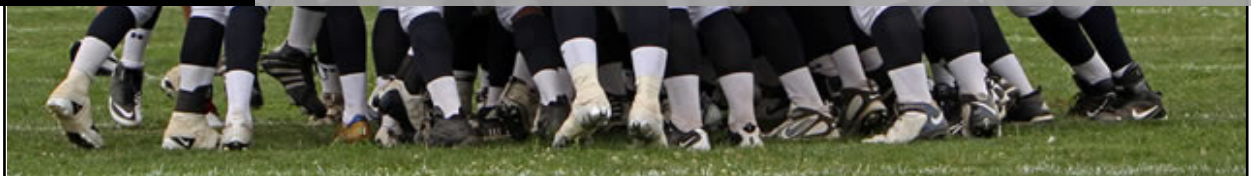


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COLORADO
DEPARTMENT
OF
EDUCATION

CONCUSSION MANAGEMENT GUIDELINES



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Preface

Legislation addressing youth concussion has been enacted in over half the states within the country, according to Education Week. The majority of traumatic brain injuries (TBI) occur in youth between the ages of five and 18. This age group is at an increased risk of experiencing a TBI and prolonged recovery (Gilchrist, Thomas, Xu, McGuire, & Corondo, 2011). In an effort to address this issue, Governor John Hickenlooper signed Senate Bill 11-040, also known as “The Jake Snakenberg Youth Concussion Act,” into law on March 29, 2011. This law went into effect in Colorado on Jan. 1, 2012.

The Colorado Department of Education developed “Concussion Management Guidelines” to educate school districts on S.B. 11-040 and to provide guidance to superintendants as they work to implement concussion management guidelines within their districts.

Acknowledgements

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This includes:

Academy 20 School District

Adams 12 School District

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Douglas County School District

Littleton School District

Manitou Springs School District

Mesa School District 51

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Section 1: Introduction

Concussions have historically been affiliated with sports and considered “just a bump on the head” or a “ding.” Often called the “silent epidemic” the Centers for Disease Control (CDC) estimate that approximately 1.6 to 3.8 million sports and recreational concussions occur each year (Langolis, Rutland-Brown & Thomas, 2006). This excludes the numerous children who sustain concussions from non-sports activities, such as motor vehicle accidents, falls and assaults.

In the past, a concussion was often compared to a “bruise” or a “bleed” in the brain. In actuality, a concussion is believed to be a disruption of ionic channels of the brain cells. A concussion cannot be seen on a computed tomography (CT) scan or on a magnetic resonance imaging (MRI) scan because it is a microscopic injury that occurs on a cellular level. A concussion is a functional problem not a structural problem. This means it can affect the way a person feels, thinks, experiences emotion and level of sleep/energy. When the doctor tells a parent that the CT scan or the MRI was normal it does not mean that there was not a concussion. If there are signs and symptoms of a concussion then it is likely that the student sustained a concussion.

One of the most dramatic signs of a concussion is loss of consciousness (LOC). Once believed necessary to make the diagnosis of concussion, research now shows that only 10 percent of concussions even involve a loss of consciousness (Delaney, Lacroix, Leclerc & Johnston, 2002). Research has also shown that LOC does not predict a “bad” outcome. In fact, no doctor can predict the outcome of a concussion at the time of the injury. The majority of concussions resolve well without complication. A few concussions take one week to recover, most concussions take between one to three weeks to recover, and some concussions take months to years to heal. It is estimated that 80 to 90 percent of concussions resolve without long term effects in about one to three weeks (Collins, Lovell, Iverson, Ide & Maroon, 2006). All the experts in the area of concussion agree that while recovering from a concussion, the student is extremely vulnerable and at high risk for further injury should they hit their head again. Experts are also concerned that once a student sustains one concussion, they are at three to six times higher risk of sustaining another concussion, sometimes with less force and often with a more difficult recovery (Guskiewicz, Weaver, Padua & Garrett, 2000).

Prevention:

A concussion is considered a traumatic brain injury. The only cure for brain injury is prevention. It is impossible to prevent all brain injuries as they occur from accidents even in the most careful of situations. Being an active participant in sports and engaging in physical activity inherently places student-athletes at higher risk for injury. However, before focusing primarily on identification and treatment of a concussion, this section is intended to remind school districts:

Before a brain injury occurs, make sure you maximize your chances of prevention

- Conduct periodic safety reviews on common play/sporting areas
- Provide appropriate and adequate staffing for sporting events and recess
- Provide appropriate access to preventative gear (helmets, mouth guards)
- Provide appropriate fitting of preventative gear
- Design guidelines and enforcement of appropriate and fair rules and techniques

Section 2: Concussion Legislation in the State of Colorado

Colorado High School Activities Association (CHSSA) Bylaws:

January 2010, voted into effect Bylaw #1790.21:

“If at any time during participation, a student-athlete is removed from participation due to head trauma, the student-athlete must obtain a written release from a licensed practitioner before participating again. A school or school district may impose stricter standards.”

April 2010, voted into effect Bylaw # 1620.4:

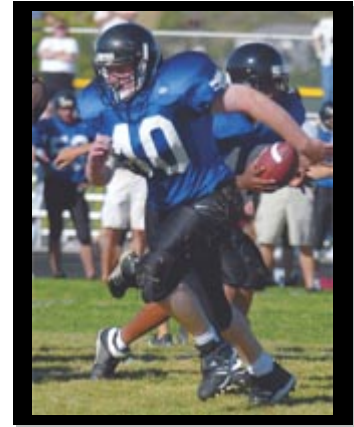
“All coaches, who have sole supervisory responsibility for a team, must annually complete one of the following: The online National Federation of State High School Associations (NFHS) Concussion Course or a school organized sports medicine review that includes a head trauma/ concussion component, and emergency evacuation procedures.”

CHSAA bylaws have only been able to oversee and govern activities in *public and private* high school settings in the state of Colorado.

Colorado State Legislation:

The field of concussion identification and management is changing every day. The state of Colorado has taken great strides in 2010 and 2011 to make sure that student-athletes are kept safe on the fields, stadiums and courts. On Jan. 14, 2011, Senate Bill 11-040, also known as “The Jake Snakenberg Youth Concussion Act”, was proposed. This legislation swiftly passed through the Senate and the House and was signed into law by Governor Hickenlooper on March 29, 2011. Senate Bill 11-040 goes into effect on Jan. 1, 2012.

Senate Bill 11-040 was named after freshman football player Jake Snakenberg from Grandview High School who died of Second Impact Syndrome (SIS). In the fall of 2004, Jake Snakenberg likely sustained a concussion in a game the week prior, however, he did not fully understand that he experienced a concussion and did not report his symptoms. One week later, Jake took a typical hit in a game, collapsed on the field and never regained consciousness. Jake passed away from “Second Impact Syndrome” on September 19, 2004.



Click here to view [Senate Bill 11-040](#)

What does this mean for school districts in Colorado?

The trend of national legislation, state legislation, the CHSAA Bylaws, and S.B. 11-040 promote these three basic tenets:

- 1) Education of concussion identification
- 2) Removal from Play for suspected concussion
- 3) Return to Play under medical supervision

The Colorado Department of Education (CDE) supports but does not oversee S.B. 11-040. CDE does not mandate certain practices for concussion training and management, however, CDE has a responsibility to ensure that school districts understand the requirements of the law, as it pertains to student-athletes ages 11 years through 18 years.

CHSAA guidelines will continue to govern concussion education/management for all high school activities. The S.B. 11-040 guidelines are farther reaching than CHSAA Bylaws and go into effect January 1, 2012. Colorado school districts are encouraged to be familiar with both the CHSAA guidelines and the S.B. 11-040 guidelines. In addition, a school district may choose to expand on the guidelines outlined by CHSAA or in S.B. 11-040. The following pages highlight how school districts can expand on the three tenets listed above by utilizing best practices.

