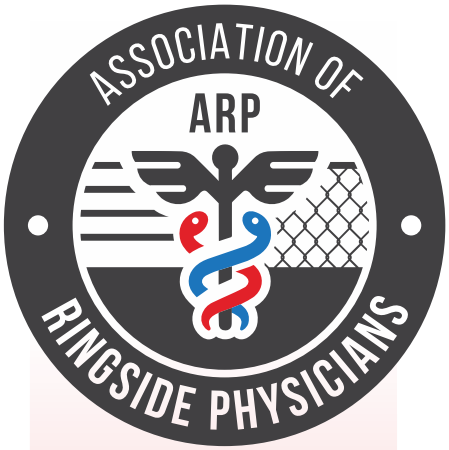


Association of Ringside Physicians

Journal of Combat Sports Medicine

Volume 2, Issue 2
July 2020

Editor-in-Chief, Editorial Board

Nitin K. Sethi, MD, MBBS, FAAN, is a board certified neurologist with interests in Clinical Neurology, Epilepsy and Sleep Medicine. After completing his medical school from Maulana Azad Medical College (MAMC), University of Delhi, he did his residency in Internal Medicine (Diplomate of National Board, Internal Medicine) in India. He completed his neurology residency from Saint Vincent's Medical Center, New York and fellowship in epilepsy and clinical neurophysiology from Weill Cornell Medical Center, New York. Dr. Sethi is a Diplomate of the American Board of Psychiatry and Neurology (ABPN), Diplomate of American Board of Clinical Neurophysiology (ABCN) with added competency in Central Clinical Neurophysiology, Epilepsy Monitoring and Intraoperative Monitoring, Diplomate of American Board of Psychiatry and Neurology (ABPN) with added competency in Epilepsy, Diplomate of American Board of Psychiatry and Neurology (ABPN) with added competency in Sleep Medicine and also a Diplomate American College of Sports Medicine (ACSM)/Association of Ringside Physicians (ARP) and a Certified Ringside Physician. He is a fellow of the American Academy of Neurology (FAAN) and serves on the Board of the Association of Ringside Physicians. He currently serves as Associate Professor of Neurology, New York-Presbyterian Hospital, Weill Cornell Medical Center and Chief Medical Officer of the New York State Athletic Commission.

Editorial Staff

Susan Rees, Senior Managing Editor
Email: srees@reesgroupinc.com

Susan Rees, The Rees Group President and CEO, has over 30 years of association experience. Currently the Executive Director of the American Osteopathic Academy of Sports Medicine, American Society for Veterinary Clinical Pathology, and the Society for Psychophysiological Research, Susan spent 12 years with the Credit Union National Association (CUNA & Affiliates) as the director of their educational publishing division. Susan has an extensive background in association management, marketing and regulatory affairs, as well as print and electronic publishing. She is also an award-winning video producer, having produced educational videos and films for the financial training market. Susan spent two years with Forbes Inc., publisher of Forbes magazine as an international acquisitions editor in the book publishing division. At Forbes, Susan worked with businesses and associations to produce books, manuals, web sites and online learning tools for general retail sales distribution, or distribution through the business or association. Susan holds a Bachelor of Arts Degree in Communications and a Master of Science Degree in Education from the University of Wisconsin-Madison. She has been President and CEO of TRG since 2000.

Lisa M. Nelson, Senior Managing Editor
Email: lnelson@reesgroupinc.com

Lisa Nelson has worked in association management for over 30 years; the past 28 years with The Rees Group. She is currently the Managing Director of the Society for Clinical and Medical Hair Removal, but spent much the last 25 years working with association publications. She is the former Managing Editor for the *Journal of Cardiopulmonary Rehabilitation* and the *Annals of Behavioral Medicine*, and continues to edit and write for several association newsletters.

Table of Contents

From the Editor's Desk

Dear Colleagues,

It gives me great pleasure to bring to you the fourth issue of the *ARP Journal of Combat Sports Medicine.* Professional boxing and mixed martial arts (MMA) are popular sports with a worldwide fanbase. COVID-19 (coronavirus disease 2019) is the infectious respiratory disease caused by SARS-COV 2 virus (Severe Acute Respiratory Syndrome coronavirus 2). On March 11,2020 The World Health Organization (WHO) declared COVID-19 a pandemic considering the large number of cases in over 110 countries and territories around the world and the sustained risk of further global spread. In order to control the spread of COVID-19, heath care authorities in different countries recommended isolation of sick persons, quarantine for those who may been exposed to the virus, and social distancing. Social distancing also referred to as physical distancing meant keeping space between people outside of their homes. A distance of at least 6 feet (2 meters) was recommended and people were asked not to gather in large groups and avoid crowded places and mass gatherings. Widespread cancellation or postponement of sporting events including boxing and MMA bouts followed. The most common sited cause for cancellation was fear of contagion. By canceling events, State Commissions, promoters, and combat sport's governing bodies made the tough but responsible decision to protect all the concerned parties namely the athletes, their camps, Commission officials, production crews, and the fans at the venue.

