UNM Youth Sports Concussion Management Education/Training Program

Funded by the State of New Mexico, GOVERNOR’S COMMISSION ON DISABILITY, Brain Injury Advisory Council (MOU # 17-645-P700-007).
Background/Statement of Need

• Mild traumatic brain injury, including concussion is common in youth participating in sports and is increasingly viewed as a significant public health concern.

• The most recent estimate is that between 1.1 and 1.9 million sports and recreation-related concussions occur annually in youth (Bryan et al., 2016).

• Studies of athletes suggest that adolescents could be more vulnerable than adults to brain injuries.

• Traumatic brain injury of any severity can pose a threat to a child’s future ability to learn and function fully. Time away from school can pose a significant threat to their academic and psychological well-being.

Need for education/training for medical professionals and school professionals regarding diagnosis and management of sports concussion
Key Points:
• 82% of children initially seek health care for concussion with primary care and only 12% within emergency departments.
• Efforts to measure incidence of concussion cannot be based on ED visits and primary care clinicians must be trained in concussion diagnosis and management.
A recent survey of Ohio public high school principals demonstrates lack of training/education and preparedness in concussion management:

- Only 37% of principals reported having concussion training in the past year
- Those with training were more likely to promote concussion training in their schools
- 22% reported having no “point person” or case manager at their school to monitor the academic progress of students with mTBI.
- Schools without a designated case manager for concussions were less likely to have athletic trainers

Survey of NMAA schools 2013-2014 school year; funded by NM Brain Injury Advisory Council

- 60% of schools did not have an athletic trainer responsible for diagnosing and managing sports concussions.
- 44% of schools felt that they had adequate resources in their school to diagnosis and management sports concussions.
- 71% of schools indicated they were interested in more education/training on diagnosis of sports concussions
- 75% of schools indicated interest in more education/training in management of sports concussions
- 87% of healthcare professionals indicated interest or strong interest in obtaining additional education/training in diagnosis of sports concussion
- 91% of healthcare professionals indicated interest or strong interest in obtaining additional training in management in sports concussion.

Less than 40% of schools reported having athletic trainers in NM

New Mexico State-Wide Survey of Youth Sports Concussion (UNM Brain & Behavioral Health Institute, 2014)

Aims/Objectives:

• To increase concussion awareness and improve knowledge of healthcare professionals and school systems regarding the management of concussion in youth—to prevent further injury, and to promote healing/recovery.

• Develop a community-based concussion management education program for schools and medical professionals in order to improve the health and well-being of the recovering student-athlete

Approach:

• Identify and establish multidisciplinary healthcare and school partnerships/teams in NM communities

• Provide education to healthcare & school professional Concussion Management teams (CMT) regarding concussion and how to manage the concussion recovery process

• Assist communities in development of concussion management protocols for identification, diagnosis, and management of concussion for return to learn and play via gradual increase in activity through systematic monitoring and guidance, implementation of academic, physical and emotional interventions/accommodations as needed, and coordinated medical to school communication
Development of Concussion Management Training Curriculum

• Reviewed current practices and scientific literature on best practice for diagnosing and managing pediatric concussion and developed a new curriculum for healthcare and school professionals and model of telehealth consultation.

• CDC Heads Up
• U. of Oregon The Center on Brain Injury Research & Training
• ORCAS Brain 101: The Concussion Playbook
• The Children’s Hospital of Philadelphia Center for Injury Research and Prevention
• Rocky Mountain Hospital for Children
• Ontario Neurotrauma Foundation
• Children’s National Health System
• AAN Summary of evidence-based guideline update: Evaluation and management of concussion in sports
• Center for Injury Research and Prevention, The Children’s Hospital of Philadelphia Research Institute
• Youth Sports concussion Safety Center, momsTEAM
• Zurich Consensus Statement on Concussion (2012)
• Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016
Community Concussion Management Team (CMT): Healthcare and School Professional Partnerships

- The Concussion Management Team (CMT) serves to assist the student-athlete’s recovery from a concussion. These team members are suggestions and may vary according to local resources.

Community Medical/Healthcare Professional Team
- Emergency physicians
- Sports Medicine physicians
- Pediatricians
- Family Practice Physicians
- Physician’s Assistants
- Physical therapists
- Neuropsychologists

Family
- Student-Athlete
- Parents
- Guardians

Academic Professionals (School Concussion Management Team)
- Athletic Team (Coaches, Athletic Trainers)
- Academic Team (Teachers, Counselors, School Social workers, Speech pathologists, School Psychologists)
- Administrators (Principals/Assistant Principals/Athletic Directors)
- School Medical Team (Team Physicians, School Nurses, Physical therapists, School-based healthcare professionals)

Brain 101: The Concussion Playbook
Concussion Team Members: Roles and Responsibilities

• School Concussion Management Team (CMT) Coordinator
  • The CMT Coordinator is a school professional (e.g., athletic trainer, school counselor, school nurse, assistant administrator) who functions as a liaison among healthcare providers, students, families, and school staff.
  • Leads the development and implementation of a Gradual Return to Activity Plan for each student who needs one.
  • CMT Coordinator oversees the monitoring and tracking of the plan.

• School Administrator
  • Important role in fostering a culture around sports concussion, put systems in place to manage it effectively, and provide the support necessary to return students to full academic and physical activity as quickly and safely as possible.

• Athletic Director
  • supports coach, student, athlete, and parent training, promotes a culture of awareness, ensures that coaches teach safe techniques, advocates for proper and well maintained equipment, monitors appropriate incident protocol, promotes good officiating, and tracks injuries.
Concussion Team Members: Roles and Responsibilities

• Athletic Trainer (AT)
  • healthcare expert in preventing, recognizing, managing, and rehabilitating injuries that result from physical activity. The AT works under the direction of a licensed physician and in cooperation with other healthcare professionals, athletic administrators, coaches, and parents. The AT is often the medical provider most familiar with each student; their involvement makes it easier to evaluate and manage injuries effectively.

• School Counselor/Psychologist
  • informs teachers of learning adjustments while a student is symptomatic and in some instances may assist with the ongoing assessments necessary to move forward with longer-term needs for 504 plans.

• School Nurse
  • works with the AT, teachers, other school staff, the student’s medical provider and the family to help make recommendations on proper care and recovery; provides ongoing care as needed at school.

• Team Physician
  • is designated by the school or club to provide medical direction to the AT and the athletic program and help develop the school emergency action plan. This person should be appropriately trained in the assessment and management of concussions and sports medicine in general. Schools and clubs with team physicians usually delegate the team doctor to make final decisions regarding return to play in collaboration with the school concussion management team and the student’s medical provider.
Concussion Team Members: Roles and Responsibilities

- Community Medical Provider (pediatrician, sports medicine physician, family physician, ED physician, physician’s assistant, physical therapist,)
  - can be recruited if a school does not have a Team Physician. This person should be trained in the assessment and management of concussions and could be a pediatrician, family practitioner, or other community healthcare provider.

- Neuropsychologist
  - can assist in conducting and interpreting assessments of protracted postconcussion neurocognitive and behavioral/emotional symptoms. This community-based provider may also be a Licensed Psychologist trained in the assessment of concussion.
Concussion Management Team (CMT):

- CMT should be familiar with the concussion laws in their state and their state's interscholastic athletic association's concussion policy.
- Before implementing any policy, make sure it aligns with the concussion laws and interscholastic athletic concussion policies in your state.

NM State Law (SB 137)

- Remove immediately from activity when signs/symptoms are present.
- Must not return to full activity prior to a minimum of 240 hours (10 days).
- Release from medical professional required for return.
- Follow school district’s return to play guidelines.
- Coaches continue to monitor for signs/symptoms once athletes return to activity.

Link to SB 137
https://www.nmlegis.gov/Sessions/16%20Regular/final/SB0137.pdf
Concussion Basics:

- What is a Concussion?
- Neuropathophysiology of mTBI
- Concussion Signs & Symptoms
- Concussion Danger Signs
- School Concussion Action Plan
- Recovery from Concussion
- Returning to School Returning to Sports and Activities
- Brain Injury Safety Tips and Prevention

It is important that healthcare professionals, school staff, students, and parents know how to recognize a concussion and need to know how to respond in ways that protect student-athletes and ensure their safe return to school activities.
What is a concussion?