EDUCATION**Required by Senate Bill 11-040**

(These guidelines are to be implemented by January 1, 2012)

(1)(a) Each public and private middle school, junior high school, and high school shall require each coach of a youth athletic activity that involves interscholastic play to complete an annual concussion recognition education course.

(a) Each private club or public recreation facility and each athletic league that sponsors youth athletic activities shall require each volunteer coach for a youth athletic activity and each coach with whom the club, facility, or league directly contracts with, formally engages, or employs who coaches a youth athletic activity to complete an annual concussion recognition education course.

(2) (a) The concussion recognition education course required by subsection (1) of this section shall include the following:

(I) Information on how to recognize the signs and symptoms of a concussion.

(II) The necessity of obtaining proper medical attention for a person suspected of having a concussion.

(III) Information on the nature and risk of concussions, including the danger of continuing to play after sustaining a concussion and the proper method of allowing a youth athlete who has sustained a concussion to return to athletic activity.

The following videos meet the requirements for SB 11-040:

NFHS→	www.nfhslearn.com/
Brain101→	http://brain101.orcasinc.com/
CDC→	www.cdc.gov/concussion/

For on-site trainings across the state, contact the Brain Injury Alliance of Colorado (BIAC) biacolorado.org or the Colorado High School Activities Association (CHSAA) www.chsaa.org

Best Practice Guidelines for Education

(These are not required by S.B. 11-040 but should be considered)

In addition to education of concussion identification as determined in S.B. 11-040:

- Education to all school staff, not limited to coaches, who supervise students at play: elementary school staff, playground supervisors, office staff, before and after school programs, physical education teachers, school nurses, and related services.

In addition to training on “identification” of concussion as determined in SB 11-040:

Training to all staff on both “identification” and “management” of a concussion. Management would include but is not limited to:

- The school staff’s role as members of a Multi-Disciplinary Concussion Management Team
- The Educator’s role in reducing cognitive and academic demands during the recovery from concussion

REMOVAL FROM PLAY FOR A “SUSPECTED” CONCUSSION**Required by Senate Bill 11-040**

(These guidelines are to be implemented by January 1, 2012)

If a coach who is required to complete concussion recognition education pursuant to subsection (1) of this section suspects that a youth athlete has sustained a concussion following an observed or suspected blow to the head or body in a game, competition, or practice, the coach shall immediately remove the athlete from the game, competition, or practice. The signs and symptoms cannot be readily explained by a condition other than concussion.

Best Practice for Removal from Play

(These guidelines are not required by SB 11-040 but should be considered)

In addition to immediate removal from play for 11 through 18 year old athletes as outlined in SB 11-040 (see above):

- Removal of any student who sustains a concussions, not limited to students between the ages of 11 years through 18 years
- Removal of any student who sustains a concussion in any setting (e.g. on the playground, in the classroom, etc.) not limited to athletic endeavors

In addition to immediate removal from play, when a concussion is observed or suspected as outlined in SB 11-040: The student should be removed from any and all types of physical activity during the recovery, including but not limited to removal from PE classes, dance classes, recess and school organized sports.

If a school comes upon information from an outside source (reported to the school from the student, a parent, Primary Care Provider, an Emergency Department) that a student (of any age) has sustained a concussion (e.g. motor vehicle or biking accident, fall, ski/snowboarding), the same principals of removal from all physical activity at the school should apply. This includes not only removal from PE classes, dance classes and recess but also removal from all school-organized sports, even though the injury did not happen at school.

RETURN TO PLAY**Required by Senate Bill 11-040**

(These guidelines are to be implemented by January 1, 2012)

(4) (a) If a youth athlete is removed from play pursuant to subsection (3) of this section and the signs and symptoms cannot be readily explained by a condition other than concussion, the school coach or private or public recreational facility's designated personnel shall notify the athlete's parent or legal guardian and shall not permit the youth athlete to return to play or participate in any supervised team activities involving physical exertion, including games, competitions, or practices, until he or she is evaluated by a health care provider and receives written clearance to return to play from the health care provider. The health care provider evaluating a youth athlete suspected of having a concussion or brain injury may be a volunteer.

"Health Care Provider" means:

- a Doctor of Medicine
- Doctor of Osteopathic Medicine
- Licensed Nurse Practitioner
- Licensed Physician Assistant
- Licensed Doctor of Psychology with training in neuropsychology or concussion evaluation and management.

(b) Notwithstanding the provisions of paragraph (a) of this subsection (4), a doctor of chiropractic with training and specialization in concussion evaluation and management may evaluate and provide clearance to return to play for an athlete who is part of the united states Olympic training program.

(i) After a concussed athlete has been evaluated and received clearance to return to play from a health care provider, an organization or association of which a school or school district is a member, a private or public school, a private club, a public recreation facility, or an athletic league may allow a registered athletic trainer with specific knowledge of the athlete's condition to manage the athlete's graduated return to play.

Best Practice for Return to Play

(These guidelines are not required by SB 11-040 but should be considered)

SB 11-040 does not speak to the school district's role in this section. Best Practice suggests that school districts create a Multi-Disciplinary Team Approach to Concussion Management including:

- A seamless system of communication between school professionals, medical professionals and the family. Information must flow smoothly from within the school to outside the school so that the RETURN TO PLAY decisions can be made safely.
- A seamless system of communication among school professionals. Information must flow smoothly between the school athletic departments and the academic departments to ensure appropriate physical and academic adjustments during the recovery.

Best Practice suggests that a school create a concussion management system that is adequate and consistent for any student, elementary through high school, who has sustained a concussion regardless of the setting or mechanism.

Best practice also recommends that a school district create a system in which a student may receive a more intensive assessment and intervention, if the concussion does not recover in a reasonable amount of time. This may include formal accommodations and/or modifications of curriculum.

Section 3: Mechanism of Concussion

It is difficult to understand the complexities of a concussion since it is a functional rather than a structural problem. It cannot be seen therefore, is it really there? And if it is, how do we know if we are making it better and how do we know when it is cured? Understanding the mechanism behind concussion helps most students, parents, coaches and educators better appreciate the complexities of the recovery.

A concussion occurs when chemicals found within the brain cells become disrupted and unbalanced. As a result, potassium flows out of the brain cell and calcium flows into the brain cell. The overall result is inefficiency of the brain cell to properly deliver the much needed nutrients (especially glucose) to the brain (Giza & Hovda, 2001). The brain needs glucose to function. Without it, a person's ability to engage in just about any type of physical and/or mental activity can be hindered.

Immediately after a concussion, the brain cells may be so dysregulated that even delivering enough fuel to sit up in a chair or to keep eyes open may place too much demand on the brain. When asked to do more than it can at the time, the brain will “flare a symptom” in the form of a headache, photophobia, dizziness (refer to page 14 for a list of additional symptoms). This theory helps explain why even the simplest of tasks may be too much to ask of a person immediately after a concussion. Often after a concussion, all a person can manage to do is sleep in a dark room.

Cells within the brain will naturally begin to re-regulate. Within days of the concussion, a person can begin sitting up, walking, talking, watching television, reading and activities of daily living. The channels in the brain cells tend to re-regulate themselves – with no other treatment (no specific intervention or medication needed) – except for rest over a period of one to three weeks. How easily one flares a symptom when trying to engage in activities becomes the best measure of how well the brain cells are re-regulating themselves. Asking a student to complete a trigonometry test can be as demanding as asking the athlete to run a four minute mile. Some adolescents experience more symptom flare up's from physical demands on the brain while others experience more symptom flare up's from cognitive demands.

Take Home Point:

The reporting and monitoring of symptoms after a concussion and throughout the recovery is absolutely essential. Symptoms, in essence, become our “lab tests” for how the concussion is resolving.