In the space of a few weeks, the COVID-19 pandemic has fundamentally changed the way we live our lives and practice medicine here in the United States and around the world. As countries around the world emerge from lockdowns, combat sports events are expected to resume initially "behind closed doors". Only the athletes, cornermen, referee, judges, Commission officials, ringside physicians, and TV production crew would be present at the venue. The rationale for holding an event behind closed doors is to reduce the risk of COVID-19 transmission from person to person at the venue.

In combat sport medicine, emphasis has been placed on the identification and treatment of head injuries. Extraordinarily little has been written regarding extremity injuries. In this issue of the *ARP Journal of Combat Sports Medicine*, Khabie et al. have outlined NO-GO orthopedic criteria in combat sports. Adherence to these criteria shall help protect the combat sports athlete from limb-threatening and career-ending orthopedic injuries.

Sethi and Khabie outline a standardized concussion evaluation which should be carried out in between rounds if concern for concussion is raised. Three versions of a Pocket Concussion Assessment Tool have been included. Physicians can laminate these cards and refer to them as they evaluate for concussions ringside.

Saby and Neidecker report results of a survey investigating ringside physician compensation. The results are interesting and show that physician compensation for combat sports event coverage varies significantly from state to state.

Our issues thus far have been well received and I acknowledge the hard work and dedication of our two Senior Editorial Managers, Lisa Nelson and Susan Rees. They are working tirelessly to improve the Journal and make it a valuable resource for you and your colleagues. The *ARP Journal of Combat Sports Medicine* is actively soliciting case reports, case series, review articles and original studies related to the field of combat sports medicine. Please consider the Journal for publication of your valuable work.

I wish you and your families good health is these extraordinary times. Stay strong for this too shall pass.

Sincerely,

Nitin K Sethi, MD, MBBS, FAAN

MAKING BOXING AND MMA SAFER: THE CASE FOR ESTABLISHING A NO-GO ORTHOPEDIC CRITERIA IN COMBAT SPORTS

Victor Khabie, MD, Dept. of Orthopedics, Northern Westchester Hospital, Mount Kisco, NY, USA

Nitin K. Sethi, MD, Dept. of Neurology, New York-Presbyterian Hospital, Weill Cornell Medical Center, New York, NY, USA
(Corresponding Author: sethinitinmd@hotmail.com)

KEY WORDS: boxing, MMA, medical stoppage, orthopaedic injury, contact sports, ringside physician

STUDY FUNDING: No targeted funding reported.

DISCLOSURES: VK serves as a ringside physician for the New York State Athletic Commission (NYSAC). NKS serves as the Chief Medical Officer of the New York State Athletic Commission (NYSAC). The views expressed above are those of the authors and do not reflect necessarily the views of the New York State Athletic Commission.

Context:

Professional boxing and mixed martial arts (MMA) are popular contact sports with a high risk for orthopaedic injuries involving the hand, elbow, shoulder, knee, and ankle. Although much emphasis has been placed on the identification and treatment of head injuries in these athletes, extraordinarily little has been written regarding extremity injuries. While rarely life threatening, these injuries can at times be limb-threatening orthopaedic emergencies such as a compartment syndrome. If not addressed in a timely fashion, they can be career ending and lead to lifelong disability. Stopping a fight in time protects the combatant from such a fate.

Evidence Acquisition:

In this commentary, NO-GO orthopaedic criteria in boxing and MMA are defined based on personal and collective evidence of experienced ringside physicians and clinical acumen. The references of pertinent articles were reviewed for other relevant sources.

Study Design:
Clinical Review Commentary

Level of Evidence: Level 3

Results:

Orthopaedic NO-GO criteria have been defined to protect the health of combat sports athletes.

