2017 Consensus Statement on Concussion in Sport

- 5th International Conference on Concussion in Sport
- Held in Berlin October 2016
- 2017 Concussion in Sport Group (CSIG) Consensus Statement
  - Build on principles in previous statements
  - Further development of conceptual understanding of Sport Related Concussion
  - Science of SRC is evolving—individual management decisions remain in the realm of clinical provider’s judgement
    - Not meant to be a clinical practice guideline or legal standard of care
- Link to document: [http://bjsm.bmj.com/content/51/11/838](http://bjsm.bmj.com/content/51/11/838)
CSIG’s 11 ‘R’s of SRC Management

- Recognize
- Remove
- Re-evaluate
- Rest
- Rehabilitation
- Refer
- Recover
- Return to sport
- Reconsider
- Residual effects and sequelae
- Risk reduction
Definition of Sport Related Concussion (SRC)

- Traumatic brain injury induced by biomechanical forces
  - May be caused by direct blow to head, face, neck or elsewhere on the body with impulsive force transmitted to the head
  - Rapid onset of short lived impairment of neurological function that resolves spontaneously. In some cases may evolve over minutes to hours
  - Typically due to functional disturbance rather than structural injury. No abnormality of standard structural neuroimaging, may see this later with advanced imaging
  - Wide range of clinical symptoms. May or may not have loss of consciousness
  - Resolution of clinical and cognitive features typically follows a sequential course
  - Prolonged symptoms in some cases
Biomechanical Studies

- Helmet based measurement devices
  - Measure linear and rotational acceleration
  - May provide useful information for collision sports
  - Not available for non-collision sports

- Accelerations detected by sensor or video system do not necessarily reflect impact to the brain itself

- Values vary considerably in studies

- Helmet based or other sensor systems are NOT supported at this time
Sideline Evaluation

- Majority of SRCs occur without LOC or frank neurological signs
  - Can be difficult to diagnose
- No perfect diagnostic test or marker for immediate diagnosis
- If concussion suspected, remove from play and have assessment by a licensed healthcare provider
- SCAT 5-a brief neuropsychological test with immediate or on-field assessment section and off-field or office assessment:
On-Field Assessment

▪ STEP 1 Red flags

▪ STEP 2: Observable signs

▪ STEP 3: Memory Assessment Maddock’s Questions

▪ STEP 4: Examination Glasgow Coma Score

▪ STEP 5: Cervical Spine Assessment
On-Field Assessment-STEP 1 Red Flags

- Neck pain or tenderness
- Double vision
- Weakness or tingling/burning in arms or legs
- Severe or increasing headache
- Seizure or convulsion
- Loss of consciousness
- Deteriorating conscious state
- Vomiting
- Increasingly restless or agitated or combative
On-Field Assessment-STEP 2 Observable Signs

- Lying motionless on the playing surface
- Balance and gait difficulties, incoordination, slow movements
- Disorientation or confusion, inability to respond appropriately
- Blank or vacant look
- Facial injury after head trauma
On-Field Assessment-STEP 3 Memory Assessment Maddock’s Questions

▪ What venue are we at today?
▪ Which half is it now?
▪ Who scored last in this contest?
▪ What team did you play last week or last game?
▪ Did your team win the last game?

▪ May substitute sports specific questions
On-Field Assessment-STEP 4 Glasgow Coma Scale

- **Eye Opening (E)**
  - 4 = spontaneous
  - 3 = to voice
  - 2 = to pain
  - 1 = none

- **Verbal Response (V)**
  - 5 = normal conversation
  - 4 = disoriented conversation
  - 3 = words, but not coherent
  - 2 = no words, only sounds
  - 1 = none

- **Motor Response (M)**
  - 6 = normal
  - 5 = localized to pain
  - 4 = withdraws to pain
  - 3 = decorticate posture (an abnormal posture that can include rigidity, clenched fists, legs held straight out, and arms bent inward toward the body with the wrists and fingers bend and held on the chest)
  - 2 = decerebrate (an abnormal posture that can include rigidity, arms and legs held straight out, toes pointed downward, head and neck arched backwards)
  - 1 = none

- **Severe**: GCS 3-8 (You cannot score lower than a 3)
- **Moderate**: GCS 9-12
- **Mild**: GCS 13-15
On-Field Assessment: STEP 5 Cervical Spine Assessment

▪ Does the athlete report that their neck is pain free at rest?

▪ If there is NO neck pain at rest, does the athlete have a full range of ACTIVE pain free movement?

▪ Is the limb strength and sensation normal?
Allowing Return to Play on Same Day

- If sideline assessment reveals no concussion, health care provider can determine disposition and timing of return to play for that athlete.

- No return to play if SRC has been diagnosed.
Sideline Video Review

- May be helpful for identifying significant head impact events
- Still need serial evaluation process for concussion as there can be delayed onset of symptoms
Signs and Symptoms of SRC

- Headache, foggy, emotional lability
- LOC, amnesia, neurologic deficit
- Balance impairment-unsteady gate
- Behavioral changes-irritable, crying
- Cognitive impairment-slowed reaction times
- Sleep/wake disturbance-drowsiness

- These symptoms are non-specific and not diagnostic of concussion
Remove from Play

- If suspected concussion, athlete needs evaluation by healthcare provider
  - Standard emergency management principles and cervical spine evaluation
- Appropriate disposition of player-sideline evaluation, EMS transport
- After first aid issues addresses, assess concussion with SCAT5 or other diagnostic tool
- Do not leave athlete alone, needs serial evaluation over next several hours
- If diagnosed with SRC, **no return to play that same day!**
Off-Field or In Office Assessment