List of Symptoms:

It is important to note that symptoms fall into four domains. All symptoms are important and the presence of any symptom must be taken seriously.

Physical (How a person feels physically)	Cognitive (How a person thinks)
<ul style="list-style-type: none"> • Headache • Neck pain/pressure • Blurred vision • Dizziness • Poor balance • Ringing in the ears • Seeing stars • Vacant stare/glassy eyed • Nausea • Vomiting • Numbness/tingling • Sensitivity to light • Sensitivity to noise • Disorientation 	<ul style="list-style-type: none"> • Feeling in a “fog” • Feeling “slowed down” • Difficulty remembering • Difficulty concentrating • Slowed speech • Easily confused
Emotional (How a person feels emotionally)	Maintenance (How a person experiences energy and sleep)
<ul style="list-style-type: none"> • Inappropriate feelings • Personality changes • Nervousness/anxiety • Feeling more emotional • Irritability • Sadness • Lack of motivation 	<ul style="list-style-type: none"> • Fatigue • Drowsiness • Excess sleep • Trouble falling asleep • Sleeping less than usual

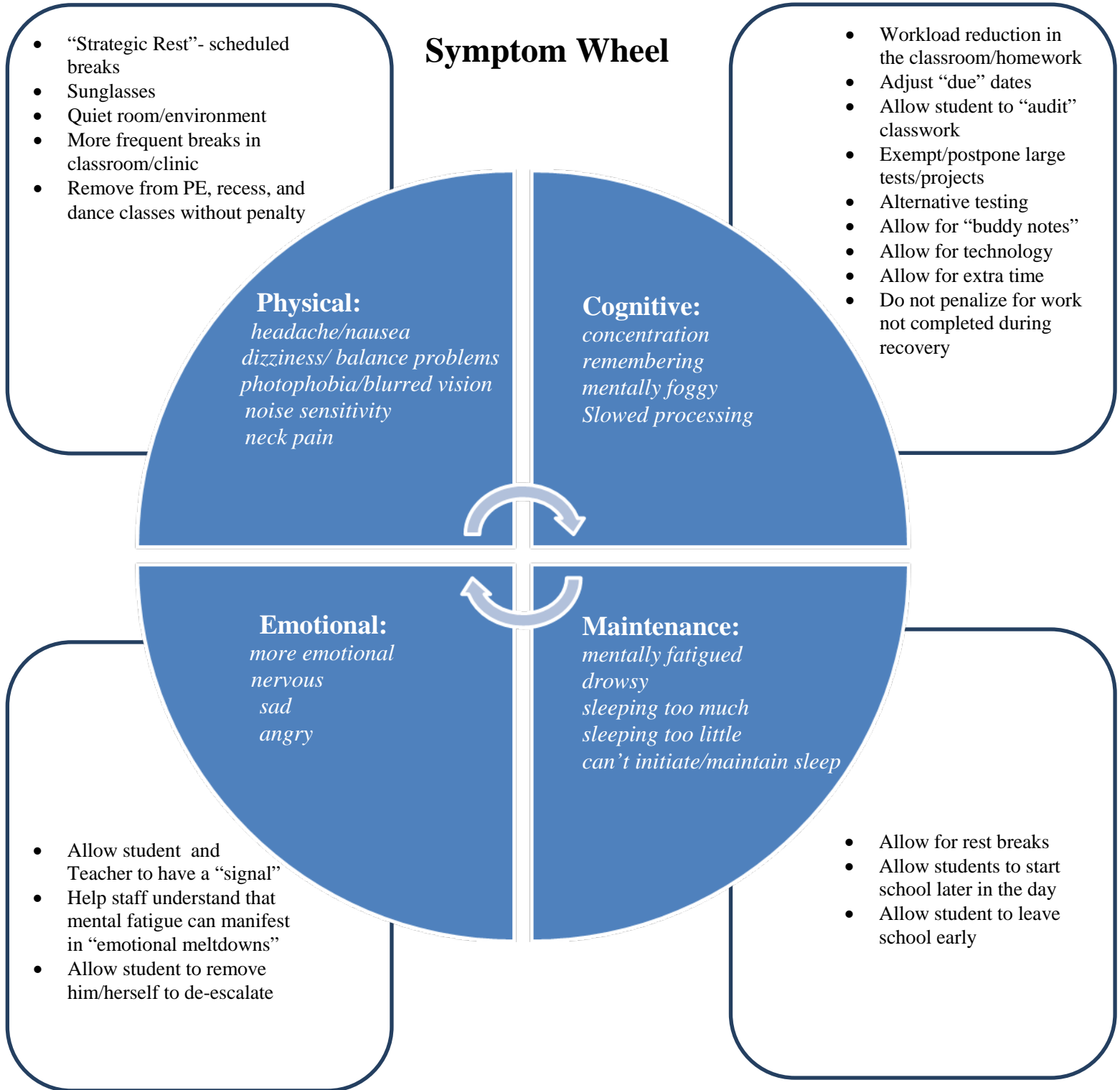
Speak a Common Language:

If symptoms are the only way to know when and how the concussion is getting better, then it helps that the student, family, coaches, certified athletic trainers, teachers, other school personnel and health care provider all speak the same language. Since a report of symptoms can be quite subjective, it is often helpful to use a rating scale. The rating scale can act as a common language for everyone involved in managing the concussion. Most concussion management programs now subscribe to a zero to six rating scale (zero= not present to six = most severe experience of the symptom). A sample of a symptom rating scale can be found on the following page.

Symptoms:	0	1	2	3	4	5	6
Headache							
Nausea							
Vomiting							
Balance problems							
Dizziness							
Fatigue							
Trouble falling asleep							
Sleeping more than usual							
Sleeping less than usual							
Drowsiness							
Sensitivity to light							
Sensitivity to noise							
Irritability							
Sadness							
Nervous/anxious							
Feeling More emotional							
Numbness or tingling							
Feeling like in a fog							
Difficulty remembering							
Difficulty concentrating							
Visual problems							
Other							

The Graded Symptom Checklist is recommended by the National Association of Athletic Trainers. The zero to six symptom scale is commonly accepted by various tests: ImPACT (Immediate Post-concussion Assessment and Cognitive Test) and the SCAT2 (Sport Concussion Assessment Tool 2).

Certain symptoms lend themselves to certain interventions. The *Symptom Wheel* helps educators align concerns with solutions (McAvoy, 2011).



Section 4: Concussion Management

S.B. 11-040 does not specify the school district's role between REMOVAL FROM PLAY to RETURN TO PLAY. According to S.B. 11-040, at a minimum, the school district must receive **written notification from a health care provider** for any student-athlete, between the ages of 11 through 18 years, who has been removed from play due to a suspected concussion. A health care provider is specified as:

- Doctor of Medicine
- Doctor of Osteopathic Medicine
- Licensed Nurse Practitioner
- Licensed Physician Assistant
- Licensed Doctor of Psychology with training in neuropsychology or concussion evaluation and management

Outlined below is range of options school districts may consider when working with a student-athlete who has sustained a concussion and is transitioning from removal from play to return to play. This process can be applied to all students, not just student-athletes. These suggestions are not required by S.B. 11-040 but are considered best practice.