Conclusion:

In recent years NO-GO criteria have been established to prevent devastating head injuries in combat sports such as boxing and MMA. However, orthopedic injuries have not received the same attention. Routinely fights are allowed to continue despite some of the orthopedic injuries detailed here, comprising fighters' orthopedic health and safety. In other professional sports such as football, basketball, hockey, and soccer, these NO-GO criteria would generate little or no controversy. However, the warrior mentality inherent in combat sports will undoubtedly put the recommendations outlined below under more scrutiny. In this commentary, NO-GO orthopaedic criteria in boxing and MMA are defined based on personal and collective evidence of experienced ringside physicians and clinical acumen. If the NO-GO criteria listed here are ignored, the combat sports athlete can suffer a permanent, career-ending and disabling injury. Combat sport athletes deserve the same protection as athletes in other contact sports. This is not an all-inclusive list but covers common orthopedic injuries in combat sports encountered by the authors. Many of these injuries are obvious, some have subtle nuances which are important to appreciate. Physicians caring for these athletes should become familiar with these classes of injuries and the NO-GO stoppage recommendations and rationale. Standardizing medical stoppage decisions in boxing and MMA with the help of clearly defined NO-GO orthopaedic criteria will help to protect a combatant from devastating career-threatening orthopaedic injuries which can lead to lifelong disability, pain, and discomfort. It is recommended that the orthopaedic and wider combat sport physician community debate the proposed guidelines and NO-GO criteria vigorously, and evidence-based guidelines be developed in conjunction with professional boxing and MMA governing bodies.

Professional boxing and MMA are popular combat sports with a high risk for orthopaedic injuries involving the hand, elbow, shoulder, knee, and ankle.[1,2,3,4] While rarely life threatening, these injuries can at times be limb threatening or lead to permanent damage if not addressed in a timely fashion. These injuries can also lead to lifelong disabilities.[5,6] Stopping a fight in time protects the combatant from such devastating injuries and long-term disability.

A good stoppage done either by the referee or the ringside physician on medical grounds for an orthopedic injury is one which is done for the right indication such as a limb-/joint-threatening or career-ending orthopedic injury and at the right time (neither too early, certainly never too late!). Standardizing orthopedic medical stoppages in the ring/cage is no easy task but certainly something which we all should be paying closer attention to. One approach which can be adopted is to establish NO-GO orthopedic criteria in boxing and MMA. If any of the NO-GO criteria are encountered during the course of the bout, the bout should be stopped on medical grounds to protect the health and safety of the combatant. Ringside physicians, referees, the Commission officials, the cornermen and, most importantly, the two combatants should be aware of these NO-GO criteria.

The following good-practice guidelines and NO-GO orthopedic criteria are proposed based on personal and collective evidence of experienced ringside physicians and clinical acumen. The authors between themselves have over 30 years of collective ringside medicine experience while working for one of the busiest combat sports commissions in the world. These represent real-life injuries encountered by the authors during their work as ringside physicians for professional boxing and MMA bouts. Discussion has been limited to the most common orthopedic injuries which have presented clinical dilemmas and by no means is meant to represent an exhaustive list of orthopedic injuries encountered in combat sports.

The fight should be stopped if the combatant experiences any of the NO-GO injuries detailed below or displays any of the signs detailed below at any time during the course of the fight. (Table 1)

1. ***Anterior Cruciate Ligament (ACL) Tear:*** The ACL provides stability to the knee. A ruptured ACL is a common orthopedic injury encountered across all sports. The violent nature of combat sports combined with the frequent twisting and explosive side to side maneuvers puts the ACL at risk for injury. Symptoms include knee pain, swelling, report of feeling a "pop" or giving out. One may observe the knee to remain stable with linear motion, but nearly collapse with twisting or pivoting moves. In the cage or ring, it may be difficult to perform special tests such as an Anterior Drawer or Pivot Shift. However, a modified Lachman test, even with the fighter sitting on a stool may elicit a poor endpoint indicating an unstable knee. An acute ACL tear, not only renders the knee unstable, but continued "giving out" events during the round has a high chance of causing further, permanent knee damage such as: meniscal tears, articular cartilage injuries, and damage to the other surrounding ligaments. Finally, a combatant with an unstable ACL is not able to fully protect himself, exposing himself to other injuries. Although a torn ACL can be surgically repaired, the long-term results are more unfavorable with the more damage the knee sustains. Continuing to allow a combatant to fight with an acute ACL rupture increases the odds of additional

