The College of Idaho Concussion Testing Protocols and C3 Logix System

The College of Idaho Athletic Training Department along with St. Luke's Intermountain Orthopedics has always been ahead of most institutions to improve the assessment and recognition of concussions and mild brain trauma of its athletes. The ImPACT program has been a major part of concussion management for The College of Idaho athletic programs by providing neurocognitive data for its athletes and is an important tool in the assessment of concussions and other types of mild brain trauma. As the advancement in technology and medicine continues, it is necessary for the athletic training staff and medical clinicians who work with the athletes at The College if Idaho to utilize and adopt advancements in technology for concussion testing and management when possible.

C3 Logix provides reliable indicators and objective measurements for the clinician to assess a concussion and significantly reduces the subjectivity of diagnosing a concussion by assessing six domains of brain function, combining the results into one program. It is by far the most complete program to date in the assessment of concussions. C3 Logix has also demonstrated the ability to diagnose other neurocognitive disorders in the clinical setting not related to mild brain trauma.

The C3 Logix Program combines computerized neurocognitive and memory testing assessment along with visual acuity, dynamic visual acuity, and balance testing. It will give the athletic training department and team physician at the College of Idaho more objective data to diagnose a concussion or mild brain trauma, relying less on subjective data, such as the athlete's symptoms. Developed by the Cleveland Concussion Clinic, this comprehensive program combines the benefits of collecting data, such as mental skills, balance and motor skills, and other factors that are impaired when an athlete sustains a concussion. It is powerful, affordable, and easy to utilize. It is simple to interpret data for medical personnel and literally provides a clear "picture" for the athlete, coaching staff, and parents of the athlete to see the levels of brain impairment in those cases of mild brain trauma when compared to the baseline test.

The data is recorded in an IPad by the athletic training staff on the court or field of play then uploaded wirelessly to I-Comet (sometimes referred to as the Cloud) where it is accessible to the team physician and other select medical professionals that are involved in caring for the athlete with a possible concussion. The chances of testing poorly or "sand bagging" a baseline test, which has been reported during other computerized

neurocognitive testing, is greatly diminished, since the medical team at The College of Idaho is administering the test for each individual athlete. Testing in the clinical setting, has demonstrated the difficulty to skew the results in all six domains. This gives the health care provider a more objective measure of the athlete's status. Total time required to administer each test is approximately 16-17 minutes per athlete however the mass baseline testing program provided by C3 Logix can be reduce the time per test significantly. Implementation and testing of large groups of athletes is very efficient and effective with the aid of athletic staff and other health care providers who work with the college.

The information provided in this policy is from JustGo Products, which is a direct distributer for C3 Logix and presented in this document so the reader so he or she has a better understanding of the C3 Logix product for concussion testing. For more information, contact the Cleveland Concussion Clinic or www.C3Logix.com.

C3 Logix Multi-Factorial Approach - The Six Domains of Assessment

C3 Logix utilizes six different areas of assessment for baseline comparison. The following chart compares recommendations from the 2012 International Conference on Concussions in Sports (ICCS). It includes components of the ImPACT Test and C3 Logix.

The Multi-Factorial Approach

Recommendations from 2012 ICCS	ImPACT™	C3 Logix
Graded Symptom Checklist	Yes	Yes
Reaction Time	Yes	Yes
Memory & Processing Speed	Yes	Yes
Motor Function	No	Yes
Vision	No	Yes
Balance	No	Yes
Vestibular Function	No	Yes

This concussion system is consistent and inclusive of all the recommendations of the ICCS, which includes neuro-motor, balance, and visual acuity assessments along with the graded symptom checklist. Other baseline assessment systems primarily focus only on neurocognitive measures such as reaction time, memory, and processing speed. The C3 Logix balance assessment utilizes an algorithm coupled with the high quality sensor array from the iPad system. The iPad is in a specially designed case and placed on the athlete's back held in place with a belt. The athlete is asked to perform each stance for 20 seconds with their eyes closed, objectively

measuring each stance that represents a “quantitative mapping” of postural stability in the six different BESS stances.

Visual acuity, both static and dynamic testing is performed by having the athlete read a series of letters which appear on the IPad. If the athlete has less than three errors, the test continues. The letters are smaller for each successive test. Dynamic testing of visual acuity involves the use of a metronome, where the athlete rotates his or her head to the left and right side, focusing on the screen of the IPad, reading the letters as they appear. The size of the letters remains the same for each of the five tests for this domain.

The result of measuring all six areas is literally a complete pictorial representation of brain function. Data visualization utilized by C3 Logix (Fig. 2).

