



Association of Ringside Physicians Consensus Statement: Concussion in Combat Sports

Introduction

Concussion is a controversial topic in the world of sports medicine. Various organizations and experts have published numerous statements and recommendations regarding different aspects of sports-related concussion including definition, presentation, treatment, management and return to play guidelines.¹⁻⁶ Many non-combat sports organizations, from the amateur to the professional levels, have recognized the importance of proper concussion management. Using these published statements and recommendations as guidelines, various sports organizations have constructed protocols outlining the in-game management of athletes who have suffered a concussion, as well as protocols for returning an athlete back to play after a concussion.

To date, there have been no written consensus statements specific for combat sports regarding management of combatants who have suffered a concussion or for return to competition after a concussion. In non-combat sports, head contact during play, for the most part, is incidental. In combat sports, head contact is an objective of the sport itself. Accordingly, management and treatment of concussion in combat sports should, and must, be more stringent than for non-combat sports counterparts.

The Association of Ringside Physicians (ARP) sets forth this Consensus Statement in order to establish a set of management guidelines that ringside physicians, fighters, referees, trainers, promoters, sanctioning bodies, and other healthcare professionals can use in the ringside or cageside setting; as well as a set of guidelines for the return of a combat sports athlete to competition after sustaining a concussion. This Consensus Statement does not address the management of moderate to severe forms of traumatic brain injury (TBI), such as intracranial bleeds; nor does it address the return to competition for combat sports athletes who have suffered such an injury. These are different, more severe forms of brain injuries and are beyond the scope of this statement.

This consensus statement does not address neuroimaging guidelines in combat sports. The ARP plans to release a separate statement providing guidelines on neuroimaging of combat sports athletes. This future statement will cover indications and reasoning of neuroimaging in both the pre-bout licensure and post-bout setting.

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Definition

The 4th international consensus statement on concussion in sport defines concussion as “[a] complex pathophysiological process affecting the brain, induced by biomechanical forces.”⁴ Concussion is further defined by clinical, pathological and biomechanical constructs. (Table 1.)

Table 1⁴

Definition of Concussion from the Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012
1) Concussion may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an "impulsive" forces transmitted to the head
2) Concussion typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, symptoms and signs may evolve over a number of minutes to hours.
3) Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.
4) Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course.

Signs and Symptoms of Concussion

Table 2 lists the signs and symptoms of concussion as seen in combat sports. If a combat sports athlete displays one or more of these problems or behaviors, concern for concussion should be raised.

Table 2

Early Signs and Symptoms of Concussion in Combat Sports
Headache
Dizziness/Loss of Balance/Difficulty Walking/Stumbling
Vision Problems/Double Vision/Difficulty Making Eye Contact/Staring Off Into Space
Nausea/Vomiting
Becomes Emotional
Confusion/Not Oriented to Person, Location, or Date/Round
Slurred/Slow Speech/Slow to Answer Questions
Walking to the Wrong Corner
Sluggish/Change in Fighting Style
Late Signs and Symptoms of Concussion in Combat Sports (Post-Concussion Syndrome)
Persistent Headache
Difficulty with Focusing/Concentrating/Reading
Sensitivity to Loud Sounds/Bright Lights (Screens)
Abnormal Fatigue
Sleep Disturbances
Mood Changes

Current Practices in Non-combat Sports

In non-combat sports it is universally agreed that, if an athlete is diagnosed with a concussion, he/she must be immediately removed from play and must not be allowed to return to play (RTP) on the day of injury.⁴⁻⁶ Most professional non-combat sports organizations have developed specific protocols for evaluating head injuries during a game.⁷ The overwhelming majority of non-combat sports organizations also require athletes who have sustained a concussion to go through a RTP protocol that consists of a gradual, stepwise increase in physical demands, sports-specific activities, and the risk for contact. Many non-combat sports organizations also require medical clearance by a licensed healthcare provider trained in the evaluation and management of concussion prior to full RTP without any restriction. In some cases of

professional athletics, an “unaffiliated physician” who practices independently of the team, decides final clearance to RTP.⁷

