Concussion continues to be an area of concern on college campuses, affecting the general student body as well as student-athletes. The NESCAC Medical Aspects in Sport Committee has performed an in-depth review of concussion, and offers the following Statement on Concussion and Return to Function Process for Concussed Students as a way to provide an evidence-based strategy for medical staff to treat individuals with concussion while also aligning expectations within institutions.

This concussion update is intended for wide distribution across NESCAC institutions and will be shared with all Faculty Athletics Representatives, Athletic Directors, Health Center Directors and Head Athletic Trainers. Further distribution to faculty and other staff members is strongly encouraged within institutions. The Committee requests that readers keep the following points in mind when considering concussion:

1. Concussion is a brain injury that can affect any student and is best managed by a provider who is trained in concussion management.
2. Many students with concussion feel anxiety and pressure to return to school, which further exacerbates symptoms and prolongs recovery. Recognizing this anxiety and providing short-term academic adjustments can facilitate recovery.
3. Current medical evidence recommends an individualized approach involving a gradual return to academic activities in a manner that does not prolong or exacerbate symptoms.
4. Initial rest followed by a symptom-based gradual return to function allows for the best recovery.
5. Students should return to full academic function and be asymptomatic before returning to unrestricted physical activity.

The Medical Aspects in Sport Committee encourages institutions to review their concussion management practices along with the following documents, making any necessary adjustments in an effort to further enhance the care for our students with concussion.

Mark Peluso M.D., FAAFP
Chairman
NESCAC Medical Aspects in Sport Committee
Concussion occurs in both athletic and non-athletic settings and can affect any student. Defined as a complex metabolic and pathophysiological process affecting the brain, concussion is induced by traumatic biomechanical forces and typically results in the rapid onset of short-lived impairment of neurologic function that resolves spontaneously. Concussive injuries are associated with an increase in energy demand by the brain coupled with a decrease in cerebral blood flow resulting in an imbalance of energy supply and demand (Barkhoudarian, Hovda, & Giza, 2011). Furthermore, the concussed brain is less responsive to both physiological and neural activation suggesting that excessive cognitive or physical activity prior to a complete recovery may result in prolonged dysfunction (Harmon et al., 2013). Based on these findings, cognitive and physical rest has become the cornerstone of concussion management (Guskiewicz et al., 2004; McCrory et al., 2008, McCrory et al., 2013, Harmon et al., 2013). Recent research suggests that cognitive rest is a critical element of successful concussion management and can significantly shorten the recovery period (Moser et al., 2012). In its most extreme form, cognitive rest initially includes no school attendance, homework, reading, video games, texting, computer time, and or television. Resumption of these activities is gradual and dependent on the absence of concussion-related symptoms.

The prescription of cognitive rest following concussion can be a significant source of anxiety for college students. Missed class, particularly multiple classes, can create an incredibly challenging situation for college students. The pressure to return to school prematurely after injury and undertake a workload beyond their cognitive capacity can result in both an increase in anxiety and a recurrence of concussion symptoms. This exacerbation often prolongs symptoms and delays recovery. The NESCAC Medical Aspects in Sports Committee has created a Return to Function process for use by medical personnel to address the tension between returning to full academic engagement and the prescription of cognitive rest that is essential for the best short-term and long-term prognosis. The Graduated Return to Academics Guidance is simply a set of general recommendations that should be used to inform the treatment of concussed individuals. All students who have sustained a concussion should be under the care of a provider who is trained in concussion management at their institution. It is important to note that the causes and consequences of concussion are variable and medical treatment must be individualized.

Immediately following a concussion or suspected concussion, students should be removed from physical activity. It is in the student’s best interest to also engage in physical and cognitive rest until symptoms (e.g., headache, dizziness, fatigue) subside. Once this has occurred, the student can most productively pursue a gradual return to cognitive activity at a level of intensity that is below the level that triggers symptoms. This is referred to as sub-symptom threshold cognitive activity and is the general guiding principle of the NESCAC Graduated Return to Academics Guidance process. Note that students should return to full academic function and be asymptomatic before returning to unrestricted physical activity.

During this recovery process, it is prudent for the student to work with the health center, Dean’s office and professors to determine if any academic adjustments are appropriate as the student recovers. Depending on the severity of the sustained injury, suggested academic adjustments might include a reduced workload, additional time for assignments, class outlines or preprinted class notes from the instructor, excuse from nonessential work, no double workload of make-up work and new work, extended test-preparation and test-taking time, a scribe for written responses, tutoring, etc. In rare
cases, students experiencing severe or prolonged symptoms may require an expanded neurocognitive assessment and accommodations.