Sport related concussion (SRC) is a traumatic brain injury induced by biomechanical forces. Several common features that may be utilized in clinically defining the nature of a concussive head injury include:

► SRC may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head.
► SRC typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, signs and symptoms evolve over a number of minutes to hours.
► SRC may result in neuropathological changes, but the acute clinical signs and symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.
► SRC results in a range of clinical signs and symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive features typically follows a sequential course. However, in some cases symptoms may be prolonged.

The clinical signs and symptoms cannot be explained by drug, alcohol, or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction, etc) or other comorbidities (eg, psychological factors or coexisting medical conditions).
Neuropathophysiology of Concussion

• A concussion or mild traumatic brain injury is believed to affect the neurochemistry of the brain.

• Acceleration and deceleration forces that result from a blow to the head or body stretch and strain brain tissue, sets off a complex cascade of changes to the brain’s neurometabolic and neurotransmission functions, temporarily disrupting neural membranes and resulting in impaired neural connectivity and reduced cerebral energy.

Link to Animation of Concussion Video
What are the signs and symptoms of a concussion?

- The clinical signs and symptoms of concussion are related to changes in the energy demands of the brain. Youth may report or show one or more of these signs and symptoms after a bump, blow, or jolt to the head or body that may indicate they have a concussion or more serious brain injury.
- Most signs or symptoms of a concussion are evident soon after the traumatic event, although sometimes they may occur hours or a few days later.
- Sometimes children may have a hard time explaining that they don't feel normal and it's up to the parents and their friends, family or coaches to know that they aren't acting like themselves and get them to rest or to seek medical attention.

SIGNS MAY BE OBSERVED:
- Appears dazed or stunned
- Is confused about events
- Answers questions slowly
- Repeats questions
- Can’t recall events prior to the hit, bump, or fall
- Can’t recall events after the hit, bump, or fall
- Loses consciousness (even briefly)
- Shows behavior or personality changes

SYMPTOMS REPORTED BY THE STUDENT:

Thinking/Remembering:
- Difficulty thinking clearly
- Difficulty concentrating or remembering
- Feeling more slowed down
- Feeling sluggish, hazy, foggy, or groggy

Physical:
- Headache or “pressure” in head
- Nausea or vomiting
- Balance problems or dizziness
- Fatigue or feeling tired
- Blurry or double vision
- Sensitivity to light or noise
- Numbness or tingling
- Does not “feel right”

Emotional:
- Irritable
- Sad
- More emotional than usual
- Nervous

Sleep:
- Drowsy
- Sleeps less than usual
- Sleeps more than usual
- Has trouble falling asleep

[Link to HEADS UP Video: Concussion Signs & Symptoms]
Although rare, some individuals can develop a hematoma (a collection of blood on the brain) after a bump, blow, or jolt to the head or body. Call 9-1-1 right away, or take the student-athlete to the emergency department if he or she has one or more of the following danger signs after a bump, blow, or jolt to the head or body:

- One pupil larger than the other.
- Drowsiness or inability to wake up.
- A headache that gets worse and does not go away.
- Slurred speech, weakness, numbness, or decreased coordination.
- Repeated vomiting or nausea, convulsions or seizures (shaking or twitching).
- Unusual behavior, increased confusion, restlessness, or agitation.
- Loss of consciousness (passed out/knocked out). Even a brief loss of consciousness should be taken seriously.

[Link to HEADS UP Video: Concussion Danger Signs]
CDC Concussion Action Plan: What to do if a concussion is suspected

A. Remove from play.
   • When in doubt, sit them out!
   • Keep a young athlete with a possible concussion out of play the same day of the injury and until cleared by a health care provider.

B. Seek medical attention.
   • After you remove a young athlete with a possible concussion from practice or play, the decision about return to practice or play is a medical decision that should be made by a health care provider.
   • As a coach or parent, providing the healthcare provider with information regarding the injury is helpful using the Concussion Care Plan Letter and Signs/Symptoms Checklist.

C. Inform and educate parents
   • Give parents/guardian HEADS UP fact sheet for parents. This fact sheet can help parents watch the young athlete for concussion signs or symptoms that may show up or get worse once the young athlete is at home or returns to school.

D. Get Written Concussion Care Instructions
   • Ask for written instructions from the young athlete’s health care provider on return to play. These instructions should include information about when they can return to play/school and what steps you should take to help them safely return to play.
   • The healthcare professional could use the ACE Care Plan-School Version to be returned to the school (preferably to the school concussion case manager).

[Links to Concussion Signs & Symptoms Checklist, Link to School Concussion Care Plan Letter to Physicians, Link to ACE Evaluation Form, Link to ACE Care Plan-School Version]
Recovery from a concussion: What to expect

• Most people make a good recovery from a concussion. As the days go by, your child or teen can expect to slowly feel better.

• Length of recovery from mild traumatic brain injury (mTBI) is variable, ranging from several days to several weeks in most students.

• Rest is important immediately after a concussion because it helps the brain heal. Your child or teen may need to limit activities while he or she is recovering from a concussion. There is evidence stating the need for physical and cognitive rest, but there are no clear answers as to the ideal duration. Extreme prolonged rest may delay recovery.
Diagnosis and Management of Concussion: Guidance for Healthcare Professionals

• Online concussion training courses
  • CDC Heads Up
  • National Federation of High Schools

• Will help you understand a concussion and the potential consequences of this injury,
• Recognize concussion signs and symptoms and how to respond,
• Learn about steps for returning to activity (play and school) after a concussion, and
• Focus on prevention and preparedness to help keep athletes safe season-to-season.
• Receive certificate of completion

[Link to CDC Online Concussion Training for Clinicians]
https://nfhslearn.com/
Sideline Evaluation

- Majority of sports-related concussions occur without loss of consciousness or frank neurological signs
- No perfect diagnostic test or marker to make an immediate diagnosis of concussion
- In all suspected cases of concussion, the individual should be removed from the playing field and assessed by a physician or licensed healthcare provider
- Players manifesting clear on-field signs of concussion (eg., loss of consciousness, tonic posturing, balance disturbance) should be immediately removed from sporting participation
- Sideline evaluation of cognitive function is an essential component in assessment for rapid screening, but not meant to replace a comprehensive neurological evaluation; nor should they be used as a standalone tool for management of concussion
  - Sport Concussion Assessment Tool-5 (SCAT5)--
  - Standardized Assessment of Concussion (SAC)
- When a player shows any symptoms or signs of concussion:
  - An evaluation by physician or other licensed healthcare provider on site using standard emergency management principles should be conducted and particular attention should be given to excluding cervical spine injury
  - If no healthcare provider is available, the player should be safely removed from practice or play and urgent referral for evaluation should be arranged
  - Once first aid issues are addressed, an assessment of cognitive function using SCAT5 or other sideline assessment tools
  - The player should not be left alone after the injury and serial monitoring for deterioration is essential of the initial few hours after injury
  - A player with diagnosed concussion should not be allowed to return to play on the day of injury (*NOTE: NM law states that minimal return to play is 10 days!*).
Diagnosis and Management of Concussion: Guidance for Healthcare Professionals

• Medical Exam Basics
  • Clinical Interview
    • Concussion hx
    • Hx of prior concussions (how many? Signs/symptoms? Duration?)
  • Physical exam
    • neurological examination including a thorough assessment of mental status, cognitive functioning, sleep/wake disturbance, ocular function, vestibular function, gait and balance
      • SCAT, BESS, PCSS, PCSI, SAC
    • A determination of the clinical status of the patient, including whether there has been improvement or deterioration since the time of injury. This may involve seeking additional information from parents, coaches, teammates and eyewitnesses to the injury.
    • A determination of the need for emergent neuroimaging in order to exclude a more severe brain injury involving a structural abnormality.
• Need for admission (Red Flags/dangerous signs/sxs)
• Assess for risk factors for persistent post concussion symptoms
Neuropsychological Assessment (NP)