Best practice suggests:

- A student-athlete with a concussion should be removed from all physical activity that occurs at school, including but not limited to physical education classes, dance classes, recess and school-organized sports. Removing the student-athlete from physical activity is necessary to:
 - Reduce the risk of another injury to the brain. It is documented that the developing brain is at higher risk for the phenomenon of Second Impact Syndrome – a devastating or fatal second blow to the brain during the recovery of the first blow to the brain. (Cantu, 1998)
 - Reduce the amount of physical stress on the brain cells. It is documented that physical strain on the brain during the one to three week recovery from a concussion will cause an exacerbation of symptoms and will hamper/delay recovery of the concussion. (CDC)

- Any student with a concussion should be allowed to reduce the amount of mental strain on the brain cells during the recovery from the concussion. It is documented that mental/cognitive strain on the brain during the one to three week recovery from the concussion will cause an exacerbation of the symptoms and will hamper/delay recovery of the concussion. (Majerske, Mihalik & Ren, 2008)

- If a school team has information of a medical condition that will affect a student's ability to perform at school academically, socially, or behaviorally, it is the school's responsibility to intervene to assist the student during recovery.
- Symptoms of the concussion will be evident at school and the pattern and trend of these symptoms is essential data in the health care providers decision about return to play activities. Schools should track symptoms over the period of recovery to better inform parents and medical professionals as they move toward the decision of medical clearance.
- Data collected on the student-athlete at school must be communicated to the parent and to the health care provider.
- Keeping an eye on the concussion and utilizing multiple sources of data is the safest way to manage a student-athlete through the course of the recovery of the concussion. Therefore, best practice suggests that the responsibility of concussion management falls to the student, family, school and medical professional. In other words, a *multi-disciplinary team* approach to concussion management is best practice.

A Multi-Disciplinary Concussion Management Team should consist of:

Family Team – the student, the parents, guardians, grandparents, peers of the student

Medical Team - Doctor of Medicine (MD), Doctor of Osteopathic Medicine (DO), Nurse Practitioner (NP), Physician Assistant (PA), a licensed psychologist (specifically either a neuropsychologist or specialist in concussion management). The health care provider may work closely with other medical professionals. Those adjunct team members may include: physical therapist, massage therapist, chiropractor, and occupational therapist. These professionals cannot medically clear the student-athlete of the concussion but they can be involved in the treatment of the concussion.

School Team - the school team has two distinct and important parts:

- The physical team – may include the certified athletic trainer, school nurse, coach, and physical education teacher, the Athletic Director and others.
- The academic team – may include the teacher, counselor, school psychologist, and school social worker, an Administrator and others.

Role of the School Team:

The school's role is to collect the data and give it to the family/health care provider to be incorporated into the health care provider's return-to-play decision. School personnel do not make return-to-play decisions or clearance. The health care provider is responsible for the ultimate written medical clearance.

The role of the school team in concussion management is two-fold:

Intervene: Adults at the school must know how to help adapt the student's environment to allow the student to feel better as they progress through recovery. This will help the student recover as quickly as possible, and prevent further damage and/or a delayed recovery.

Progress monitor and share data: Adults at the school must track data, including but not limited to: teacher observations, symptom checklists, academic performance, visits to the nurse's office, need for (amount and frequency) for pain medication, etc. Some schools choose to include formal data collection. See more in Neurocognitive Testing on Page 22.

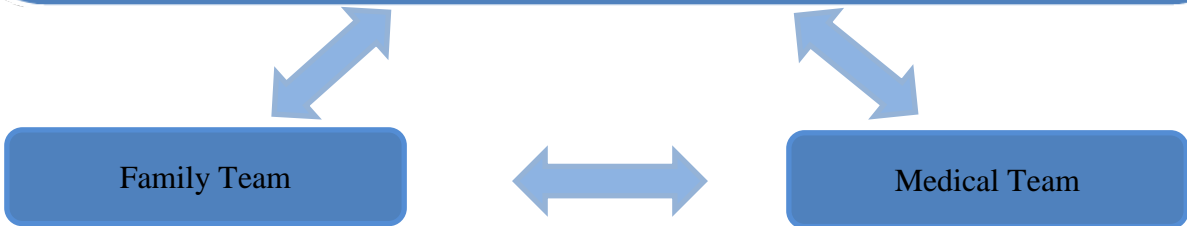
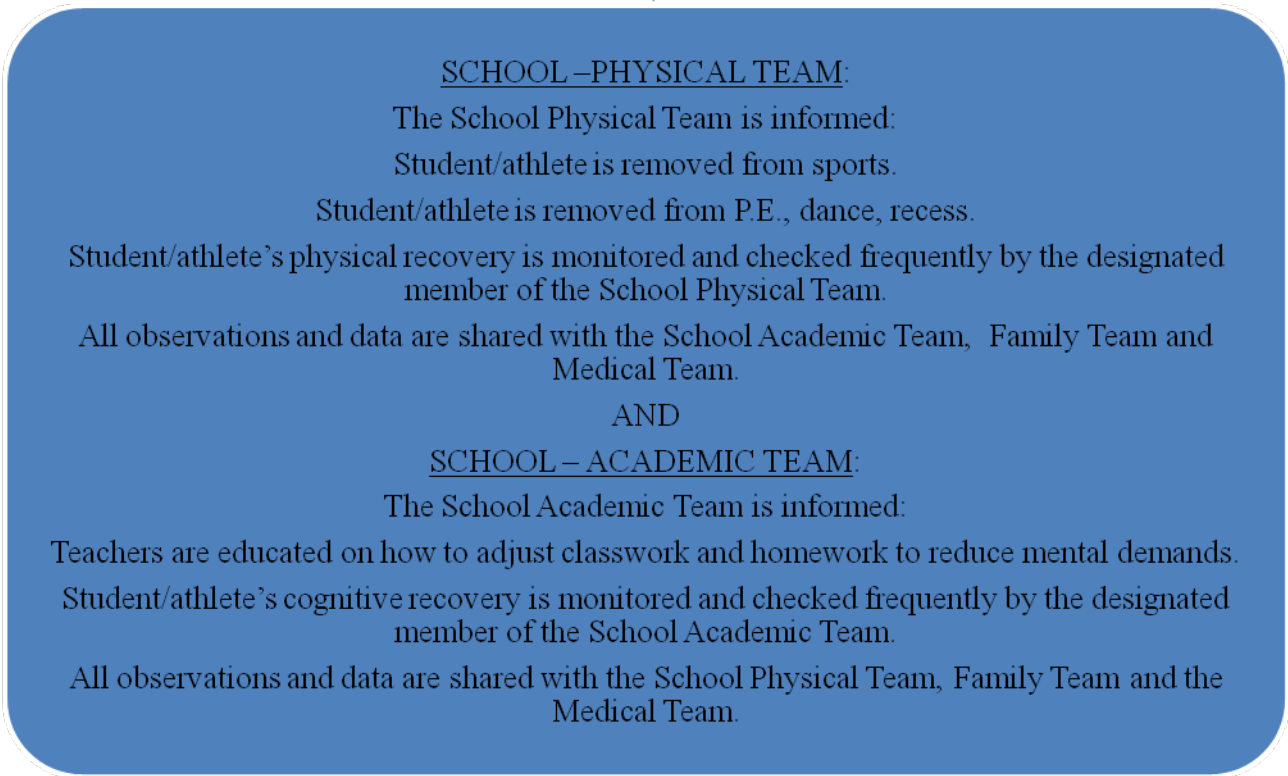
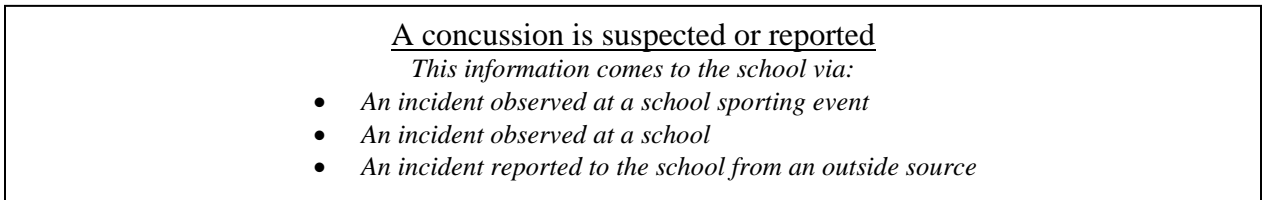
The results of all data collected must be shared with the student's parents and with the student's health care provider to ensure that all data is incorporated into the safest return-to-play decision.