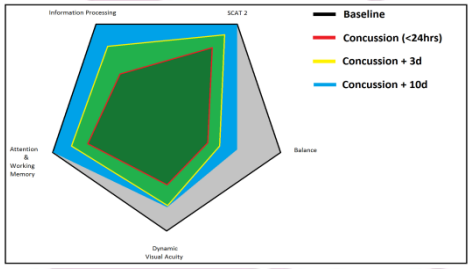

Fig. 2

The outer sides of the pentagon represent the athlete's baseline test, with the inner portions representing testing following a concussion. Normative and statistical data are available for the clinician to examine as well.

Implementation of Testing Protocols for Concussion Management

Beginning in the fall of each academic year, athletes considered high risk or contact sports at The College of Idaho would receive a baseline test prior to their preseason conditioning programs. Baseline tests through the C3 Logix testing program are a part of the athlete's preparticipation physical examination (PPE) obtained by the athletic training staff at the college every other year. These sports are as follows:

1. Baseball
2. Men's and Women's Basketball
3. Football
4. Men's and Women's Soccer
5. Men's and Women's Ski Teams

6. Women's Softball *

7. Women's Volleyball *

8. Men's and Women's Lacrosse

* Sports that have recorded two or more concussions within a competitive season will be baseline tested

Physical therapists from RehabAuthority and other health care personnel designated by the athletic training room staff will also assist in administering baseline tests for those athletes in sports with large rosters. Sports such as baseball, basketball, football, and softball require mass baseline testing. Additional athletic staff and athletic training students can assist in directing athletes in the testing process.

The Baseline Testing Procedure

The C3 Logix testing procedure includes three stations set up at a location on campus. Applied on the right or left upper chest, area on his or her shirt is a bar code sticker. The IPad for each portion of the baseline test will scan it. JustGo Products sends the barcodes via email to the athletic training staff and printed on Avery Shipping Labels for mass baseline testing. Because of the balance portion of the test, athletes will be asked to wear comfortable clothing, preferably athletic clothing, during baseline testing. The athlete enters their demographic data (Intake Module) and begin the neurocognitive portion in the first station on the IPad provided by the athletic training department. Scanning of the bar code allows athletes to go to any one of the clinicians or athletic training staff involved in administering the test in the next two stations, which are the visual acuity and balance modules. As a part of their service agreement, Just-Go Products can furnish additional IPads for the College of Idaho to use for mass baseline testing at no additional charge and ship them prior to the testing. The college will return the IPads once testing is complete. The college will pay a small shipping fee to return the IPads to Just-Go Products.

Data Collection

Uploaded date from baseline testing and subsequent testing following a mild brain injury is available on i-Comet. This is a massive storage database provided by the C3 Logix System, in conjunction with technologies provided by Apple. Access to this data will be limited to the team physician and athletic training staff at the College of Idaho. Other health care providers involved in caring for the athlete who sustains a mild brain injury (neurologists, neurosurgeons, vestibular therapists, etc.) can also have access to data collected from the C3 Logix baseline test and subsequent follow up testing with a referral from the team physician and permission from the athlete. As with all medical information, the data collected from C3 Logix testing is subject to the HIPPA privacy laws related to medical information.

Management of Mild Brain Trauma and Concussions

The College of Idaho Team Physician, athletic training staff, and health care providers that work directly with the athletes at the college understand the importance of early recognition, management, and care of concussions and mild brain trauma. Many of the protocols and procedures highlighted in this document follow recommendations regarding management of mild brain trauma by the National Athletic Trainer's Association (NATA), the National Collegiate Athletic Association (NCAA), and the National Association of Intercollegiate Athletics (NAIA) as well as other allied medical organizations. Adoption of these policies and procedures is necessary to manage these types of injuries in an expedient manner.

1. The athlete that is recognized by the athletic training or coaching staff as receiving a potential mild brain injury or concussion will be removed from the field of play. The athletic training staff immediately following the injury episode will evaluate this athlete if athletic staff is present. If athletic training staff is absent, the coaching staff refers the athletic training office by the coaching staff as soon as possible.

2. Athletes who are symptomatic and present with any post concussive symptoms related to a mild brain injury or concussion following a blow to the head will not return to practice or competition. The athletic training staff will determine his or her medical status 24 hours after the injury episode.

3. Athletic training staff conducts and records a post-event concussion test utilizing the C3 Logix Testing Program. The team physician and athletic training staff determine the athlete's medical status based on the following criteria:

His or her current post concussive symptoms

Results from the post-event assessment compared to the athlete's baseline test

4. The head athletic trainer in conjunction with athletic training staff will facilitate referrals to the team physician for mild brain injuries or concussions, as with other athletic injuries.

5. Further testing and activity restrictions will be placed on the athlete by the team physician based on additional assessments made by the team physician and recommendations of the athletic training staff at the College of Idaho, who will follow the athlete's status on a day-to-day basis. If significant changes in the athlete's symptoms occur during this process, the athletic training staff notify the team physician. The team physician will make referrals to neurologists, neurosurgeons, or other specialized therapy for the athlete diagnosed as having a concussion.