- Neuropsychologists are uniquely qualified to interpret NP tests and can play an important role within the contest of a multifaceted-multimodal and multidisciplinary approach to managing concussion.
- NP assessment should not be the sole basis of management decisions.
- Brief computerized cognitive evaluation tools are not a substitute for complete NP assessment.
- Baseline or pre-season NP testing is not felt to be required or mandatory, but can be helpful or add useful information to overall interpretation of a NP assessment and provides an educational opportunity to discuss significance of injury with athlete.
- Post-injury NP testing not required for all athletes.
- Post-injury NP testing may be used to assist return to play decisions and is typically performed when the athlete is symptom-free. There may be situations when NP assessment may add important information in the early stages after injury.
Concussion Diagnostic and Assessment Tools for Healthcare Providers

- ChildSCAT5 Sport Concussion Assessment Tool for Children aged 5-12
- SCAT5 Sport Concussion Assessment Tool for Athletes aged 13+
- CDC Acute Concussion Evaluation Form (ACE)
- Post concussion Symptom Inventory for Children (PCSI; aged 5-7)
- Post Concussion Symptom Inventory for Children (PCSI; aged 8-12)
- Post Concussion Symptom Inventory Self Assessment (PCSI; Ages 13-18)
- Post Concussion Symptom Scale (PCSS)
WHAT IS THE SCAT5?
The SCAT5 is a standardized tool for evaluating concussions designed for use by physicians and licensed healthcare professionals. The SCAT5 cannot be performed correctly in less than 10 minutes.

If you are not a physician or licensed healthcare professional, please use the Concussion Recognition Tool (CRT). The SCAT5 is to be used for evaluating athletes aged 13 years and older. For children aged 12 years or younger, please use the Child SCAT5.

Provisional SCAT5 baseline testing can be useful for interpreting post-injury test scores, but is not required for that purpose. Detailed instructions for use of the SCAT5 are provided on page 7. Please read through these instructions carefully before testing the athlete. Brief verbal instructions for each test are given in Italian. The only equipment required for the test is a watch or timer.

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Recognise and Remove
A red flag by either a direct blow or indirect transmission of force can be associated with a serious and potentially fatal brain injury. If there are significant concussive symptoms, including any of the red flags listed in Box 1, activation of emergency procedures and urgent transport to the nearest hospital should be arranged.

Key points
- Any athlete with suspected concussion should be REMOVED FROM PLAY, medically assessed and monitored for deterioration. No athlete diagnosed with concussion should be returned to play on the day of injury.
- If an athlete is suspected of having a concussion and medical personnel are not immediately available, the athlete should be referred to a medical facility for urgent assessment.
- Athletes with a suspected concussion should not drink alcohol, use recreations drugs and should not drive a motor vehicle until cleared to do so by a medical professional.
- Concussion signs and symptoms wobble over time and it is important to consider repeat evaluation in the assessment of concussion.
- The diagnosis of a concussion is a clinical judgment made by a medical professional. The SCAT5 should not be used by itself to make, or exclude, the diagnosis of concussion. An athlete may have a concussion even if their SCAT5 is "normal."

Remember:
- The basic principles of first aid (danger, respond, airway, breathing, circulation) should be followed.
- Do not attempt to move the athlete (other than that required for airway management) unless trained to do so.
- Assessment for a spinal cord injury is a critical part of the initial on-field assessment.
- Do not remove a helmet or any other equipment unless trained to do so safely.
CLINICAL NOTES:

Name: ____________________________
DOB: ____________________________
Address: _________________________
ID number: _______________________
Examiner: ________________________
Date: ____________________________

Balanced Error Scoring System (mBESS) testing

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<th>Score</th>
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<tr>
<td>Visually directed test</td>
<td>(1) right</td>
</tr>
<tr>
<td>Stumbling on 9 feet</td>
<td>(1) hit</td>
</tr>
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<td>Stumbling on 3 feet</td>
<td>(1) hit</td>
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<tr>
<td>Total Errors</td>
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Total number of words recalled accurately: (1) of (2) |

STEP 5: DELAYED RECALL:

The delayed recall should be performed after 5 minutes have elapsed since the end of the Immediate Recall section. Score 1 pt. for each correct response.

If you remember that of words you read a few times later, but as many words as possible to your memory as accurately as you can.

Time Started: _________________________

Please request the words not recalled. Total score is the number of words recalled.

**CONCUSSION INJURY ADVICE**

(To be given to the person monitoring the concussed athlete)

This patient has received an injury to the head. A careful medical examination has been carried out and no sign of any serious complications has been found. Recovery time is variable across individuals and the patient will need monitoring for a further period by a responsible adult. Your treating physician will provide guidance as to this timeframe.

If you notice any change in behavior, vomiting, worsening headache, double vision or excessive drowsiness, please telephone your doctor or the nearest hospital emergency department immediately.

Other important points:

- Initial rest: Limit physical activity to routine daily activities (avoid exercise, training, sports and limit activities such as school, work, and screen time to a level that does not worsen symptoms).
- Avoid alcohol.
- Avoid prescription or non-prescription drugs without medical supervision. Specifically:
  - Avoid sleeping tablets
  - Do not use aspirin, anti-inflammatory medication or stronger pain medications such as narcotics
- Do not drive until cleared by a healthcare professional.
- Return to play/sport requires clearance by a healthcare professional.

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Contact details or stamp:

CONCLUSION

Any athlete suspected of having a concussion should not be removed from play and seek medical evaluation.

Signs to watch for

Problems could arise over the first 24 hours. The athlete should not be left alone and must go to a hospital or clinic if they experience:

- Worsening headache
- Drowsiness or inability to be awakened
- Unusual behaviour or confusion or irritability
- Seizures (not in athletes less than 10 years of age)
- Speech changes

Consult your physician or licensed healthcare professional after a suspected concussion. Remember, it is better to be safe.

Foot & Rehabilitation

After a concussion, the athlete should have physical rest and cognitive rest for a few days to allow their symptoms to improve. In most cases, the recovery process is very slow. The athlete should not return to any kind of activity until the symptoms have completely resolved. This means that the athlete should not go back to school or any other activities until all symptoms have resolved.

Graduated Return to School Strategy

1. Daily activities that do not increase symptoms
- Most activities do not increase symptoms, but some can increase some symptoms. The athlete should stop that activity and rest until symptoms get better. To make sure that the athlete can get back to school without problems, it is important that the healthcare providers, parents, caregivers and teachers talk to each other so that everyone knows what the plan for the athlete is to go back to school.

Note: If mental activity cannot cause any symptoms, the athlete may return to their usual activity and step 2 and return to school part-time before doing school activities at home at first. Return to school full time.

Graduated Return to School Strategy is a strategy that may allow the athlete to return to school, but it is not a guarantee that the athlete will be able to return to school without symptoms. It is important to monitor the athlete's symptoms carefully and to make adjustments to the plan as necessary.

Mental Activity

Activity

Ease of step

feasibility

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WHAT IS THE CHILD SCAT5?

The Child SCAT5 is a standardized tool for evaluating concussions designed for use by physicians and licensed healthcare professionals.

If you are not a physician or licensed healthcare professional, please use the Concussion Recognition Tool 5 (CRT5). The Child SCAT5 is to be used for evaluating Children aged 5 to 12 years. For athletes aged 13 years and older, please use the SCAT5.

Preseason Child SCAT5 baseline testing can be useful for interpreting post-injury test scores, but not required for that purpose. Detailed instructions for use of the Child SCAT5 are provided on page 7. Please read through these instructions carefully before testing the athlete. Brief verbal instructions for each test are given in italics. The only equipment required for the tester is a watch or timer.

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Recognise and Remove

A head impact by either a direct blow or indirect transmission of force can be associated with a serious and potentially fatal brain injury. If there are significant concerns, including any of the red flags listed in Box 1, then activation of emergency procedures and urgent transport to the nearest hospital should be arranged.