How to create a Multi-Disciplinary Team:

CHSAA endorses the Multi-Disciplinary Concussion Management Team approach as the safest way to return any student-athlete to play. The Multi-Disciplinary Team approach supports the premise that: multiple “eyes” (perspectives) on the concussion and multiple “sources of data” will lead to the safest return to play decision.

PROGRESS MONITOR and SHARE DATA	Week 1	Week 2	Week 3
Family Team	*Assess and track physical, emotional, cognitive and especially sleep/energy symptoms *Continue to rest and reduce activity levels	Continue into week two as needed	Continue into week three as needed
School Academic Team	*Assess and track physical, emotional, sleep/energy and especially cognitive symptoms * Observe informal (academic performance) formal cognitive measures (neurocognitive tests, if a school district has made a choice to use such tests) *Intervene: Adjust academic demands	Continue into week two as needed	Continue into week three as needed
School Physical Team	*Assess and track cognitive, emotional, sleep/energy and especially physical symptoms * Observe formal and informal physical measures of mental status and balance (if a school district has made a choice to use such tests) *Continue to keep student-athlete out of physical activity	Continue into week two as needed	Continue into week three as needed
Medical Team Ideally, the decision to return an athlete to play is based upon multiple sources of data and is made by consensus of the Multi-Disciplinary Team However, the Medical Team has the ultimate responsibility to make final medical clearance	*Assess concussion *Rule out other medical conditions *Collect symptom reports, formal and informal testing data	Continue into week two as needed	Continue into week three as needed

One size does not fit all for the Multi-Disciplinary Team. Large school districts may have many resources and smaller districts may have limited resources. Regardless of the size or demographics, any community/school can create a Multi-Disciplinary Concussion Team. The main focus of all school districts creating Concussion Management Protocol is – communication and collaboration. The essential players and flow of information is as follows:



All teams watch symptoms and collect data, formally and/or informally. All data must be shared amongst team members and across teams. It is best practice that the Return-to-Play decision is made with convergent data and by consensus of the Multi-Disciplinary Team. When data is “divergent” and/or when there is no consensus on the Multi-Disciplinary Team, a problem-solving process should be engaged, with oversight from a school administrator. Ultimately, the health care provider has final responsibility for medical clearance of the student. However, a school district may choose to question the health care provider’s decision if data is not in alignment. Each school district may want to consider creating an appeal process for such occasions. They may also want to engage an appeal process for other areas of contention that might arise such as:

- Dissention/ disagreement on the multi-disciplinary team
- Divergent data which cannot be explained
- Differences of opinion about the athlete’s return to play after one concussion, after multiple concussions
- Questions about retirement from play
- Questions about level of academic accommodation provided by the school
- Problem-solving arena for students moving from universal to targeted to intensive interventions

Return-to-Play (RTP) Decision:

Best Practice for RTP follows the guidelines set forth by the Consensus Statement on Concussion in Sport: the 3rd International Conference on Concussion in Sport Held in Zurich (McCrory, Meeuwisse, Johnston, Dvorak, Aubry, Molloy & Cantu, 2008):

- The athlete must be “symptom-free” before being safe to return to physical activity:
 - ✓ Symptom-free would suggest – not on medications for symptom resolution
 - ✓ Symptom-free would suggest - the student has no cognitive symptoms and is performing “back to baseline” on all measures of neurocognitive and/or academic functioning

At that time, the health care provider may return the athlete *progressively* back to play per the Graduated Return-to-Play guidelines. Staying consistent with the concept that the concussed brain will flare a symptom if it is asked to exert beyond its capacity physically or mentally, the Zurich Guidelines outlines a six step, graduated RTP. As the athlete is asked to perform more and more rigorous physical activity (with 24 hours in between steps), a symptom will develop if the brain cells have not yet re-regulated themselves. If no symptoms return with increased exertion, the concussion management team can assume that the brain is back to normal and the athlete can return to his/her sport safely.

The graduated RTP guidelines are accepted best practices for athletes. Best practice suggests that a graduated RTP is important for any student (not just an athlete) returning to activity.

The Graduated Return-to-Play Guidelines are as follows:

Stage	Activity	Functional Exercise	Objective of Stage
1	No physical activity as long as there are symptoms	Complete rest	Recovery
*****	Must be symptom-free for 24 hours before starting Step 2	*****	*****
2	Light aerobic activity	Walking. Swimming, stationary cycling-keeping intensity <70MPHR, no resistance training	Increase heart rate
3	Sport-Specific exercise	Skating/running drills, 20-30 minutes – no weightlifting, no head contact.	Add movement
4	Non-contact training drills	Progression to more complex training drills; may start progressive resistance training.	Exercise, coordination, cognitive load
5	Full-contact practice	Following medical clearance, participate in normal training activities; full exertion	Restore confidence, assessment of functional skills by coaching staff
6	Return to play	Return to normal activity	

Neurocognitive Testing:

Neurocognitive testing in the context of concussion consists of brief computerized tests that assess an athlete's neurocognitive functioning pre-concussion and then again, at regular intervals, post-concussion. There are currently five neurocognitive tests on the market:

- ImPACT (Immediate Post-concussion Assessment and Cognitive Test)
- CogSport (also known as Axon)
- CNS Vital Signs
- HeadMinders
- ANAM (Automated Neuropsychological Assessment Metrics)

While these measures are popular in the field of concussion management, they are not yet mandated in the Zurich Consensus Statement. CDE does not endorse any one of these neurocognitive tests, nor does it endorse the addition of neurocognitive testing to a school district's Concussion Management Protocol. Adding a neurocognitive test presents unique logistical and liability challenges to a school district. **A school district is advised to seek legal and risk management counsel before subscribing to any computerized neurocognitive test.**

However, if a school district does choose to incorporate one of these neurocognitive tests into its Concussion Management Protocol, that school district should be cognizant of and comply with:

Test administration guidelines:

- Who is credentialed to give the test?
- Who is credentialed to interpret the test?

Most of the neurocognitive tests have some guidelines about the credentialing of personnel to give/interpret the test. Research this carefully and comply.

Test standardization guidelines:

- Under what conditions should the test be given?
- Baseline tests are often suggested with these five neurocognitive tests. Be cognizant that baseline be administered systematically and in a standardized fashion.
- Under what conditions and at what intervals should post-concussion testing be given?

If a school district is involved in giving a neurocognitive test to a concussed student, results of that test should be shared with the parent and with the medical provider. The Law clearly states that the RTP decision must be made by a health care provider. Therefore, if a school chooses to utilize a neurocognitive test, the test results must not be interpreted by the school personnel but instead must be given over to the health care provider to be used in the RTP decision.

Take Home Points:

- No RTP decision can be based on test results alone. The neurocognitive test should only be used as additional information in the context of the more comprehensive Multi-Disciplinary Team Management Protocol.
- No school district concussion management protocol can substitute the use of a test in lieu of sending the athlete to an approved health care provider.
- A neurocognitive test is a concussion management **tool**; it is not intended to be considered the Concussion Management Plan/Protocol for the district.

Other Testing:

It is standard practice in concussion identification and management, that sideline and post-concussion tests of mental status, orientation and postural-stability are used. These tests are most commonly administered by a certified athletic trainer or coach. School districts are advised to research these test credentialing, administration and interpretation requirements as well. These tests can be found under these names:

- Balance Error Scoring System (BESS)
- The Standardized Assessment of Concussion (SAC)
- Sport Concussion Assessment Tool 2 (SCAT2)

What to do when the concussion does not clear in the typical three to four weeks:

It is estimated that symptoms will linger beyond three to four weeks in approximately 10 to 20 percent of concussions (Collins et al., 2006). When this happens, the school team is obligated to continue academic adjustments and physical restrictions for a longer period of time. Symptoms may continue for weeks or even months.