Return-to-Play Protocols and Activity Restrictions for Mild Brain Injuries and Concussions

Athletes diagnosed as sustaining a mild brain injury or concussion does not return to physical activity as long as he or she presents with post-concussive symptoms and has not returned to their baseline status as measured by their individual C3 Logix test.

The decision to begin implementation of these protocols for the athlete who sustains a concussion is at the discretion of the team physician. The athlete must remain asymptomatic at each stage of the return-to-play protocols in order to progress to the next stage. If symptoms return at any stage of the process, the athlete will be restricted to no activity status. The team physician will make all decisions as to when the athlete can begin any mild physical activity during recovery. There are five gradual steps to help safely return an athlete to play, adapted from the International Concussion Consensus Guidelines : , and have been adopted by the team physician, athletic training department at the College of Idaho, and the Concussion Clinic at St. Luke's Health Care System.

Return to Play Progression

Baseline (Step 0): As the baseline step of the Return to Play Progression, the athlete needs to have completed physical and cognitive rest and not be experiencing concussion symptoms for a minimum of 24 hours. Keep in mind, the younger the athlete, the more conservative the treatment.

Step 1: Light Aerobic Exercise
Goal: only to increase an athlete's heart rate.
Time: 5 to 10 minutes.
Activities: exercise bike, walking, or light jogging.
Absolutely no weight lifting, jumping or hard running.

Step 2: Moderate Exercise
Goal: limited body and head movement.
Time: Reduced from typical routine
Activities: moderate jogging, brief running, moderate-intensity stationary biking, and moderate-intensity weightlifting

Step 3: Non-contact Exercise
Goal: more intense but non-contact
Time: Close to Typical Routine
Activities: running, high-intensity stationary biking, the player's regular weightlifting routine, and non-contact sport-specific drills. This stage may add some cognitive component to practice in addition to the aerobic and movement components introduced in Steps 1 and 2.

Step 4: Practice
Goal: Reintegrate in full contact practice.

Step 5: Play
Goal: Return to competition

Academic Considerations for the Athlete with a Mild Brain Injury

As indicated earlier in this document, a concussion has a significant impact on cognitive functions of the brain, which will not only affect the athlete on the field of play, but a more significant impact on his or her performance in the classroom. Moreover, increased mental stimulation of the brain can prolong or worsen the athlete's symptoms, therefore prolonging recovery from mild brain trauma. Therefore, cognitive rest is an important factor in the treatment of a concussion. Medical studies have demonstrated the medical benefits in the recovery process of mild brain trauma. In fact athletes who undertake cognitive activity restriction recover faster and have reduced possibility of symptoms returning, which is an indication of the brain's dysfunctional metabolism following a concussion. The goal is to provide "reasonable academic accommodations" for the student athlete that has suffered mild brain trauma. Other colleges and universities have adopted "Post-Concussion Disability Accommodations," which should be included as a part of the policies for the Learning Center/Students with Disabilities at the College of Idaho. A physician or other qualified medical professional can apply these accommodations for any student who has sustained a concussion.

An athlete diagnosed with a concussion will follow the Academic Classification for Return to Classroom Participation for the Concussed Student Athlete. It includes management strategies for the professor and student athlete and based on the athlete's medical status following a concussion or mild brain trauma.

Post-Concussion Classification and Procedures

This system is for academic professionals to understand the implications of mild brain injury as it relates to the student athlete's academic performance in the classroom. Once diagnosed, the following actions will occur:

- The Director of The Learning and Disabilities Center at The College of Idaho is contacted via email
- A determination of the athlete's cognitive status is made by the athletic training staff and team physician and placed in a specific classification system (Red, Orange, Yellow, Blue, Green) This system is a personalized education program and based on the student-athlete's daily academic progress.
- The Director of The Learning notifies each professor or instructor and Disabilities Department via email for each class the athlete attends. He or she will also contact the student-athlete and arrange a subsequent meeting(s) in the Learning Center.
- Monitoring of both physical and social behaviors in the classroom by the professor or instructor is the key component of this policy. These actions are indicative of neurocognitive function and recovery.
- The student-athlete is placed in the lowest classification or color based on observation and day-to day-evaluations by the athletic training staff. Each concussion will manifest differently in each student, so a proper determination of the athlete's cognitive status is important.