Key points
- Any athlete with suspected concussion should be REMOVED FROM PLAY, medically assessed and monitored for deterioration. No athlete diagnosed with concussion should be returned to play on the day of injury.
- If the child is suspected of having a concussion and medical personnel are not immediately available, the child should be referred to a medical facility for urgent assessment.
- Conussion signs and symptoms evolve over time and it is important to consider repeat evaluation in the assessment of concussion.
- The diagnosis of a concussion is a clinical judgment, made by a medical professional. The Child SCAT5 should NOT be used by itself to make, or exclude, the diagnosis of concussion. An athlete may have a concussion even if their Child SCAT5 is “normal”.

Remember:
- The basic principles of first aid (danger, response, airway, breathing, circulation) should be followed.
- Do not attempt to move the athlete (other than that required for airway management) unless trained to do so.
- Assessment for a spinal cord injury is a critical part of the initial on-field assessment.
- Do not remove a helmet or any other equipment unless trained to do so safely.

IMMEDIATE OR ON-FIELD ASSESSMENT

The following elements should be assessed for all athletes who are suspected of having a concussion prior to proceeding to the neurocognitive assessment and ideally should be done on-field after the first aid/emergency care priorities are completed.

If any of the “Red Flags” or observable signs are noted after a direct or indirect blow to the head, the athlete should be immediately and safely removed from participation and evaluated by a physician or licensed healthcare professional.

Consideration of transportation to a medical facility should be at the discretion of the physician or licensed healthcare professional.

The GCS is important as a standard measure for all patients and can be done serially if necessary in the event of deterioration in conscious state. The cervical spine exam is a critical step of the immediate assessment, however, it does not need to be done serially.

STEP 1: RED FLAGS

- Neck pain or tenderness
- Double vision
- Weakness or tingling/burning in arms or legs
- Severe or increasing headache
- Seizure or convolution
- Loss of consciousness
- Deteriorating conscious state
- Vomiting
- Increasingly restless, agitated or combative

CERVICAL SPINE ASSESSMENT

- Does the athlete report that their neck or head pain is new? Y N
- If they answered yes, ask the athlete to stretch out their neck and observe for any changes in symptoms?

OFFICE OR ON-FIELD ASSESSMENT

STEP 1: ATHLETE BACKGROUND

- Please note that the neurocognitive assessment should be done in a distraction-free environment with the athlete in a sitting state.
- Sport team/school
- Date of injury
- Name of complaint
- Age
- Gender: M/F/Other
- Dominant hand: left/right
- How was the athlete concussed? Note the time of the event.
- When was the last remote concussion?
- How long was the recovery time (day/night)?
- How long was the recovery time (time since last injury)?
- Has the athlete had any head injury?
- Has the athlete had any surgery?
- Has the athlete had any medication(s)?
- Has the athlete had any medications?
- Does the athlete have any other problems?

STEP 3: EXAMINATION

GLASGOW COMA SCALE (GCS2)

Time of assessment:
Date of assessment:

Best eye opening (E)
No eye opening
Eye opening in response to pain
Eye opening in response to speech
Eye opening spontaneous

Best verbal response (V)
No verbal response

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**STEP 2: SYMPTOM EVALUATION**

The athlete should be given the symptom form and asked to read this instruction paragraph out loud then complete the symptom scale. For the baseline assessment, the athlete should rate his/her symptoms based on how he/she typically feels and for the post injury assessment the athlete should rate their symptoms at this point in time.

To be done in a resting state.

Please Check: □ Baseline □ Post-Injury

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Rest of the Time</th>
<th>A Bit of the Time</th>
<th>Somewhat of the Time</th>
<th>A Lot of the Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headaches</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Dizzy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling light-headed</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Being very light-headed</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling sick</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>My mouth hurts</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I get a bit of a headache</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I get a bit of a stomach ache</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Trouble concentrating</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Trouble remembering or paying attention</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Problems following directions</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I am too tired</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I get confused</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel like I cannot think</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I have trouble figuring things out</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I have trouble walking</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Parent Report**

**The child:**

- **Headaches:**
  - 0
  - 1
  - 2
  - 3
- **Dizzy:**
  - 0
  - 1
  - 2
  - 3
- **Feeling light-headed:**
  - 0
  - 1
  - 2
  - 3
- **Being very light-headed:**
  - 0
  - 1
  - 2
  - 3
- **Feeling sick:**
  - 0
  - 1
  - 2
  - 3
- **My mouth hurts:**
  - 0
  - 1
  - 2
  - 3
- **I get a bit of a headache:**
  - 0
  - 1
  - 2
  - 3
- **I get a bit of a stomach ache:**
  - 0
  - 1
  - 2
  - 3
- **Trouble concentrating:**
  - 0
  - 1
  - 2
  - 3
- **Trouble remembering or paying attention:**
  - 0
  - 1
  - 2
  - 3
- **Problems following directions:**
  - 0
  - 1
  - 2
  - 3
- **I am too tired:**
  - 0
  - 1
  - 2
  - 3
- **I get confused:**
  - 0
  - 1
  - 2
  - 3
- **I feel like I cannot think:**
  - 0
  - 1
  - 2
  - 3
- **I have trouble figuring things out:**
  - 0
  - 1
  - 2
  - 3

**Overall rating for child to answer:**

<table>
<thead>
<tr>
<th>Very bad</th>
<th>Very good</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5</td>
<td>6 7 8 9 10</td>
</tr>
</tbody>
</table>

| Name: | Date: |

**STEP 3: COGNITIVE SCREENING**

**Standardized Assessment of Concussion - Child Version (SACC-C)**

**IMMEDIATE MEMORY**

The Immediate Memory component can be completed using the traditional 5-word per trial list or optionally using 10-words per trial to minimize any selling effect. All 3 trials must be administered irrespective of the number correct on the first trial. Administer at the rate of one word per second.

Please circle EITHER the 5 or 10 word list groups and circle the specific word list chosen for this test.

**DIGITS BACKWARDS**

Please circle the Digit list chosen (A, B, C, D, E, F). Administer at the rate of one digit per second reading DOWN the selected column.

**CONCENTRATION**

Please circle the Digit list chosen (A, B, C, D, E, F). Administer at the rate of one digit per second reading DOWN the selected column.

**DAYS IN REVERSE ORDER**

Now list the days of the week in reverse order. Start with the last day and go backward. Do not skip any days. Example: Tuesday, Monday, Sunday ...

**Score:**

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STEP 4: NEUROLOGICAL SCREEN

See the instruction sheet (page 7) for details of test administration and scoring of the tests.

Can the patient read aloud (e.g. symptom check list) and follow instructions without pauses? [Y] [N]

Even the patient have a full range of movement? [Y] [N]

Free to perform cortical spine movements? [Y] [N]

Without moving the head or neck, can the patient look straight ahead and move one eye without double vision? [Y] [N]

Can the patient perform the finger nose test coordination tests normally? [Y] [N]

Can the patient perform tandem gait normally? [Y] [N]

BALANCE EXAMINATION

Modified Balance Error Scoring System (MBESS) testing:

Which foot was tested (i.e. which is the non-dominant foot)? [Left] [Right]

Testing surface (hard floor, field, etc.)

Footwear (shoes, barefoot, braced, tape, etc.)

Condition

Double leg stance of 10

Single leg stance (non-dominant foot, 10-15 s/10 s each)

Excessive stance (non-dominant foot at back)

Total Errors

STEP 5: DELAYED RECALL:

The delayed recall should be performed after 5 minutes have elapsed since the end of the Immediate Recall section. Score 1 pt. for each correct response.

Do you remember that we read a few times earlier? Tell me as many words from the list as you can remember in any order:

Total number of words recalled correctly: of 5 or of 10

STEP 6: DECISION

Date & Time of assessment:

Date and time of injury:

If the athlete is known to you prior to their injury, are they different from their usual self? [Yes] [No] [Does not apply]

Concussion diagnosis:

Clinic phone number:

Patient's name:

Date / time of injury:

Date / time of medical review:__________

Healthcare Provider:__________

Other important points:

Following concussion, the child should rest for at least 24 hours.

- The child should not use a computer, internet or play video games if these activities make symptoms worse.
- The child should not be given any medications, including painkillers, unless prescribed by a medical doctor.
- The child should not go back to school until symptoms are improving.
- The child should not go back to sport or play until a doctor gives permission.