It is best practice for a school district to have a system in place by which a student can be evaluated for additional services such as a health plan, a Section 504 plan, a Response To Intervention (RTI) plan or for special education (IDEA), if needed. A sample graphic is provided in the Resource section demonstrating how one school district (Cherry Creek School District) has charted concussion on the Response to Intervention pyramid providing for a continuum of services for their students with mild to moderate to severe brain injury. For more information on how to assess and service students with a brain injury, visit the website: www.cokidswithbraininjury.com

Some school districts have Brain Injury Resource Teams. It is best practice to have these teams involved from the ground up to:

- Help create the district-level Concussion Management protocol
- Be present on Problem-Solving Teams
- Be available for consultation/testing when/if a 504 Plan, RTI Plan or Special Education evaluation becomes necessary.

Applying Response-to-Intervention to Concussion Management:

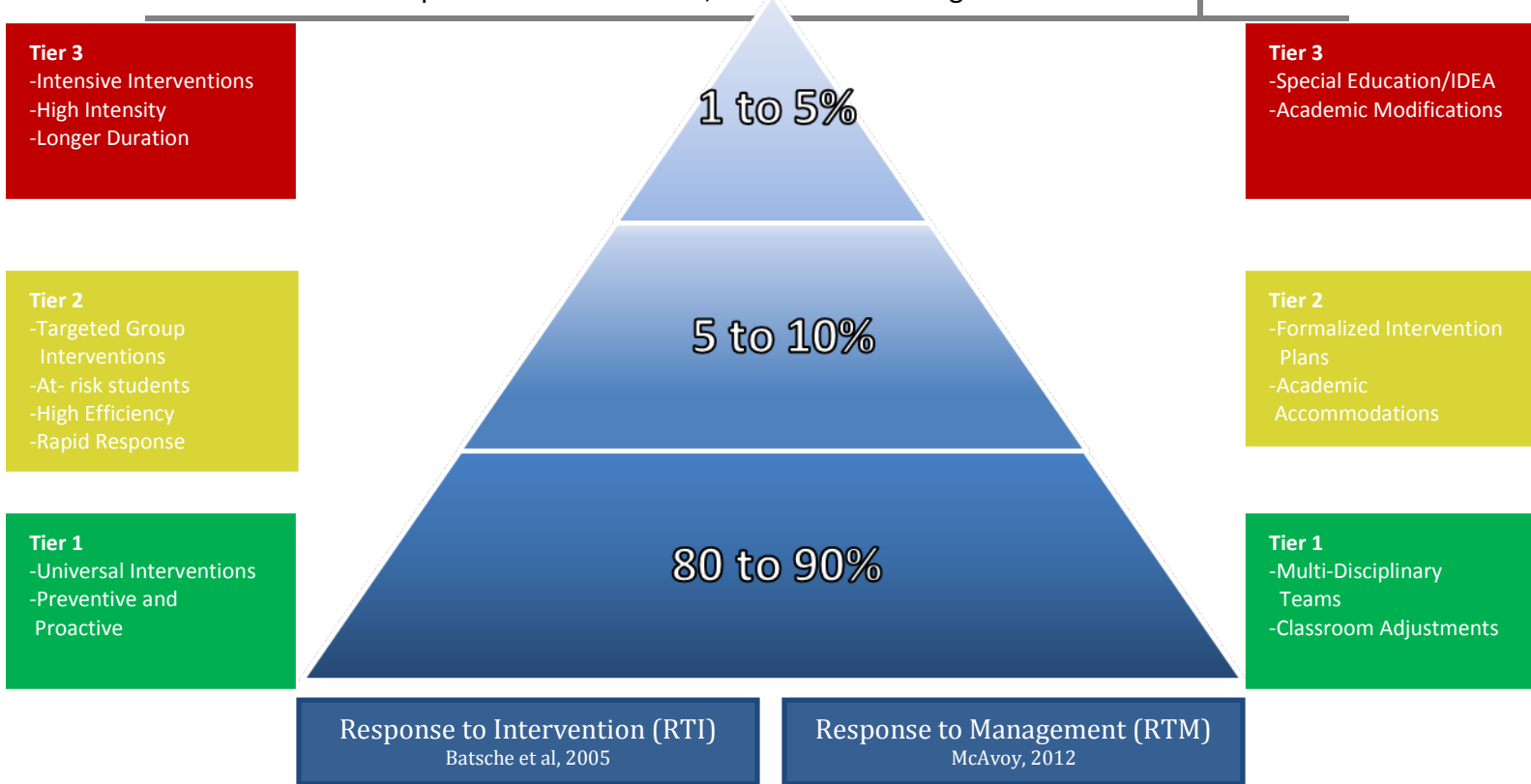
An estimated 1.6 to 3.8 concussions occur each year (Langolis, Rutland-Brown & Wald, 2006). Fortunately, almost all 50 states have advanced concussion awareness through legislation focusing on early identification and early intervention. In the field of education, Response-to-Intervention (RTI) is an initiative that similarly focuses on awareness, early identification and early intervention for emerging learning and behavioral disabilities. As an approach to dealing with potential difficulties, RTI has grown in acceptance and support since its introduction in the Reauthorization of IDEA (Individuals with Disabilities Education Act) in 2004 (<http://idea.ed.gov>). The essential elements of RTI includes:

- A multi-tier (three) level of increased intervention and support
- Quick implementation of research-based interventions, on-going progress-monitoring and evaluation of effectiveness
- Family education and involvement (RTINetwork.org)

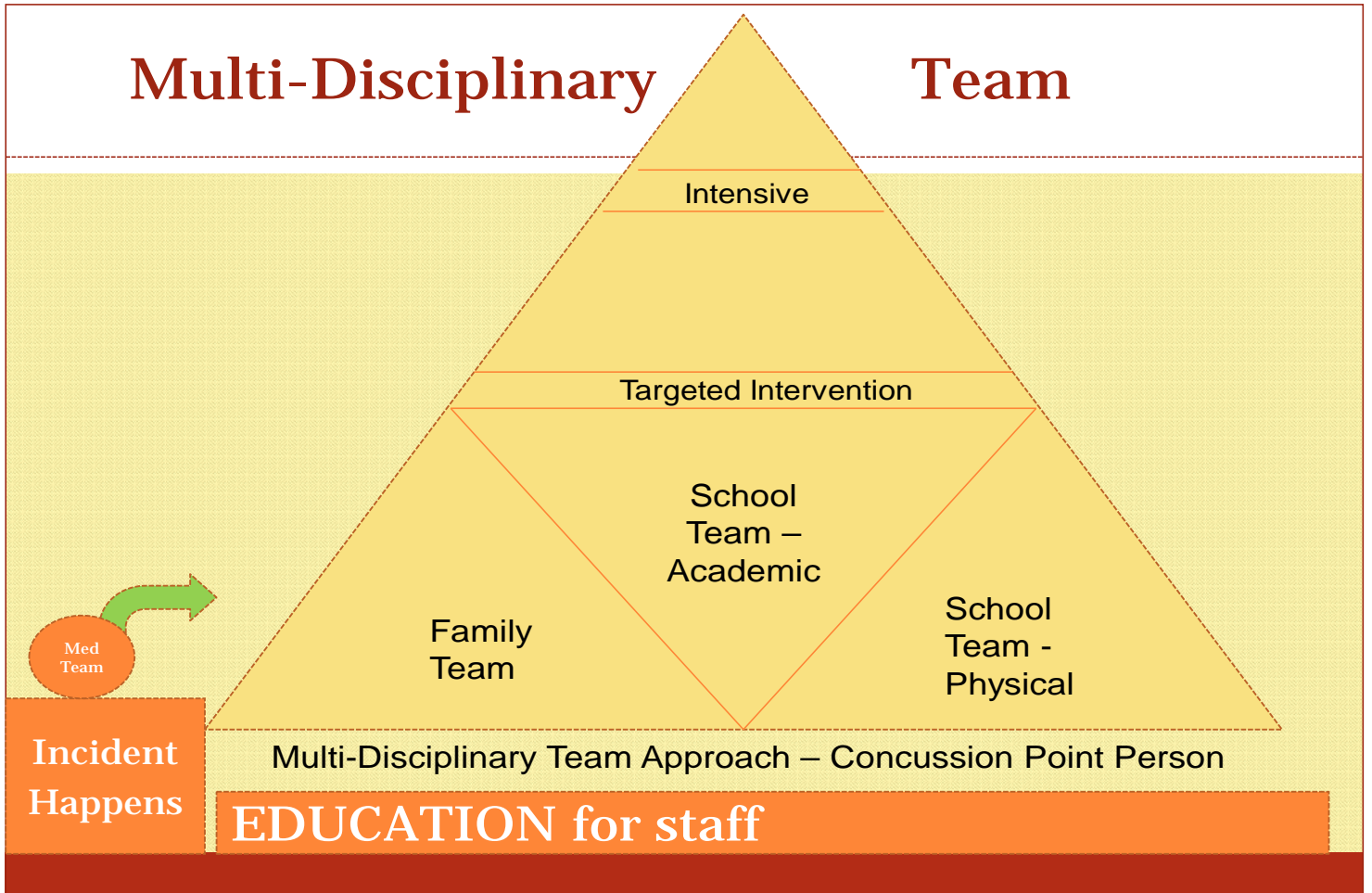
The essential elements of RTI are often displayed on a three level pyramid:

1. Eighty to 90% of students benefit from the foundational Tier 1 (Universal Level). With good teacher training and awareness, problems can be detected in students in the collective setting of the general education classroom and can be immediately supported with *adjustment* of curriculum within the classroom. Interventions are proactive and preventive (Batsche, Elliott, Graden, Grimes, Kovalski, Prasse, Reschly, Schrag & Till, 2005).
2. At Tier 2, an estimated 5 to 10% of students will need more targeted assessment and/or intervention (Targeted Level). Progress monitoring of these students may reveal a specific or continued need and may require small group instruction or *accommodation* of curriculum.
3. Finally, an estimated 1% to 5% of students will not respond to interventions at Tiers 1 or 2. They will need the most individualized intensive intervention of Tier 3 (Intensive Level). Special Education identification is usually necessary at this level allowing for *modification* of curriculum, concentrated and individualized instruction and/or specialized placement.

In the field of brain injury, a concussion *is* a brain injury. As many school districts are now being mandated through legislation to provide concussion awareness, education and management for their student/athlete's, school districts are being challenged to meet this new requirement. The existing model of RTI easily lends itself to a Response-to-Management (RTM) concussion protocol.



1. Universal Level: Current research determines that 80 to 90% of concussions resolve in 3 to 4 weeks (Collins, Lovell, Iverson, Ide & Maroon, 2006). The majority of students with a concussion will respond positively to a well-orchestrated system of cognitive reduction, physical rest and academic adjustment in the general education classroom. These interventions provided at Tier 1 (Universal Level) are simple academic *adjustments* to the existing classroom curriculum with slight environmental changes to support physical and cognitive rest.
2. With the RTM model, the 10 to 20% of students who do not respond sufficiently to interventions at Tier 1 can be systematically moved on to Tier 2 for Targeted Intervention. It is suggested that the multi-disciplinary concussion team engaged at Tier 1 continue to collect data on symptoms (progress-monitor), communicate and collaborate with medical professionals and parents (family engagement) to promote further recovery. At Tier 2, a more formalized academic plan may be required for the student (ie. Health Plan, RTI Plan, or Section 504 Plans). The objective of Tier 2 is to expand and strengthen academic *accommodations* to affect greater recovery from the concussion.
3. At the peak of the RTI/RTM pyramid is the 1% to 5% of students who do not adequately respond to concussion management efforts at Tiers 1 and 2. While these numbers are low, a small but significant percentage of students with concussion suffer severe and long-term neurocognitive and physical effects (Willer & Leddy, 2006). Students resistant to management attempts at Tiers 1 or 2 would be advanced to the most intensive level of assessment and intervention provided at Tier 3. At this level, *modification* of curriculum and protection under IDEA may be necessary.



An example of how one school district has applied the Response-to-Intervention protocol to their Concussion Management plans can be found on page 27.

Section 5: Return to Learning: Going Back to School Following a Concussion

This section is written with the School Nurse, School Psychologist and Educator in mind and will focus on specific guidelines and recommendations as the student-athlete returns to school following a concussion. It will provide support for academic adjustments of in-class work and at-home work to achieve cognitive/mental rest during the one to three week recovery period.

This section has been published on Communiqué by National Association of School Psychologists (NASP). CDE has obtained permission from the author Karen McAvoy, PsyD and the publisher. Click here to view [Return to Learning: Going Back to School Following a Concussion](#).

Education	<ul style="list-style-type: none"> ■ District educates all coaches and persons in supervisory positions of students on “concussion identification” ■ C.R.S. 25-43-101 - Middle and High School level ■ CHSAA By-Law 1620.4 and 1790.21 - High school level ■ Parent and student-athlete read, sign and return the “Concussion Education Form” in the athletic packet
Incident Happens	<p>Coaches observe signs and symptoms</p> <ul style="list-style-type: none"> ■ removes student-athlete ■ consults ATC/RN (if on site) ■ informs ATC/RN later (if not on site) ■ informs administrator at school (mandated at middle schools). ■ contacts parents/guardian. “Coach Notification of Suspected Head Injury” form given to parent with encouragement to seek medical consultation. ■ Coach becomes aware of signs/symptoms of concussion of an injury from parent or student at a later date, not yet evaluated/diagnosed or witnessed, follow steps above. <p>ATC/RN evaluates head injury</p> <ul style="list-style-type: none"> ■ Assess for signs and symptoms of concussion. Determine possible concussion: <ul style="list-style-type: none"> ■ If no concussion suspected – communicate with parent/guardian, give “Notification of Head Injury” form ■ If concussion suspected – communicate with parent/guardian, give “Notification of Suspected Concussion” form to parent with encouragement to seek medical consultation for confirmation of diagnosis of concussion ■ School becomes aware of signs/symptoms of concussion from an injury not yet evaluated/diagnosed, ATC/RN evaluates and follows above protocol ■ Student returns to school with diagnosis of concussion. ■ School becomes aware of a diagnosis of concussion determined in the community by PCP or ED ■ Student is removed from participation and play in physical activities, initiate Multi-Disciplinary Team approach ■ Identify a Concussion Point Person for this student-athlete at school. Their role is to begin to coordinate a Multi-Disciplinary team approach. ■ Code concussion in Power School. Note date of concussion and note date of “medical clearance” from concussion.