▪ Use sideline screening for rapid assessment

▪ If suspected concussion based on initial screening, should proceed to additional evaluation

▪ With SCAT5, further testing—takes 10 minutes (often 20-30)

▪ Should be done in a distraction-free environment with the athlete in a resting state
Neuropsychological Assessment

- Assists in clinical decision making
- Neuropsychologists are typically interpreting assessment
  - Brief computerized testing-baseline and post injury
  - Full NP assessment
- Computerized testing not available in all places
  - Consider more conservative return to play
- Should not be the sole basis for management decisions
- All athletes should have a clinical neurological assessment as part of overall management
- Baseline computerized testing not mandatory—may be helpful and adds opportunity for athlete/parent education
Concussion Investigations

• Advanced imaging-fMRI, DTI, MRS, CBF
• Electrophysiology, heart rate, measure of exercise performance
• Fluid biomarkers
• Genetic testing
• Transcranial magnetic stimulation

• All require further evaluation and validation for clinical use
• Currently helpful as research tools
Rest

- Moving away from complete rest
- Brief rest 24-48 hours
- Then encourage them to become gradually and progressively more active
- Stay below threshold that incites symptoms
- Avoid vigorous exertion during recovery
- Optimal time is not well defined
Refer

- Persistent symptoms
  - >10-14 days for adults
  - >4 weeks for children
- Typically a constellation of non-specific post-traumatic symptoms
  - May be confounding factors: migraine, depression, ADHD, substance abuse
- Limited evidence for pharmacotherapy
- Refer to health care professional with experience in treating SRC
Recovery

- Large majority recover, from a clinical perspective, within the first month
- Severe initial symptoms predict slower recovery
- Pre-injury migraines and mental health problems are at risk for having symptoms > 1 month
- Teenage years may be most vulnerable time period for having persistent symptoms
  - Greater risk for girls than boys
- Physiological dysfunction may last longer than clinical symptoms
  - “Buffer zone” of gradual increasing activity before full contact risk
Return to Sport

▪ Stepwise rehabilitation strategy

▪ Can begin symptom limited activity after 24-48 hours

▪ When symptom free, can begin return to play protocol

▪ Each step should take 24 hours so RTP typically in one week after resolution of symptoms

▪ If concussion symptoms occur, drop back to previous asymptomatic level and progress again after 24 hour period of being symptom free
Graduated Return to Sport Strategy

1. Symptom-limited activity
   - Daily activities that do not provoke symptoms
   - Gradual reintroduction of work/school activities

2. Light aerobic exercise
   - Walking or stationary cycling at slow to medium pace
   - No resistance training
   - Increase heart rate

3. Sport-specific exercise
   - Running or skating drills
   - No head impact activities
   - Add movement

4. Non-contact training drills
   - Harder training drills, passing drills
   - May start progressive resistance training
   - Exercise, coordination and increased thinking

5. Full contact practice
   - Following medical clearance, participate in normal training activities
   - Restore confidence and assess functional skills by coaching staff

6. Return to sport Normal game play

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

1. Daily activities at home that do not give the child symptoms
   - Typical activities of the child during the day as long as they do not increase symptoms (reading, texting, screen time)
   - Start with 5–15 min at a time and gradually build up
   - Gradual return to typical activities

2. School activities Homework, reading or other cognitive activities outside of the classroom
   - Increase tolerance to cognitive work

3. Return to school part-time Gradual introduction of schoolwork.
   - May need to start with a partial school day or with increased breaks during the day
   - Increase academic activities

4. Return to school full time
   - Gradually progress school activities until a full day can be tolerated

5. Return to full academic activities and catch up on missed work
Reconsider

- Elite and non-elite athletes should be managed using same principles
- More research needed for children age 5-12 years and adolescents age 13-18 years—need age specific studies
- Expected duration for children **up to 4 weeks**
- Schools should have SRC policy
- No return to sport until they have returned to school
  - Can still introduce early symptom-limited physical activity
Residual Effects and Sequelae

- Potential for developing CTE (chronic traumatic encephalopathy) must be considered
- Incidence in athletic populations is unknown
- A cause and effect relationship has not been documented between CTE and SRC or exposure to contact sports
- The relationship between repeated concussion or sub-concussive impacts and CTE is unknown
Risk Reduction

▪ A detailed SRC history is of value

▪ History of concussion may put athlete in a high risk category and allows provider to educate athlete or consider disqualification

▪ Previous symptoms, length of recovery and number of concussions

▪ Ask about previous spine, cervical and facial injuries

▪ Disproportionate impact versus symptom severity may indicate increased vulnerability to concussion

▪ Educate athlete, can discuss modification of playing behavior
Prevention

- Evidence limited in sports that already use helmets
- Helmets—evidence for risk reduction in skiing/snowboarding.
  - Should be mandatory for these sports
- Mouth guard—non-significant trend toward protective effect in collision sports
- No body checking in youth hockey until > age 13 does help
- Vision training for college football players may be helpful
- Limited contact in youth football—less head contact but unclear if fewer SRC
- No prevention with fair play rules in hockey, tackle training without helmets/pads in football and rugby tackling technique
Knowledge Translation

- Continue to educate healthcare providers, athletes, parents, coaches, administrators about SRC
- Education may lead to improved identification of concussions
- Fair play and sports ethics
Conclusion

▪ Science of concussion is incomplete

▪ Management and return to play decisions should be made by healthcare providers on an individual athlete basis
References


▪ SCAT 5: http://bjsm.bmj.com/content/bjsports/early/2017/04/26/bjsports-2017-097506SCAT5.full.pdf