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SCORING ON THE CHILD SCATS SHOULD NOT BE USED AS A STAND-ALONE METHOD TO DIAGNOSE CONCUSSION, MEASURE RECOVERY OR MAKE DECISIONS ABOUT AN ATHLETE'S READINESS TO RETURN TO COMPETITION AFTER CONCUSSION.
INSTRUCTIONS

Words in italics throughout the Child SCAT5 are the instructions given to the athlete by the clinician.

Symptom Scale

In situations where the symptom scale is being completed after exercise, it should still be filled out in a standing, non-exercising position.

At baseline:

• The child is asymptomatic and feels healthy.
• The child feels normal.
• The clinician completes the Parent Repeating section.

At 60 min post exercise:

• The child feels tired and/or hungry.
• The child feels fatigued.
• The child has had to stop exercise.
• The clinician completes the Parent Repeating section.

At 24 hr post exercise:

• The child feels normal.
• The clinician completes the Parent Repeating section.

For Total number of symptoms, maximum possible is 21
For Total number of symptoms possible at all of above tabulations, maximum possible is 21 + 6 + 3 = 30

Standardized Assessment of Concussion Version 9.5 (SAC-9.5)

Immediate Memory

Choose one of the 3 word lists. Then perform 3 trials of immediate memory using this list.

Concurrent 3 trials of 3 word list.

A word list is made up of 3 related words.

I am going to read you a number of words. As I read you a number of words, I would like you to try and remember as many of those words as possible. It’s not necessary to repeat back as many words as you can remember in any order. The words must be read at one word per second.

Sprint memory is determined by the Immediate Memory has a reliable testing effect when a 3 word list is used. On younger children, use the 4 word list is used. In settings where the child is unable to maintain the memory span for a period of 40 words per trial, to ensure that more than 10 words are remembered, for a period of 30 words per trial, to ensure that the maximum score per trial is 10 with total sub-total maximum of 30.

Trade 3 & 4 MUST be completed regardless of score on trial 1 & 2.

Trade 3 & 4 MUST be completed regardless of score on trial 1 & 2.

Balance testing – types of errors

1. Hands lifted off

2. Step, stumble, or fall

3. Losing balance in feet

4. Choosing the wrong position on the balance beam

Each of the 20-second trials is scored by counting the errors, or deviations from the prototype, accomplished by the child. The examiner will begin counting errors when the child begins a new trial. Each error is counted when the child performs the procedure in the incorrect manner. Each error is scored as one error. In more than one error, only one error is recorded.

Balance testing – types of errors

1. Hands lifted off

2. Step, stumble, or fall

3. Losing balance in feet

4. Choosing the wrong position on the balance beam

Each of the 20-second trials is scored by counting the errors, or deviations from the prototype, accomplished by the child. The examiner will begin counting errors when the child begins a new trial. Each error is counted when the child performs the procedure in the incorrect manner. Each error is scored as one error. In more than one error, only one error is recorded.

Tandem Gait

Instruction for the examiner: Demonstrates the following to the child:

The examiner will start the test for the child. The child will start the test for the examiner. The examiner will continue the test with a score of the child. The child will start the test for the examiner. The examiner will continue the test with a score of the child.

Tandem Gait

Instruction for the examiner: Demonstrates the following to the child:

The examiner will start the test for the child. The child will start the test for the examiner. The examiner will continue the test with a score of the child. The child will start the test for the examiner. The examiner will continue the test with a score of the child.

Finger to Nose

The child should determine their height for the examiner. The examiner will start the test for the child. The child will start the test for the examiner. The examiner will continue the test with a score of the child. The child will start the test for the examiner. The examiner will continue the test with a score of the child.

Finger to Nose

The child should determine their height for the examiner. The examiner will start the test for the child. The child will start the test for the examiner. The examiner will continue the test with a score of the child. The child will start the test for the examiner. The examiner will continue the test with a score of the child.

Neurological Screen

Ready

The child is asked to read a paragraph of text from the instructions in the Child SCAT5. For children who can not read, they are asked to describe what they saw in a photograph of a neurological screening card.

Modified Balance Error Scoring System (MEBESS) testing

These responses are to be used to administer the screening SCAT, and each balance test response, will be to be be added to the raw score.

Each of the 20-second trial is scored by counting the number of errors. The test is considered a modified version of the Balance Error Scoring System (BESS).

If you think you or a teammate has a concussion, tell your coach/trainer/ parent right away so that you can be taken out of the game. You or your teammate might not be aware that a symptom would show a decrease in your overall score. If you or your teammate has a concussion, you or your teammate will be unable to participate in any form of sport or activity for a period of 3 days. Your coach/trainer/parent should NOT ALLOW you to return to play sport at that day.

Signs to watch for

Problems can happen over the next 24-48 hours. You or your teammate should not be allowed to return to play sport at that day if:

• New headache, or worsening headache

• Neck pain that gets worse

• Feeling sick to your stomach

• Has weakness, trouble standing or moving (arms, legs or face)

• Unsteadiness while standing

•看到

Consult your physician or licensed healthcare professional for a concussion before you can be allowed to return to play the sport.

Graduated Return to Sport Program

After a concussion, the child should rest physically and mentally for a few days to allow symptoms to get better. In most cases, after a few days of rest, you can return to your regular activities. It is important to avoid any activity that may cause symptoms to get worse. As the child gets better, you may increase exercise in steps, guided by the healthcare professionals (see below). The child should not play the sport for 24-48 hours. If they get better, they can gradually increase exercise in steps, guided by the healthcare professionals (see below). The child should not play the sport for 24-48 hours. If they get better, they can gradually increase exercise in steps, guided by the healthcare professionals (see below). The child should not play the sport for 24-48 hours. If they get better, they can gradually increase exercise in steps, guided by the healthcare professionals (see below).

Note: If mental activity does not cause any symptoms, the child may be able to return to school part-time without doing school activities at home first.

Mental Activity

Activity each step End of each step

1. Daily activities that do not cause symptoms

2. School activities

3. Return to part-time

4. Return to full activities

Graduated Return to School Program

If the child continues to have symptoms with mental activity, some other things that can be done to help with return to school may include:

• More time to finl activities

• More time to finish assignments

• Rest period to finish assignments

• Use a student helper/super

• Not going to noisy areas

• Less classes, class size

• Roommates, class size

The child should not go back to sports until they are back to school/learning, which may take significantly worse and no longer needing any changes to their schedule.

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- Patient-Family Education and reassurance.
- Physical and cognitive rest until acute symptoms have resolved.
- Gradual return to school and social activities.
- Low level exercise for those who are slow to recover.

Resources for physicians to guide return to activity:
- Link to ACE Care Plan (School Version)

- Provide information on role of physical/cognitive rest and exercise.
- Provide guidelines for gradual, step-wise return to activity (play and learn).
- Complete ACE Care Plan (School Version) or letter of accommodation.
You have been diagnosed with a concussion (also known as a mild traumatic brain injury). This personal plan is based on your symptoms and is designed to help speed your recovery. Your careful attention to it can also prevent further injury.

You should not participate in any high risk activities (e.g., sports, physical education (PE), riding a bike, etc.) if you still have any of the symptoms below. It is important to limit activities that require a lot of thinking or concentration (homework, job-related activities), as this can also make your symptoms worse. If you no longer have any symptoms and believe that your concentration and thinking are back to normal, you can slowly and carefully return to your daily activities. Children and teenagers will need help from their parents, teachers, coaches, or athletic trainers to help monitor their recovery and return to activities.