All consensus statements agree that when an athlete sustains a concussion, an initial cognitive and physical rest period is needed prior to beginning a RTP protocol. However, what is not currently agreed upon is the amount or duration of rest needed. Some statements recommend not beginning a RTP progression until the athlete no longer reports any concussion-related symptoms.⁵⁻⁶ Other publications recognize that the current published evidence evaluating the effect of rest following a sports-related concussion is sparse; and that low level exercise may be beneficial to recovery after an initial period of rest.⁴ A 2016 publication which summarized a meeting of 37 concussion experts stated that, “strict rest is contraindicated (after

concussion) and may exacerbate the effects of (the) injury.”⁸ This same publication also summarized that concussion symptoms and impairments are treatable; and that concussions in which symptoms last a prolonged period of time be managed by a multidisciplinary team with active rehabilitation depending on the individual’s clinical profile.⁸

Neuropsychological (NP) testing has been ubiquitously recognized as a helpful tool in sports-related concussion evaluation and management.⁴⁻⁶ For convenience of time and availability, various programs of computerized NP testing have been developed. Computerized NP while not as comprehensive as formal “pencil and paper” NP testing, does give a quick “snapshot” of a person’s cognitive status. Many non-combat sports organizations utilize computerized NP testing in RTP protocols. These protocols require athletes to return to his/her pre-injury baseline computerized NP testing scores in order to return to competition. NP testing, however, is not used as the sole determining factor in management decisions.

Current Practices in Combat Sports

Some combat sports organizations have developed specific written policies regarding intra-bout evaluation/management of concussion and RTP after TKO/KO. Specifically, USA Boxing guidelines state that a match should be stopped if a boxer is showing signs and symptoms of concussion.⁹ USA Boxing guidelines also include minimum periods of

suspension for TKO/KO.⁹ Suspensions in USA Boxing are based upon whether there has been a loss of consciousness (LOC) attendant to a TKO/KO, and the duration of a loss of consciousness (LOC) following a TKO/KO; as well as number of times a fighter has suffered a TKO/KO with or without LOC. (Table 3)

Regarding professional combat sports, intra-bout evaluation of concussion and RTP after concussion vary from state-to-state/commission-to-commission. Some states/commissions have specific written guidelines regarding concussion; while other states/commissions do not, and procedures are followed based upon previous precedent and at the discretion of the supervising ringside physician. Further, while in some states/commissions, ringside physicians are authorized to stop a fight, in other states/commissions, only the referee is the sole arbitrator of the fight but are allowed to stop the fight on medical grounds at the ringside physician’s request. Minimum suspensions typically given in professional combat sports are 30 days for a TKO, 60 days for KO without LOC, and 90 days for KO with LOC. However, as noted above, these timeframes vary depending on the state/commission. Some states/commissions require a lesser period of suspension if a fight went for a certain number of rounds, win or lose; e.g., six or more rounds.

Ultimately, states/commissions often leave medical suspensions to the discretion of the

Table 3⁹

USA Boxing: Minimal Suspension Period After TKO/KO

Single occurrence of TKO/KO	
TKO or KO without LOC	30 day suspension
KO with LOC less than 1 minute	90 day suspension
KO with LOC greater than 1 minute	180 day suspension
Second occurrence of TKO/KO in a 90 day period after single occurrence suspension	
TKO or KO with/without LOC	Minimum 90 day suspension or double previous suspension (Use higher suspension)
Third occurrence of TKO/KO in a 365 day period	
TKO or KO with/without LOC	18 month suspension and consider retirement

covering ringside physician. Ringside physicians vary greatly in their level of ringside experience and sub-specialty medical background leading to variations in post-bout recommendations and suspensions. All periods of suspension imposed by states/commissions, are enforceable as to competition only and have no effect on what a combatant may do in training/practice/sparring.

Currently, there are no general requirements for a combat sports athlete to be evaluated by a licensed healthcare provider specifically trained in the evaluation and management of concussion as a part of medical clearance to RTP following a concussion or TKO/KO. Although a covering ringside physician may require the same as a condition attendant to the period of suspension, such a requirement may not be stringently imposed. This risks a combat sports athlete RTP in the absence of a robust medical evaluation.