Each color represents a classification based on the student's most significant limitation in any one class. The definition combines physical classroom attendance and mental attendance (e.g. classroom participation, responding to verbal questions from students/instructors, appropriate social interaction)

Classification	Definition	Instructional Strategies	EMAIL Language
	Initial Suspicion/Day of Trauma	**The injury affects student's class attendance. Modifications to the student's academic day may vary from class to class and the Classification indicated determines the most significant symptoms occurring in any class.**	**Initial Suspicion of Concussion Email: This student has sustained a concussion. Symptoms associated with this type of injury may include, but are not limited to headache, dizziness, difficulty concentrating, fatigue, fogginess, sensitivity to light & noise, changes in social or academic interaction and difficulty reading. Symptoms manifest themselves later in the day and/or may return with higher level thinking tasks and cognitive exertion. Please let us know if you notice any changes in this student's academic or social behavior in your class, as this will assist us in determining the follow-up care they receive.**
1 -Red	**No School Symptomatic at Rest**	**Not attending school**	**This student has suffered a concussion and is currently resting both cognitively and physically at home. Student advised to avoid all academic work and to avoid any symptom exacerbation. Upon their return to your class, they may not have all assignments up to date and will probably need to reduce the pace or quantity of work for several days. We will provide an update following their next clinical evaluation. Upon return to school, the student and teacher will need to discuss any missed work and upcoming assignments to develop a plan that encourages gradual completion of assignments as recovery progresses.**

Classification	Definition	Instructional Strategies	EMAIL Language

2- Orange	**Limited school day**
	Limited Physical class attendance
		Student class attendance limited
		
		Clear Desk, meaning no written desk work (auditory only)
		
		Limited Classwork
		Peer note taking
		
		Student may benefit from periodic breaks from active classroom participation (head down on desk)
			This student is under continued monitoring for a concussion by the athletic training staff. They may be attending partial school days and/or need to limit the amount of time in a particular class and will most likely not have completed some assignments. Students in this recovery zone may benefit from the following instructional strategies:
			• **Rest breaks during class**
			  ○ **Head down in class or seated with eyes closed not actively working, but actively listening**
			• **Rest in health room for up to 20 minutes**
			• **Limited classwork/testing**
			  ○ **Less reading, more listening**
			  ○ **Utilize teacher or peer notes**
			• **Develop and maintain a schedule for completing assignments**
			Please be observant of any changes in the student's physical or cognitive activity when they return to your class and share any concerns with appropriate staff members (athletic trainer, counselor, administrator, etc.). In addition, please communicate with the student about their progress so they can feel comfortable and confident about returning to school, participating in class, completing assignments and sharing information with you related to their recovery.

Classification	Definition	Instructional Strategies	EMAIL Language

3 - Yellow	**Student attends full day of school**
	Limited class time with possible partial mental class attendance
		Clear Desk
		
		Classroom participation as tolerated
		
		Limited Classwork
		
		Student may need period of mental and/or physical rest within the classroom (head down on desk)
			This student will be attempting to complete a full school day but may need to limit time attending any class that causes concussion symptoms to resurface and/or intensify. Depending on the class content, time of day, and method of instruction, the following instructional strategies may provide the greatest benefit to the student:
			• **Rest breaks during class**
			  ○ **Head down in class or seated with eyes closed not actively working, but actively listening**
			• **Rest in health room for up to 20 minutes**
			• **Adjusting amounts of classwork/testing**
			  ○ **Emphasis on formative rather than summative assessments**
			  ○ **Develop and maintain a schedule for completing assignments**
			
			Please continue communicating with the student regarding assignments, class participation and their overall recovery. Please contact the counselor and/or athletic training staff if you have any questions.

4-Blue	**Full class attendance (both mental and physical) with instructional strategies**	**Student attends full class** **Instructional strategies in use** **Relevance of instructional strategies to be determined by the teacher as appropriate for each individual student's needs**	**This student should be attending a full school day and be in attendance for and participating in the entire class period with minimal instructional strategies in place, including:** • **Adjusting amounts of classwork/testing, including summative assessments** • **Actively working on completing missed assignments** **These instructional strategies utilized to reduce any residual concussion symptoms and foster the most appropriate learning environment during the final stages of the student's recovery. Please alert the counselor and/or athletic training staff if the student is not able to maintain classroom attendance due to concussion symptoms.**

Classification	Definition	Instructional Strategies	EMAIL Language
5-Green	**Full Class Attendance**	**No instructional strategies needed**	**This student should be participating fully in class at this time and scheduled to begin a return to athletic participation/increased physical activity. Before we do, we are asking for any input or concern that you as the teacher might have about this student based on your classroom observation as they have progressed through the concussion recovery. Please alert the athletic training staff if the student continues to utilize any instructional strategies to minimize concussion symptom exacerbation. The student should be actively working on, or have completed any make up work as appropriate.**
Post	**Follow-up 1 – 3 weeks post return to unrestricted activity**	**Verification that student is performing at pre-concussion level cognitively in classroom**	**This student has recently recovered from a concussion and has returned to unrestricted cognitive and physical activity. We would like to verify that this student has returned to their pre-concussion academic ability in <u>your</u> class. Please respond to confirm or comment on their recovery.**

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