**Today’s symptoms are present (circle or check).**

<table>
<thead>
<tr>
<th>Physical</th>
<th>No reported symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headaches</td>
<td>Sensitivity to light</td>
</tr>
<tr>
<td>Nausea</td>
<td>Sensitivity to noise</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Numbness/Tingling</td>
</tr>
<tr>
<td>Visual problems</td>
<td>Vomiting</td>
</tr>
<tr>
<td>Balance Problems</td>
<td>Dizziness</td>
</tr>
</tbody>
</table>

**Return to Daily Activities**

1. Get lots of rest. Be sure to get enough sleep at night; no late nights. Keep the same bedtime weekdays and weekends.
2. Take daytime naps or rest breaks when you feel tired or fatigued.
3. Limit physical activity as well as activities that require a lot of thinking or concentration. These activities can make symptoms worse.
   - Physical activity includes PE, sports practices, weight-training, running, exercising, heavy lifting, etc.
   - Thinking and concentration activities (e.g., homework, classwork load, job-related activity).
4. Drink lots of fluids and eat carbohydrates or protein to main appropriate blood sugar levels.
5. As symptoms decrease, you may begin to gradually return to your daily activities. If symptoms worsen or return, lessen your activities, then try again to increase your activities gradually.
6. During recovery, it is normal to feel frustrated and sad when you do not feel right and you can’t be as active as normal.
7. Repeat evaluation of your symptoms is recommended to help guide recovery.

**Returning to School**

1. If you (or your child) are still having symptoms of concussion you may need extra help to perform school-related activities. As your (or your child’s) symptoms decrease during recovery, the extra help or supports can be removed gradually.
2. Inform the teacher(s), school nurse, school psychologist or counselor, and administrator(s) about your (or your child’s) injury and symptoms. School personnel should be instructed to watch for:
   - Increased problems paying attention or concentrating
   - Increased problems remembering or learning new information
   - Longer time needed to complete tasks or assignments
   - Greater irritability, less able to cope with stress
   - Symptoms worsen (e.g., headache, tiredness) when doing schoolwork

**Returning to Sports**

1. You should NEVER return to play if you still have ANY symptoms – (Be sure that you are at rest and while doing any physical activity and/or activities that require a lot of thinking or concentration in a new environment, e.g., stationary cycle).
2. Be sure that the PE teacher, coach, and/or athletic trainer are aware of your symptom and your current functional status.
3. It is normal to feel frustrated, sad and even angry because you cannot return to sports right away. Recovery will reduce the chances of getting hurt again. It is better to miss one or two games than suffer a second concussion.

**Gradual return to sports practices/games at this time**

- Return to play should occur in gradual steps beginning with aerobic exercise only (e.g., stationary cycle), moving to increasing your heart rate with movement (e.g., running), then contact if appropriate; and finally return to sports competition.

- Pay careful attention to your symptoms and your thinking and concentration skills at each level. If you do not experience any symptoms at the next level of activity only if you do not experience any symptoms at the next level of activity, you may move to the next level. If you do not experience any symptoms at the next level of activity, you may move to the next level. If you do not experience any symptoms at the next level of activity, you may move to the next level. If you do not experience any symptoms at the next level of activity, you may move to the next level. If you do not experience any symptoms at the next level of activity, you may move to the next level. If you do not experience any symptoms at the next level of activity, you may move to the next level. If you do not experience any symptoms at the next level of activity, you may move to the next level. If you do not experience any symptoms at the next level of activity, you may move to the next level. If you do not experience any symptoms at the next level of activity, you may move to the next level. If you do not experience any symptoms at the next level of activity, you may move to the next level.
Concussion Management Guidance for Healthcare Professionals: Patient-Family Education

- Provide anticipatory guidance & verbal reassurance that reduces anxiety and helps set realistic expectations, promotes recovery and prevents re-injury.

- Patient and family/caregivers need to know:
  - current symptoms are expected and common;
  - that it is expected that most patients (80-90%) recover within 7-10 days
  - However, some children/adolescents still have symptoms at one month and beyond, and need to be monitored.

Resources for Parent Information:
- Link to CDC Facts Sheets
- Link to cbirt http://cbirt.org/ocamp/parents/

Recovery is expected!
The cornerstone of concussion management is physical and cognitive rest until the acute symptoms resolve and then a grade programme of exertion prior to medical clearance and return to play....Low level exercise for those who are slow to recover may be of benefit.”
Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016


“There is currently insufficient evidence that prescribing complete rest achieves these objectives. After a brief period of rest during the acute phase (24-48 hours) after injury, patients can be encouraged to become gradually and progressively more active while staying below their cognitive and physical symptom-exacerbation thresholds (ie, activity level should not bring on or worsen their symptoms). It is reasonable for athletes to avoid vigorous exertion while they are recovering. The exact amount and duration of rest is not yet well defined in the literature and requires further study.”
5-Step Return to Play Progression

Baseline: Back to School First
Athlete is back to their regular school activities, is no longer experiencing symptoms from the injury when doing normal activities, and has the green-light from their health care provider to begin the return to play process.

Step 1: Light aerobic activity
Begin with light aerobic exercise only to increase an athlete’s heart rate. This means about 5 to 10 minutes on an exercise bike, walking, or light jogging. No weight lifting at this point.

Step 2: Moderate activity
Continue with activities to increase an athlete’s heart rate with body or head movement. This includes moderate jogging, brief running, moderate-intensity stationary biking, moderate-intensity weightlifting (less time and/or less weight from their typical routine).

Step 3: Heavy, non-contact activity
Add heavy non-contact physical activity, such as sprinting/running, high-intensity stationary biking, regular weightlifting routine, non-contact sport-specific drills (in 3 planes of movement).

Step 4: Practice & full contact
Young athlete may return to practice and full contact (if appropriate for the sport) in controlled practice.

Step 5: Competition
Young athlete may return to competition.

NM State Law
Must not return to full activity prior to a minimum of 240 hours (10 days)

- Monitor for concussion symptoms after each day’s return to play progression activity.
- One should only move to the next step if they do not have any new symptoms at the current step.
- If symptoms come back or if new symptoms present, (a sign that the athlete is pushing too hard), then one should stop these activities and the medical provider should be contacted.
- After more rest and no concussion symptoms, the athlete can start at the previous step.

Link to HEADS Up Video: Returning to Sports
• Monitor for concussion symptoms after each day's return to play progression activity.
• One should only move to the next step if they do not have any new symptoms at the current step.
• If symptoms come back or if new symptoms present, (a sign that the athlete is pushing too hard), then one should stop these activities and the medical provider should be contacted.
• After more rest and no concussion symptoms, the athlete can start at the previous step.

NM State Law Must not return to full activity prior to a minimum of 240 hours (10 days)

**Consensus statement**

### Table 1: Graduated return-to-sport (RTS) strategy

<table>
<thead>
<tr>
<th>Stage</th>
<th>Aim</th>
<th>Activity</th>
<th>Goal of each step</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Symptom-limited activity</td>
<td>Daily activities that do not provoke symptoms</td>
<td>Gradual reintroduction of work/school activities</td>
</tr>
<tr>
<td>2</td>
<td>Light aerobic exercise</td>
<td>Walking or stationary cycling at slow to medium pace. No resistance training</td>
<td>Increase heart rate</td>
</tr>
<tr>
<td>3</td>
<td>Sport-specific exercise</td>
<td>Running or skating drills. No head impact activities</td>
<td>Add movement</td>
</tr>
<tr>
<td>4</td>
<td>Non-contact training drills</td>
<td>Harder training drills, eg, passing drills. May start progressive resistance training</td>
<td>Exercise, coordination and increased thinking</td>
</tr>
<tr>
<td>5</td>
<td>Full contact practice</td>
<td>Following medical clearance, participate in normal training activities</td>
<td>Restore confidence and assess functional skills by coaching staff</td>
</tr>
<tr>
<td>6</td>
<td>Return to sport</td>
<td>Normal game play</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** An initial period of 24–48 hours of both relative physical rest and cognitive rest is recommended before beginning the RTS progression.

There should be at least 24 hours (or longer) for each step of the progression. If any symptoms worsen during exercise, the athlete should go back to the previous step.

Resistance training should be added only in the later stages (stage 3 or 4 at the earliest). If symptoms are persistent (eg, more than 10–14 days in adults or more than 1 month in children), the athlete should be referred to a healthcare professional who is an expert in the management of concussion.
Buffalo Concussion Treadmill Test

- Graded aerobic exercise treatment protocol to help speed recovery and return to activity.