Currently no known combat sports organization requires baseline formal NP or computerized NP testing.

Association of Ringside Physicians Concussion Management and Return to Play Guidelines for Combat Sports Athletes

Taking into consideration, the above-referenced differences between non-combat sports and combat sports, as well as the absence of uniformity among the jurisdictions which currently regulate combat sports, the ARP proposes the following guidelines for concussion management and RTP of a combat sports athlete:

Suspensions and Concussion Management

- If a fighter is exhibiting signs of a concussion during a bout, the fight should be stopped. These signs include but are not limited to headache, confusion, blurred/double vision, nausea/vomiting and balance/gait issues. (Table 2)
- If a combat sports athlete sustains a TKO secondary to blows to the head, it is recommended that he/she be suspended from competition for a minimum of 30 days. Although it might be difficult to enforce, it is also recommended that the fighter refrain from sparring for 30 days as well.

- If a combat sports athlete sustains a KO without loss of consciousness secondary to blows to the head, it is recommended that he/she be suspended from competition for a minimum of 60 days. Although it might be difficult to enforce, it is also recommended that the fighter refrain from sparring for 60 days as well.
- If a combat sports athlete sustains a KO with loss of consciousness secondary to blows to the head, it is recommended that he/she be suspended from competition for a minimum of 90 days. Although it might be difficult to enforce, it is also recommended that the fighter refrain from sparring for 90 days as well.
- Combat sports athletes may participate in non-contact training and conditioning one week after sustaining a loss via TKO/KO secondary to head strikes; provided his/her symptoms are improving and do not increase in severity with activity. A gradual activity progression of increased intensity is recommended, starting with light aerobic activity progressing to more rigorous/combat sports specific activity and finally sparring when symptoms have completely resolved. (Table 4)
- Under no circumstances should a combat sports athlete compete or engage in sparring activity if he or she is experiencing signs and symptoms of concussion.

Specialist Evaluation

- In addition to the above-mentioned periods of suspension, it is recommended that a combat sports athlete's suspension not terminate until the fighter is cleared by a specialist physician trained in concussion management. Specialist physicians trained in concussion management include neurologists, neurosurgeons, and primary care sports medicine physicians.

Other Baseline Testing

- It is recommended that all combat sports athletes undertake a validated neuropsychological evaluation with the initial test serving as a baseline. If possible, vestibular/ocular and balance baseline testing is also recommended. Repeat baseline testing should occur annually. If there is any decline, it is recommended that a physician trained in head injuries and concussion management evaluate the athlete.

Education

- It is recommended that all combat sports athletes and their coaches/trainers be educated and trained to recognize the signs and symptoms of concussion. If a combat sports athlete is experiencing any signs or symptoms of a concussion during training or competition, he or she should remove themselves from contact activities and seek immediate evaluation by a healthcare professional.

Discussion of Guidelines

The ARP recognizes the rapid advancements in concussion management over the recent years and its adaptation into non-combat sports. This has created a safer environment and may lead to a decrease in morbidity associated with sports related head trauma. Current non-combat sports RTP protocols do not allow an athlete to return to competition/contact if he or she is exhibiting any concussion symptoms. If a non-combat sports athlete suffers an injury and is showing signs or symptoms of concussion he/she is removed from competition immediately, with no same-day RTP. The ARP agrees that this practice should also be employed in combat sports. If a combat sports athlete is exhibiting signs or symptoms of concussion during a bout (Table 2), he/she should be evaluated by the covering ringside physician and if a concussion is suspected the bout should be immediately stopped.

Non-combat sports allow athletes to return to competition/contact when concussion symptoms resolve and the athlete has tolerated a stepwise

progression of activity without return of symptoms. The ARP is also in agreement with this premise. However, due to the nature and objective of combat sports, it is recommended that combat sports athletes should also wait a minimum specified amount of time (30/60/90 days) until RTP. Return to fight protocols should be specific to the athlete's combat sport.