The NESCAC Medical Aspects in Sport Committee strongly encourages students to report symptoms of concussion, receive appropriate medical attention, follow the Return to Function process, and reduce stress and anxiety by working with their professors and deans to provide appropriate academic adjustment and accommodation during recovery.

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References
Appendix: Current references regarding rest and return to function after concussion.

1. There are no standardized guidelines for returning the athlete to school. If the athlete develops increased symptoms with cognitive stress, student athletes may require academic accommodations such as a reduced workload, extended test-taking time, days off or a shortened school day. Some athletes have persistent neurocognitive deficits following a concussion, despite being symptom free. Consideration should be made to withhold an athlete from contact sports if they have not returned to their ‘academic baseline’ following their concussion (level of evidence C). The CDC developed educational materials for educators and school administrators that are available at no cost and can be obtained via the CDC website. Additional resources for academic accommodations should be developed for both clinicians and educators (level of evidence C). Harmon KG, et al. Br J Sports Med 2013;47:15–26. doi:10.1136/bjsports-2012-091941

2. The cornerstone of concussion management is physical and cognitive rest until the acute symptoms resolve and then a graded programme of exertion prior to medical clearance and RTP. The current published evidence evaluating the effect of rest following a sports-related concussion is sparse. An initial period of rest in the acute symptomatic period following injury (24–48 h) may be of benefit. Further research to evaluate the long-term outcome of rest, and the optimal amount and type of rest, is needed. In the absence of evidence-based recommendations, a sensible approach involves the gradual return to school and social activities (prior to contact sports) in a manner that does not result in a significant exacerbation of symptoms. McCrory P, et al. Br J Sports Med 2013;47:250–258. doi:10.1136/bjsports-2013-092313

3. In the initial days following a concussion, mental and physical rest has been strongly encouraged. Three lines of evidence indirectly support the value of rest. First, concussions can have a large adverse effect on physical and cognitive functioning in the first few days postinjury. Acutely, the brain might be in a state of neurometabolic crisis, at which time increased energy demand may hinder the restorative process, and it is believed that rest might facilitate recovery. Second, in animal injury models, there appears to be a ‘temporal window’ of vulnerability in which a second overlapping injury results in greater levels of traumatic axonal injury and magnified cognitive and behavioural deficits. Thus, a rest period will reduce the likelihood of the athlete experiencing an overlapping injury. Finally, it has been demonstrated in rodent models that exercise appears to be good for the injured brain; however, animals that are allowed to exercise too soon after injury do not show the expected exercise-induced increases in molecular markers of neuroplasticity. For these reasons, it is believed that rest is very likely beneficial following injury. However, this is largely based on animal research, theory and expert consensus. At present, there are no evidence-based guidelines for how to manage athletes with slow recovery. The optimal time period for rest is unknown. Moreover, the specific schedule and type of rest (eg, bed rest versus greatly restricted activities) have not been studied and it has recently been argued that absolute rest is unrealistic. In general, prolonged bed rest following medical procedures or as an intervention for health problems has rarely been shown to be beneficial and may cause harm.34 There has been only one clinical trial involving bed rest following mild traumatic brain injury (MTBI) in civilians recruited from the emergency department, and this trial did not support the use of 6 days of bed rest as a management strategy. Although resting until symptom free is widely recommended following a concussion, only three studies met the inclusion criteria evaluating rest. One case crossover study did not show improvements in symptoms during a period of nonintervention, and a case series demonstrated a longer duration of symptoms in individuals who were prescribed cognitive rest. Positive effects on neurocognitive function and symptoms were reported following a 1-week period of prescribed rest in another study irrespective of the time since injury. However, no long-term follow-up was discussed, so the impact that the resting period had on the ability to resume activity is not known. Additionally, individuals were not randomised to rest versus other activity levels, so it is not known if improvements in cognitive function and symptom reports were due to physical rest, cognitive rest, combined rest, non-specific effects of contact with a specialist, education and reassurance or other factors. Further studies to evaluate the effects of a resting period and the optimal duration of this period are needed. In the absence of evidence-based recommendations, a sensible approach involves the gradual return to school and social activities (prior to contact sports) in a manner that does not result in a significant exacerbation of symptoms. Schneider KJ, et al. Br J Sports Med 2013;47:304–307. doi:10.1136/bjsports-2013-092190
NESCAC Medical Aspects In Sport Committee (MASC) Return to Function Process for Concussed Students