1. BCTT: Identify symptom-limited threshold HR
2. 20 min/day aerobic exercise of 80% of threshold HR for 2 weeks
3. If tolerating, increase target HR by 5-10 bpm (5 bpm for nonathletes/10 bpm for athletes)
4. Repeat process every 2 weeks until at 85%-90% of APMHR for 20 min without symptom exacerbation
5. Begin graduated RTP protocol
6. If symptoms return, repeat BCTT

Concussion Management Guidance for Healthcare Professionals

• Acute headache treatment
  • Acetaminophen for first 24 hours
  • After 24 hours Acetaminophen or NSAIDS
  • For intractable HA that worsens, take to Emergency Department
Focused, evidence-based treatments for persistent post-concussive symptoms/problems (ie >10-14 days in adults; > 4 weeks in children)

- **Persistent Headaches**
  - Assess for need for neurology consult, physical therapy, or behavior medicine, ophthalmology or alternative medicine treatment

- **Balance/proprioception or cervical-cranial dysfunction (e.g., whiplash) problems**
  - Physical Therapy/Vestibular Rehabilitation

- **Graded active rehabilitation/exercise (e.g., aerobic exercise, coordination exercises, visualization/positive imagery) is safe, feasible and reduction in post-concussive symptoms (Gagnon et al. 2016)**

- **Psychological Treatment**

**Requires a Biopsychosocial Perspective**
A range of factors may influence evaluation, management of concussion, and predict potential for prolonged or persistent symptoms for the healthcare professional to consider.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Modifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>Number; Duration (&gt;10 days); Severity</td>
</tr>
<tr>
<td>Signs</td>
<td>Prolonged loss of consciousness (LOC) (&gt; 1 min); Amnesia</td>
</tr>
<tr>
<td>Sequeleae</td>
<td>Concussive convulsions</td>
</tr>
<tr>
<td>Temporal</td>
<td>Frequency-repeated concussions over time; Timing-injuries close together in time; ‘Recency’-recent concussion or TBI</td>
</tr>
<tr>
<td>Threshold</td>
<td>Repeated concussions occurring with progressively less impact force or slower recovery after each successive concussion</td>
</tr>
<tr>
<td>Age</td>
<td>Child and adolescent (&lt;18 years old)</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>Migraine, depression or other mental health disorders, attention deficit hyperactivity disorder (ADHD), learning disabilities (LD), sleep disorders</td>
</tr>
<tr>
<td>Medication</td>
<td>Psychoactive drugs, anticoagulants</td>
</tr>
<tr>
<td>Behavior</td>
<td>Dangerous style of play</td>
</tr>
<tr>
<td>Sport</td>
<td>High-risk activity, contact and collision sport, high sporting level</td>
</tr>
</tbody>
</table>

• Online Concussion Training Programs:

• CDC Concussion Training for Schools provides fact sheets and resources for school nurses, teachers, counselors, etc. to assist return to school/learning.

• Brain 101: The concussion Playbook is a web-based, school-wide mTBI training/management program that incorporates skills training, guidelines on creating a concussion management team, and strategies for supporting students in the classroom.
  • Glang et al. (2105) showed that student athletes and parents at Brain 101 schools had better sports concussion knowledge, knowledge application, and behavioral intention to implement effective concussion management practices compared to control schools
  • Students who had concussions in Brain 101 schools also received more individualized/customized academic accommodations than students in control schools.
Best practice recommends that all youth sports organizations build a protocol and assemble a concussion management team in advance to effectively deal with concussion when it happens.

School system-wide concussion management policies/plans should require that all school personnel understand:

a. the academic effects of mTBI,

b. the gradual process needed to assist students’ return to school life (learning, social activity, PE, etc), and

c. guidelines for when students can safely return to full physical and cognitive activities.
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rest.</td>
<td>No mental exertion (computer, texting, video games, or homework), stay at home, no driving.</td>
</tr>
<tr>
<td>2. Light mental activity</td>
<td>Up to 30 minutes of mental exertion, but no prolonged concentration, stay at home, no driving. &lt;br&gt; Progress to next level when able to handle up to 30 minutes of mental exertion without worsening of symptoms.</td>
</tr>
<tr>
<td>3. Part-time school</td>
<td>Maximum accommodations (shortened day/schedule, built-in breaks, provide quiet place for mental rest, no significant classroom or standardized testing, modify rather than postpone academics, provide extra time, extra help, and modified assignments). &lt;br&gt; Progress to next level when able to handle 30–40 minutes of mental exertion without worsening of symptoms.</td>
</tr>
<tr>
<td>4. Part-time school</td>
<td>Moderate accommodations (no standardized testing, modified classroom testing, moderate decrease of extra time, help, and modification of assignments). &lt;br&gt; Progress to next level when able to handle 60 minutes of mental exertion without worsening of symptoms.</td>
</tr>
<tr>
<td>5. Full-time school</td>
<td>Minimal accommodations (no standardized testing, but routine testing ok; continued decrease of extra time, help, and modification of assignments; may require more supports in academically challenging subjects). &lt;br&gt; Progress to next level when able to handle all class periods in succession without worsening of symptoms AND medical clearance for full return to academics.</td>
</tr>
<tr>
<td>6. Full time school</td>
<td>Full academics with no accommodations (attends all classes, full homework).</td>
</tr>
</tbody>
</table>
## ACE Post Concussion Gradual Return to School

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Activity Level</th>
<th>Criteria to Move to Next Stage</th>
<th>Date Criteria Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No return, at home</td>
<td>Day 1 - Maintain low level cognitive and physical activity. No prolonged concentration. Cognitive Readiness Challenge: As symptoms improve, try reading or math challenge task for 10-30 minutes; assess for symptom increase.</td>
<td>To Move To Stage 1: (1) Student can sustain concentration for 30 minutes before significant symptom exacerbation, AND (2) Symptoms reduce or disappear with cognitive rest breaks* allowing return to activity.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Return to School, Partial Day (1-3 hours)</td>
<td>Attend 1-3 classes, intersperse rest breaks. No tests or homework. Minimal expectations for productivity.</td>
<td>To Move To Stage 2: Symptom status improving, tolerates 4-5 hours of activity; 2-3 cognitive rest breaks built into school day.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Full Day, Maximal Supports (required throughout day)</td>
<td>Attend most classes, with 2-3 rest breaks (20-30'), no tests. Minimal HW (≤ 60'). Minimal-moderate expectations for productivity.</td>
<td>To Move To Stage 3: Symptom number &amp; severity improving, needs 1-2 cognitive rest breaks built into school day.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Return to Full Day, Moderate Supports (provided in response to symptoms during day)</td>
<td>Attend all classes with 1-2 rest breaks (20-30'); begin quizzes. Moderate HW (60-90') Moderate expectations for productivity. Design schedule for make-up work.</td>
<td>To Move To Stage 4: Continued symptom improvement, needs no more than 1 cognitive rest break per day</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Return to Full Day, Minimal Supports (Monitor final recovery)</td>
<td>Attend all classes with 0-1 rest breaks (20-30'); begin modified tests (breaks, extra time), HW (90'+) Moderate-maximum expectations for productivity.</td>
<td>To Move To Stage 5: No active symptoms, no exertional effects across the full school day.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Full Return, No Supports Needed</td>
<td>Full class schedule, no rest breaks. Max. expectations for productivity. Begin to address make-up work.</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

*Cognitive rest break: a period during which the student refrains from academic or other cognitively demanding activities, including schoolwork, reading, TV/games, conversation. May involve a short nap or relaxation with eyes closed in a quiet setting.

Link to HEADS UP Video: Returning to School
### Consensus statement

#### Table 2  Graduated return-to-school strategy

<table>
<thead>
<tr>
<th>Stage</th>
<th>Aim</th>
<th>Activity</th>
<th>Goal of each step</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Daily activities at home that do not give the child symptoms</td>
<td>Typical activities of the child during the day as long as they do not increase symptoms (e.g., reading, texting, screen time). Start with 5–15 min at a time and gradually build up</td>
<td>Gradual return to typical activities</td>
</tr>
<tr>
<td>2</td>
<td>School activities</td>
<td>Homework, reading or other cognitive activities outside of the classroom</td>
<td>Increase tolerance to cognitive work</td>
</tr>
<tr>
<td>3</td>
<td>Return to school part-time</td>
<td>Gradual introduction of schoolwork. May need to start with a partial school day or with increased breaks during the day</td>
<td>Increase academic activities</td>
</tr>
<tr>
<td>4</td>
<td>Return to school full time</td>
<td>Gradually progress school activities until a full day can be tolerated</td>
<td>Return to full academic activities and catch up on missed work</td>
</tr>
</tbody>
</table>
Returning to School

• Most students who sustain a concussion return to pre-injury functioning within 3–4 weeks of their injury.
• Symptoms may linger beyond this time in approximately 10–20% of concussions. When this happens, the school team must continue academic adjustments and physical restrictions for a longer time.
• Symptoms might 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 appropriate services (e.g., Section 504 plan, Special Education/Individualized Education Plan).