MULTI-DISCIPLINARY TEAM APPROACH: Family Team, School Team – Academic and Physical, Medical Team	
Family Team	<ul style="list-style-type: none"> ■ INTERVENE – Family Team imposes REST and reduction – remove from all physical activities, limit mental activity, texting, driving. ■ TRACK DATA – Family Team tracks and regularly progress monitors physical, cognitive, emotional and maintenance symptoms. Tracking of data and progress monitoring of symptoms over course of recovery is essential in clearance decision ■ COMMUNICATE – progress/recovery/results back to Concussion Point Person and/or Multi-Disciplinary Team on a regular basis
School Academic Team (SAT)	<ul style="list-style-type: none"> ■ INTERVENE - School Academic Team informs and educates teachers on cognitive, behavioral and emotional symptoms of concussion and helps to coordinate a temporary academic plan for the duration of the recovery (can be up to 3 weeks) ■ TRACK DATA - School Academic Team helps to gather data regularly (daily, bi-weekly, weekly and/or as determined case by case) from teachers on the cognitive, emotional and maintenance symptoms of concussion. Tracking of data and progress monitoring of symptoms over course of recovery is essential in clearance decision ■ COMMUNICATE – progress/recovery/results back to Concussion Point Person and/or Multi-Disciplinary Team on a regular basis
School Physical Team (SPT)	<ul style="list-style-type: none"> ■ INTERVENE - School Physical Team informs and educates PE teachers, coaches on the physical, cognitive, emotional and maintenance symptoms of a concussion and removes the student from all physical activities (including recess) ■ TRACK DATA - School Physical Team helps to gather data regularly (daily, bi-weekly, weekly and/or as determined case by case) on the physical symptoms of concussion. Tracking of data and progress monitoring of symptoms over course of recovery is essential in clearance decision ■ COMMUNICATE – progress/recovery/results back to Concussion Point Person and/or Multi-Disciplinary Team on a regular basis
Medical Team (MT)	When all members of the Multi-Disciplinary Team (FT, SAT, SPT and MT) agree that the student/athlete is #1) symptom-free (with no medications) and #2) functioning “back to baseline” on all academic and/or neurocognitive measures, the Medical Team can approve the start of the Zurich Guidelines (six steps of progressive physical exertion with 24 hour rest in between steps)*. With MT approval, the Zurich Guidelines can be administered under the supervision of the school Certified Athletic Trainer or under the supervision of another trained adult specified by the MT.
“Medical Clearance”	Final “medical clearance” is made at the successful completion of the Zurich Guidelines. Final “medical clearance” is made by the consensus of the Multi-Disciplinary Concussion Management Team in consultation with a CHSAA-approved/Senate Bill 40-approved Licensed Health Care Professional.‡

* see Zurich Guidelines in “Resources”

‡ see CHSAA-approved Licensed Health Care Providers and Senate Bill 40-approved Licensed Health Care providers in “Resources”





Incident Happens

Coaches observe signs and symptoms

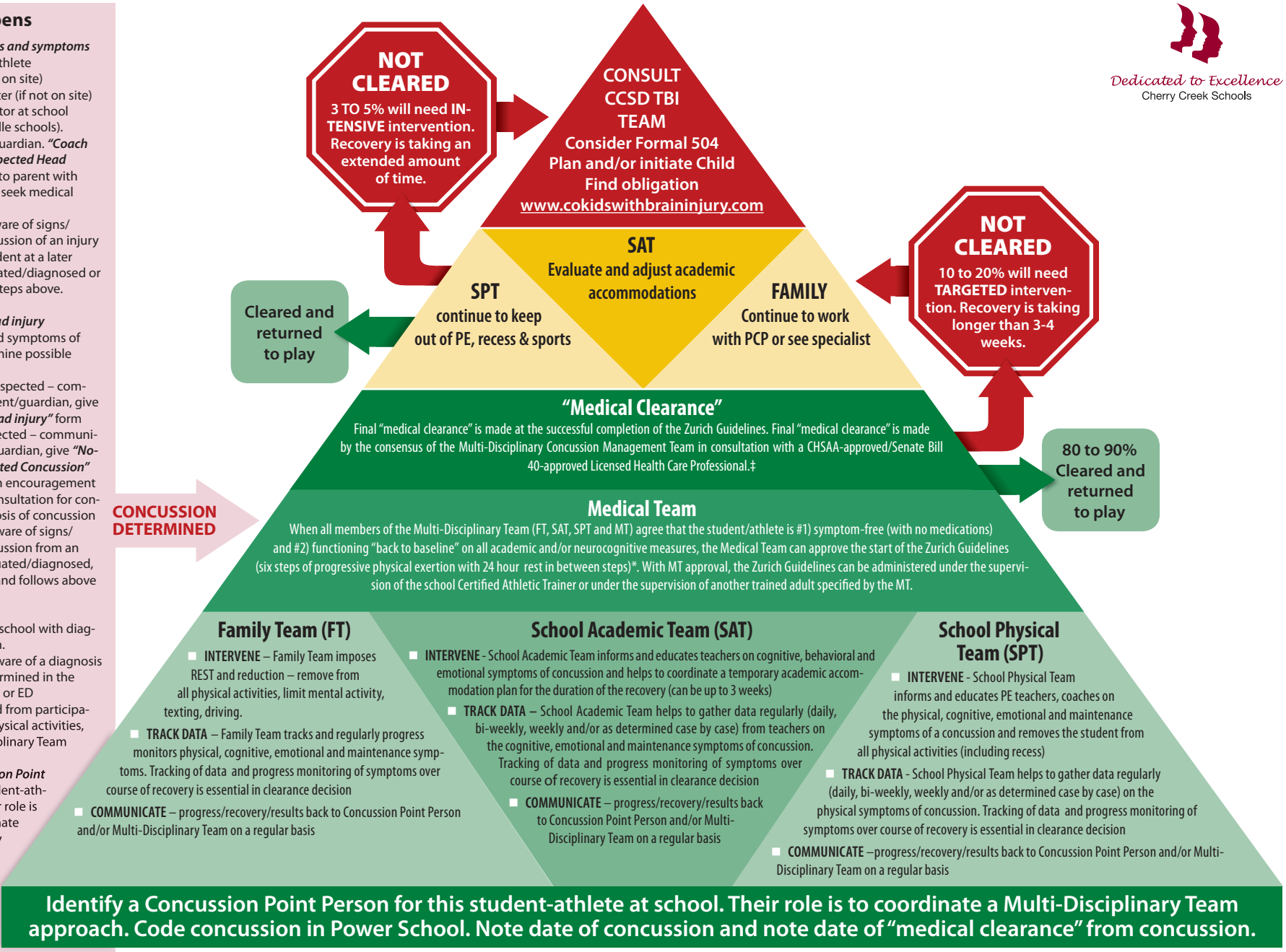
- removes student-athlete
- consults ATC/RN (if on site)
- informs ATC/RN later (if not on site)
- informs administrator at school (mandated at middle schools).
- contacts parents/guardian. "Coach Notification of Suspected Head Injury" form given to parent with encouragement to seek medical consultation.
- Coach becomes aware of signs/symptoms of concussion of an injury from parent or student at a later date, not yet evaluated/diagnosed or witnessed, follow steps above.

ATC/RN evaluates head injury

- Assess for signs and symptoms of concussion. Determine possible concussion:
- If no concussion suspected – communicate with parent/guardian, give "Notification of Head Injury" form
- If concussion suspected – communicate with parent/guardian, give "Notification of Suspected Concussion" form to parent with encouragement to seek medical consultation for confirmation of diagnosis of concussion
- School becomes aware of signs/symptoms of concussion from an injury not yet evaluated/diagnosed, ATC/RN evaluates and follows above protocol

- Student returns to school with diagnosis of concussion.
- School becomes aware of a diagnosis of concussion determined in the community by PCP or ED
- Student is removed from participation and play in physical activities, initiate Multi-Disciplinary Team approach
- Identify a **Concussion Point Person** for this student-athlete at school. Their role is to begin to coordinate a Multi-Disciplinary team approach.
- Code concussion in Power School. Note date of concussion and note date of "medical clearance" from concussion.

CONCUSSION DETERMINED



Identify a Concussion Point Person for this student-athlete at school. Their role is to coordinate a Multi-Disciplinary Team approach. Code concussion in Power School. Note date of concussion and note date of "medical clearance" from concussion.

EDUCATION

- District educates all coaches and persons in supervisory positions of students on "concussion identification"
- C.R.S. 25-43-101 - Middle and High School level
- CHSAA By-Law 1620.4 and 1790.21 - High School level
- Parent and student-athlete read, sign and return the "Concussion Education Form" in the athletic packet

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