Nalepa et al. have proposed recommendations with regard to return to fight protocols.¹⁰ This protocol is broken down into three phases: Phase 1 – Return to General Fitness; Phase 2 – Return to Non-Contact Fighting Activities; and Phase 3 – Return to Contact Fighting Activities/Sparring. It is recommended that a combat sports athlete should not begin Phase 1 for at least one week after sustaining a loss via TKO/KO secondary to head strikes. This initial rest phase is the cornerstone of concussion management and allows for acute symptoms to resolve.⁴ Combat sports athletes may progress from Phase 1 to Phase 2 provided symptoms do not increase in severity. The combat sports athlete should perform one step per day, waiting a minimum of an additional 24 hours before moving on to the next step. If symptoms do not increase over that 24 hour period, he/she may move on to the next step. He/She should not advance if concussion symptoms increase in that 24-hour period. If symptoms increase, he/she should go back to the prior step where symptoms did not increase. Under no circumstance should a combat sports athlete progress to Phase 3 if he/she continues to exhibit concussion symptoms. Athletes who remain symptomatic for greater than 10 days, should be seen by a physician trained in concussion management to monitor symptoms, initiate treatments, and recommend activity progression.

The majority of non-combat sports concussion protocols throughout the amateur and professional levels require evaluation and clearance by a healthcare provider trained in the management of concussion before return to contact/competition. The ARP also believes such a practice should be applied in combat sports. If a combat sports athlete is experiencing concussion signs and symptoms 30 minutes after his or her bout, or lost his/her bout by KO via strikes to the head, it is most likely the athlete has sustained a concussion. Accordingly, he/she should be evaluated and cleared by a healthcare provider skilled in concussion management before return to

Table 4¹⁰**Return to Fighting Protocol**

Phase 1: Return to General Fitness		
STEP 1	Light Aerobic Activity	Stationary biking, elliptical, incline walking: gradually escalating heart rate and monitoring through perceived exertion and/or HRM
STEP 2	Moderate Aerobic Activity	Jogging, swimming, weightlifting: escalating heart rate to moderate and high-demand activity through HRM or perceived exertion; assess high-level vestibular functioning
STEP 3	Sport-Specific Activity	Sprinting, mitts, bag/footwork, walk-through grappling, etc.; increasing duration; no partner work
Phase 2: Return to Non-contact Fighting Activities		
STEP 1	Bag/Mitt Work with Movement	Tests fighter ability to punch and/or kick in multiple planes while testing vestibular and visual systems
STEP 2	Shadow Boxing/Drills	Re-introduces fighter to sport environment and re-establishes footwork in ring parameter and surface.
STEP 3	One-sided Sparring & Grappling	Fighter begins to spar without the concern of contact. Reacts to opponents movements and begins to get timing back for punches, kicks and body position.
Phase 3: Return to Contact/Sparring Fighting Activities May only advance to this phase when concussion symptoms have completely resolved		
STEP 1	Sparring - short duration	First step of live sparring. Rounds of short duration with long breaks. Number of rounds is small to begin with and then can increase as tolerated.
STEP 2	Sparring - longer duration	Rounds at this step begin to lengthen in duration while breaks between rounds shortens. Number of rounds can also increase as fatigue allows.
STEP 3	Sparring - normal parameters	Full return to normal training. Return to normal rounds and time limits based on sport and next potential bout. Fighter should be able to tolerate normal parameters of training/sparring, and is training as normal without a return of symptoms.

***Adapted from Nalepa et al.

contact/competition. The specialist clearance should be in addition to the above-referenced recommended minimal day suspensions.

Often emphasis in suspensions and medical treatment is focused on the loser of the bout, or the one who suffers a KO or TKO. The ARP recommends that all combat sports athletes, even the winner be evaluated for signs and symptoms of concussion and should be managed and treated

accordingly. It is not unreasonable for the covering ringside physician to consider a minimum suspension of 30 days for all fighters, win/lose/draw, if the fighter has been through a particularly long, grueling, difficult bout.