A school-wide academic accommodation protocol for students with concussions or brain injuries can be effectively implemented in most schools using the following progression.
## Academic Effects and Accommodations for Youth with Concussion

<table>
<thead>
<tr>
<th>Persistent Symptom</th>
<th>Effect of attending school</th>
<th>Accommodation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>Difficulty concentrating</td>
<td>Frequent breaks, quiet area, hydration</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Decreased attention, concentration</td>
<td>Frequent breaks, shortened day, only certain classes</td>
</tr>
<tr>
<td>Photophobia/phonophobia</td>
<td>Worsening symptoms (headache)</td>
<td>Sunglasses, ear plugs or headphones, avoid noisy areas (cafeterias, assemblies, sport events, music class), limit computer work</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Decreased attention or concentration, overexertion to avoid falling behind</td>
<td>Reassurance and support from teachers about accommodations, reduced workload</td>
</tr>
<tr>
<td>Difficulty concentrating</td>
<td>Limited focus on school work</td>
<td>Shorter assignments, decreased workload, frequent breaks, having someone read aloud, more time to complete assignments and tests, quiet area to complete work</td>
</tr>
<tr>
<td>Difficulty remembering</td>
<td>Difficulty retaining new information, remembering instructions, accessing learned information</td>
<td>Written instructions, smaller amounts to learn, repetition</td>
</tr>
</tbody>
</table>
## Return to School Information and Strategies

<table>
<thead>
<tr>
<th>Possible General Support</th>
<th>Possible Specific Classroom-based Supports</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Re-integration into school occurs gradually (e.g., student returns part-time before building up to a full schedule)</td>
<td></td>
</tr>
<tr>
<td>• Student not asked to do all missed work, and extra help given to get student caught back up</td>
<td></td>
</tr>
<tr>
<td>• Extra check-in meetings provided with teacher</td>
<td></td>
</tr>
<tr>
<td>• Rest time or breaks provided during the day</td>
<td></td>
</tr>
<tr>
<td>• Overall homework and class work load reduced</td>
<td></td>
</tr>
<tr>
<td>• Cognitively demanding in-school tasks reduced (e.g., no more than one test each day)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tests put off until recovery complete</td>
</tr>
<tr>
<td></td>
<td>• Extra time given to complete tests</td>
</tr>
<tr>
<td></td>
<td>• Flexibility allowed for assignment due dates</td>
</tr>
<tr>
<td></td>
<td>• Preferential seating provided to allow for closer teacher monitoring and decreased distractions</td>
</tr>
<tr>
<td></td>
<td>• Access to a model peer’s or teacher’s notes allowed</td>
</tr>
</tbody>
</table>

Links to:
- Return to school Information and strategies
- CBIRT Accommodations and Modifications in the Classroom for student with TBI (http://media.cbirt.org/uploads/files/classroomaccommodations_ocamp.pdf)
“Schools are encouraged to have an SRC policy that includes education on SRC prevention and management for teachers, staff, students and parents, and should offer appropriate academic accommodation and support to students recovery from SRC. Student should have regular medical follow-up after an SRC to monitor recovery and help with return to school, and students may require temporary absence from school after injury.

Children and adolescents should not return to sport until they have successfully returned to school. However, early introduction of symptom-limited physical activity is appropriate.”
Creating a Concussion Management Plan

A Concussion Management Plan/Protocol should ensure the following:

- Designated individuals mobilize the plan immediately when concussion is suspected; establish and maintain channels of communication with appropriate stakeholders; and see the plan through until the athlete is safely returned to activity.

- Appropriate emergency healthcare professionals are designated and available.

- Parents/guardians are notified and given information at the time of suspected concussion and throughout the return-to-academics and return-to-play processes.

- Healthcare professionals, parents, coaches, referees, and other stakeholders work together on a return-to-activity plan that includes symptom monitoring and lines of clear, ongoing communication.

**Academic Professionals (School Concussion Management Team)**

- Athletic Team (Coaches, Athletic Trainers)
- Academic Team (Teachers, Counselors, School Social workers, Speech pathologists, School Psychologists)
- Administrators (Principals/Assistant Principals/Athletic Directors)
- School Medical Team (Team Physicians, School Nurses, Physical therapists, School-based healthcare professionals)
School Concussion Management Policy/Creating a Concussion Management Plan

- Links to:
- cbirt Sample School District Policy
- APS concussion policy
Brain Injury Safety Tips and Prevention

• There are many ways to help reduce the risk of a concussion or other serious brain injury both on and off the sports field.
  • Use age appropriate protective equipment
  • Ensure safe physical environment (e.g., adequate lighting, padding goal posts)
  • Educate athletes, parents, and coaches about good sportsmanship practices
  • Enforce game rules
  • Encourage athletes to report (i.e., not hide) injuries
  • Train people in first aid and how to manage suspected concussions
  • Strengthen rules for return to play
  • Strengthen public health infrastructure to properly assess burden and determine injury related risk factors

Brain Injury Safety Tips and Prevention

• Sufficient evidence to support mandatory helmet use in skiing/snowboarding to reduce overall head injury.
• Evidence for mouthguard use to prevent concussion is mixed.
• Strong evidence that disallowing body checking under age 13 is protective in reducing risk of concussion.
• Vision training may reduce concussion in collegiate football players.
• Limiting contact in youth football practices may reduce frequency of head contact, but not necessarily reduce concussion.
Resources

- CDC Customizable materials (https://www.cdc.gov/headsup/resources/custom.html)
- For Parents and Youth
  - HEADS UP Fact Sheets for Parents (https://www.cdc.gov/headsup/youthsports/parents.html)
- For healthcare professionals
- For school professionals (nurses, teachers, coaches, counselors, administrators)
  - HEADS UP Fact Sheet for Parents (https://www.cdc.gov/headsup/schools/parents.html)
  - HEADS UP Fact Sheet for School Professionals (https://www.cdc.gov/headsup/schools/nurses.html)
- For coaches
- ChildSCAT5 Sport Concussion Assessment Tool for Children aged 5-12
- SCAT5 Sport Concussion Assessment Tool for Athletes aged 13+
- CDC Acute Concussion Evaluation Form (ACE)
- Post concussion Symptom Inventory for Children (PCSI; aged 5-7)
- Post Concussion Symptom Inventory for Children (PCSI; aged 8-12)
- Post Concussion Symptom Inventory Self Assessment (PCSI;Ages 13-18)
- Post Concussion Symptom Scale (PCSS)
References

- AAN Summary of evidence-based guideline update: Evaluation and management of concussion in sports (http://www.neurology.org/content/80/24/2250.full%20)
- Center for Injury Research and Prevention, The Childrens Hospital of Philadelphia Research Institute
- Children’s National Health System (http://childrensnational.org/choose-childrens/conditions-and-treatments/brain--nervous-system/concussion)
- Heyer et al., 2015. J. Pediatric
- Ontario Neurotrauma Foundation (http://onf.org/system/attachments/266/original/GUIDELINES_for_Diagnosing_and_Managing_Pediatric_Concussion_Recommendations_for_HCPs__v1.1.pdf)
- ORCAS Brain 101: The Concussion Playbook (http://brain101.orcasinc.com/)
- Rocky Mountain Hospital for Children (http://rockymountainhospitalforchildren.com/service/concussion-management-reap-guidelines)
- U. of Oregon The Center on Brain Injury Research & Training (http://cbirt.org/ocamp/)
- UNM Brain & Behavioral Health Institute, 2014)