bell		
Sleep disturbance	Decreased arousal, shifted sleep schedule, trouble falling asleep	Later start time Shortened day or rest breaks		
Fatigue	Lack of energy	Periodic rest breaks, short naps in quiet location Passive participation		
Emotional Symptoms				
Irritability	Poor tolerance for stress	Reduce stimulation and stressors (e.g., overwhelmed with missing work)		
Anxiety/ nervousness	Worried about falling behind, pushing through symptoms	Reassurance from teachers and team about accommodations, workload reduction, alternate forms of testing Time built in for socialization		
Depression/ withdrawal	Withdrawal from school or friends because of stigma or activity restrictions	Allow student to be engaged with peers during selected low stress/ extracurricular activities as tolerated Lunch in a quiet room with friends		
Specific Academic Re	commendations			
	Writing	Provide alternatives to written output (word bank, oral response, etc.)		
Subject specific	Mathematics calculation	Use of calculator, reduced number of problems		
difficulties	Reading comprehension	Shorter reading passages Provide tools to assist with visual tracking or comprehension of information (e.g., use of audio books)		
Make-up/Missing work	Trouble managing current load of make-up work	<ul> <li>Waive previously missed work</li> <li>Reduce amount of outstanding work (assign essential learning tasks)</li> </ul>		
Tests/quizzes	Unprepared for tests/quizzes	No/ Modified classroom testing (e.g., breaks, extra time, quiet location) Limit number of classroom tests per day per day.		
Other:				

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# Appendix D: Symptom monitoring log

To be completed by the Symptom Monitor

		_	_	_	-
Rate Symptom	Date:	Date:	Date:	Date:	Date:
Physical 1. Use she she sh	0 = Not a problem	3 = Moderate	Problem	6 = Severe pro	oblem
1. Headaches					
2. Faligue					
4. Dissinger					
4. Dizziness					
5. Balance problems					
c. sensitivity to light					
7. Sensitivity to noise					
9. Vomiting					
10 Numbross / tingling					
Cognitivo	0 - Not a problem	2 - Madarata	Droblom	6 - 504050 05	ablam
11 Feeling montally forgy	0 = Not a problem	5 = Wouerate	Problem	6 = Severe pri	obiem
12. Problems concentrating					
13. Problems remembering					
14. Slow to respond/ complete work					
15. Disorganized					
Emotional	0 - Not a problem	2 - Modorato	Problem	6 - Sovere pr	ahlam
16 Irritability/ easily angered		5 = Moderate	TTODIETT	0 = Severe pro	
17 Sadness					
18. Nervousness					
19. Feeling socially isolated				I	
20. Feeling more emotional					
21. Less able to cope with stress					
Other	1		1	1	
*Exertion			1		
*Overall Rating (0, 1, 2)					

#### \* Please read the following questions and use the corresponding rating scales to complete the three items above\*

Exertion: Which symptoms worsen with Physical or Cognitive Activity? (place # of symptom inside corresponding box)

Overall Rating: To what degree do you feel "differently" than before the injury (not feeling like yourself)? 0 = No difference/normal 1= A little different 2= Very different

Activity Level: Compared to what your typical activity (before the injury), your current level of activity has been: 0= Less than usual 1= Same as usual

**Communication to Healthcare Provider/ Family:** The above table indicates monitoring of the student's symptoms. Additional Information:

Concerns/ Questions:

 This material was adapted from the BrainSTEPS Program in Pennsylvania which is jointly funded by the Department of Health and the PA Department of Education, and implemented by the Brain Injury Association of PA.

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### Appendix E: Academic monitoring tool

To be completed by classroom teachers

		Academic N	Ionitoring Tool		
Student Na	ne:	Date:			
Teacher:	Course/Class:				
Instructions: with the stude timeline to cor <i>Please return</i> Please list the student may r	Please fill out this form on a wee nt the assignments that are esses mplete the work. While the stude to the Academic Monitor by this <u>essential assignments</u> (or attact eed to complete the assignment	why basis to monitor the student's nntial to complete, what assignme nt is recovering, the focus should date: n electronic grade book) the stude 0. Once an assignment has been o	academic progress and concussion sym nts can be modified, and what assignme be on mastery and essential learning co nt will need to complete the following we ompleted, please fill in the grade the stu	ptoms observed in the cl nts will be excused. Discu ncepts. wek and any accommodat dent received.	assroom. Discuss iss a reasonable ions you think the
Due date	Assignments, classwork, h	omework, tests, or guizzes	Accommodations needed/ Additional comments Grade		
This week the	following post-concussive sy	mptoms were observed that (m	ore than usual prior to his/her concus	ssion) (check).	
	Physical	Thinking/Cognitive	So	ocial/Emotional	
Headaches	Sensitivity to light	Feeling mentally foggy	Irritability/easily angered	Social isolation	
Fatigue	Sensitivity to noise	Problems concentrating	Sadness	Less able to cope with	n stress
Visual problem	ns Nausea	Problems remembering	Nervousness	Feeling more emotion	al
Dizziness	Vomiting	Slow to respond / complete work	Exertional Effects: Do symptoms	worsen with activities?	Voc No
Balance Probl	ems Numbness/ tingling	Disorganized	Filysical Activity: Tes No	Cognitive Activity	. res No
What has impro	ved (symptoms or performance)?	?			
<ul> <li>This material wa Injury Associatio</li> <li>Any use or revisi</li> </ul>	s adapted from the BrainSTEPS Program n of PA. on of this material should cite the Safe	n in Pennsylvania which is jointly funded Concussion Outcome Recovery & Educat	by the Department of Health and the PA Departr	nent of Education, and implem om the authors (G. Gioia).	ented by the Brain

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