NP baseline testing is a helpful tool in making decisions regarding a return to fighting in combat sports athletes who have sustained a concussion. NP testing is also helpful for

screening of neurological decline over the course of a combatant's career. Computerized NP baseline testing is now widely available and affordable. For these reasons, the ARP recommends that all combat sports athletes undergo a validated and reproducible neuropsychological baseline test. Baseline vestibular/ocular and balance testing is a helpful adjunct for the same reasons.

Finally, none these guidelines can be enforced outside of competition. Only the combat sports athlete and his/her coaches/trainers know what happens inside the gym and during training.

Hence athletes and their coaches/trainers should have a basic education of concussion and its signs/symptoms. (Table 2) Unfortunately when there has been a tragic outcome in the ring, it is often revealed that the combat sports athlete suffered a head injury in training that was not divulged to the physician. If a combat sports athlete sustains an injury and is experiencing any signs or symptoms of a concussion during training or competition, he/she should be encouraged to remove themselves from contact activities and seek evaluation by a healthcare professional.

Qualifying Statement

These guidelines are recommendations designed to assist ringside physicians, fighters, trainers, promoters, sanctioning bodies, governmental bodies and others in making decisions. These recommendations may be adopted, modified, or rejected according to clinical needs and constraints and are not intended to replace local commission laws, regulations, or policies. It is hoped that these guidelines will serve to augment locally agreed policies already in place. In addition, it should be understood that the guidelines developed by the ARP are not intended as standards or absolute requirements, and their use cannot guarantee any specific outcome. Guidelines are subject to revision as warranted by the evolution of medical knowledge, technology and practice. They provide basic recommendations that are supported by synthesis and analysis of the current literature, expert and practitioner opinion, commentary and clinical feasibility.

References

1. **Aubry M**, Cantu R, Dvorak J, *et al*. Summary and agreement statement of the 1st International Symposium on Concussion in Sport, Vienna 2001. *Clin J Sport Med*. 2002; **12**:6-11
2. **McCroory P**, Johnston K, Meeuwisse W, *et al*. Summary and agreement statement of the 2nd International Symposium on Concussion in Sport, Prague 2004. *Br J Sport Med*. 2005; **39**:196-204
3. **McCroory P**, Meeuwisse W, Johnston K, *et al*. Summary and agreement statement of the 3rd International Symposium on Concussion in Sport, held in Zurich, November 2008. *Br J Sport Med*. 2009; **43**:176-184
4. **McCory P**, Meeuwisse WH, Aubry M, *et al*. Consensus statement on concussion in sport: the 4th international conference on concussion in sport held in Zurich, November 2012. *Br J Sports Med* 2013; **47**:250-258
5. **Harmon KG**, Drezner J, Gammons M, *et al*. American Medical Society for Sports Medicine Position Statement: Concussion in Sport, *Clin J Sport Med*. 2013; **23**: 1-18
6. **Broglio SP**, Cantu RC, Gioia GA, *et al*. National Athletic Trainers' Association Position Statement: Management of Sport Concussion, *J of Athl Train*. 2014; **49**: 245-65
7. **NFL Health Playbook**, National Football League Head, Neck and Spine Committee's Protocols Regarding Return to Participation Following Concussion. Retrieved from <http://static.nfl.com/static/content/public/photo/2014/08/21/0ap3000000381608.pdf> Sept 1, 2016
8. **Collins MW**, Kontos AP, Okonkwo DO, *et al*. Statements of agreement from the Targeted Evaluation and Active Management (TEAM) approaches to treating concussion meeting held in Pittsburgh, October 15-16, 2015, *Neurosurg*. 2016
9. **USA Boxing**, Medical Handbook and Medical Rules of AIBA Open Boxing. Retrieved from <http://www.teamusa.org/usa-boxing/rulebook/medical-handbook> Sept 1, 2016
10. **Nalepa B**, Alexander A, Pardini J, *et al*. Fighting to keep a sport safe: Toward a structured and sport-specific return to play protocol. *The Physician and Sportsmedicine*. Published online February 2017