A concussion is a brain injury best defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces. While the majority (80–90%) of concussions resolve in a short (7–10 day) period, some patients require more time to return to their pre-injury level of function. The NESCAC Medical Aspects in Sports Committee (MASC) has created a Return to Function process for use by medical personnel to address the tension between returning to full academic engagement and the prescription of cognitive rest that is essential for the best short-term and long-term prognosis. The NESCAC MASC recommends that all students with a suspected or diagnosed concussion receive a medical evaluation from a provider who is trained in concussion management at their institution, recognizing that:

1. The most current medical evidence recommends an individualized approach involving a gradual return to academic activities in a manner that does not prolong or exacerbate symptoms.
2. Students should return to full academic function and be asymptomatic before returning to unrestricted physical activity.
3. The stress and anxiety that students experience around missed classes and assignments can be mitigated with appropriate short-term academic adjustments and support from professors and deans.
4. Ongoing medical supervision with coordinated care between the health center, counseling, deans, and sports medicine when appropriate, is essential.
5. For students with symptoms lasting longer than 3 weeks, further medical management considerations and accommodations, rather than academic adjustments, may be needed.

The Graduated Return to Academics Guidance and Graduated Return to Physical Activity Guidance below are designed to guide concussion recovery in conjunction with ongoing, individualized medical care.

<table>
<thead>
<tr>
<th>2014 NESCAC MASC Graduated Return to Academics Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rehabilitation stage</strong></td>
</tr>
<tr>
<td>A  No cognitive activity</td>
</tr>
<tr>
<td>B1 Class Attendance</td>
</tr>
<tr>
<td>B2 Class Participation</td>
</tr>
<tr>
<td>B3 Homework</td>
</tr>
<tr>
<td>C  Return to full academic</td>
</tr>
<tr>
<td>work</td>
</tr>
</tbody>
</table>

Unlike a strict stepwise progression, this guidance allows the student to re-introduce cognitive activities based on their symptoms. Progression back to full academic work is individualized and based on performing activities at a level and time interval below which post-concussion symptoms do not occur (the sub-symptom threshold). Academic adjustments such as class-excuses, providing class notes, extended deadlines and make-up tests are essential in reducing the stress associated with concussion recovery and should be provided as needed on an individualized basis. For students with prolonged symptoms, more formal academic accommodations may be required.

<table>
<thead>
<tr>
<th>Rehabilitation stage</th>
<th>Functional exercise at each stage of rehabilitation</th>
<th>Objective of each stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 No activity</td>
<td>Symptom limited physical and cognitive rest</td>
<td>Recovery</td>
</tr>
<tr>
<td>2 Light aerobic exercise</td>
<td>Walking or stationary cycling for 30 minutes keeping intensity &lt;70% maximum permitted heart rate. No resistance training/ weightlifting.</td>
<td>Increase HR</td>
</tr>
<tr>
<td>3 Sport-specific exercise</td>
<td>Individual activity drills with light exertion. Dribbling a soccer ball/ basketball, stickhandling a puck. Catching or throwing a Frisbee. No head impact activities. If only working out, gradually increase time &amp; intensity of running/ biking, swimming.</td>
<td>Add movement</td>
</tr>
<tr>
<td>4 Non-contact training</td>
<td>Progression to more complex training drills, eg, passing drills in soccer, basketball, Ultimate Frisbee, hockey. Drills should not introduce risk of collision. May start progressive resistance training/ weightlifting.</td>
<td>Exercise, coordination and cognitive load</td>
</tr>
<tr>
<td>5 Full practice</td>
<td>Following medical clearance, participate in normal training activities, including drills which may involve contact or collision.</td>
<td>Restore confidence and functional skills</td>
</tr>
<tr>
<td>6 Return to play</td>
<td>Normal physical activity/game play</td>
<td></td>
</tr>
</tbody>
</table>

With this stepwise progression, the student should continue to proceed to the next level if asymptomatic at the current level. Generally, each step should take 24 hours so that a student would take approximately 1 week to proceed through the full rehabilitation protocol once they are asymptomatic at rest and with provocative exercise. If any post-concussion symptoms occur during the stepwise program, then the student should drop back to the previous asymptomatic level and try to progress again after a further 24 hours period of rest has passed.