Table 1. Orthopaedic NO-GO criteria in Combat Sports

Orthopaedic Injury	Acute Management Ringside	Immediate transfer to Level I Trauma Center	Specialist Management
ACL injury	Stabilize. Analgesics. Avoid weight bearing.	No	Orthopaedic
Acute patellar dislocation	Reduction. Analgesics. Avoid weight bearing.	No. Transfer if acute reduction unsuccessful	Orthopaedic
Acute knee dislocation	Stabilize.	Yes	Orthopaedic
Acute shoulder dislocation	Reduction. Analgesics.	No. Transfer if acute reduction unsuccessful	Orthopaedic
Peripheral nerve injury	Avoid weight bearing.	No	Orthopaedic Neurology
Major tendon tear	Stabilize. Analgesics. Immobilize	No	Orthopaedic
Compartment syndrome	Stabilize.	Yes	Orthopaedic
Clavicular fracture and sternoclavicular (SC) dislocation	Stabilize. Analgesics. Sling.	No. Transfer for SC dislocation.	Orthopaedic
Rib fracture	Analgesics	No. Transfer if concern for pneumothorax.	Medicine
Acute elbow dislocation	Reduction. Analgesics.	No. Transfer if acute reduction unsuccessful.	Orthopaedic

damage to the knee and may result in an otherwise "fixable" problem becoming a career-ending injury.

2. *Patella Dislocation:* Patella dislocations have been encountered during combat sports. When they occur, the fighter usually falls to the ground and is unable to stand on that leg. If performed immediately, a reduction maneuver may relocate the patella and the fighter may feel better and may want to continue to fight. An acute patellar dislocation is often associated with tears in the medial patellofemoral ligament which will often require surgical reconstruction.[7] Continuing to fight after a patellar dislocation risks a recurrent dislocation event which increases the likelihood of cartilage injury, fracture, and loose bodies. As with ACL injuries, recurrent patella dislocations, if permitted to occur, can lead to additional injuries which can jeopardize the athlete's career.

3. *Knee Dislocation:* Knee dislocations are rare events in combat sports. When they occur, they are quite dramatic and require immediate medical care. A knee dislocation by definition involves the rupture of multiple knee ligaments resulting in an extremely unstable situation. Obvious pain, swelling, and a significant deformity will be seen. If possible, immediate reduction and splinting of the knee dislocation in the cage or ring should be performed to reduce the chance of neurovascular compromise to the leg. This is not only an obvious "NO-GO" situation, but because of potential neurological and arterial injury, the fighter needs to be stabilized and immediately transferred to a Level I medical center for definitive care.

4. *Acute Shoulder Dislocation:* The shoulder is the most mobile joint in the body. However, this enhanced range of motion also makes it inherently unstable. Both active (muscles/tendons) and static (ligaments/labrum) stabilizers work in unison to prevent dislocations. Unfortunately, the extremes of shoulder motion and high magnitude of forces produced in combat sport puts the shoulder at high risk of injury.[8] By definition, when a shoulder dislocates, there is damage to the static stabilizers. This could be relatively minor such as a stretch in the capsule or ligaments, or a more significant injury such as a complete disruption of the ligaments often associated with a fracture of the glenoid (Bankart lesion). In older athletes, complete rotator cuff or biceps tears can also be seen associated with this injury. Even if the shoulder spontaneously reduces in the cage, the athlete may demonstrate signs of shoulder weakness, apprehension and is at high risk for another dislocation. As with knee instability, each time a shoulder dislocates it sustains more and possibly irreversible damage including axillary nerve injury, fracture, articular cartilage damage, bone loss, and rotator cuff/labral tears. At times, it may be difficult to assess if a shoulder truly sustained a dislocation if it spontaneously relocates. In this situation, during a round, the standard instability tests (Apprehension, Jobe Relocation and Load and Shift tests) may be exceedingly difficult to perform. The physician must rely on the clinical presentation, muscle strength testing, the ability to effectively use the arm in both defensive and offensive maneuvers to reach a decision. If it is determined that an acute dislocation has occurred, this is a NO-GO combat situation to minimize long-term shoulder injury.

5. *Peripheral Nerve Injury:* Repetitive blows to a nerve or even one extremely high-powered and accurate strike could lead to temporary or permanent nerve damage. Those nerves most at risk are those that are located in a superficial location, without muscular protection and are held tight to an underlying bone. Examples are the radial nerve as it winds around the posterior mid humerus (wrist drop), the ulnar nerve at the cubital tunnel (loss of hand strength) and the common peroneal nerve as it traverses around the fibular head (foot drop). The latter is the most common peripheral nerve injury we have encountered in combat sports. A common peroneal nerve injury can also lead to much

clinical confusion in the cage if the physician is not familiar with its presentation. A blow to the lateral proximal leg from a kick or a punch can lead to a neuropraxia. Initially the ankle will give out or collapse, causing the fighter to fall, because of weakness to the ankle dorsiflexion and eversion.[9] This can be confused with an ankle sprain or fracture. Often times the combatant will get up and continue to fight. Because plantarflexion strength is not affected by this injury, straight ahead movements will not be limited, but when the athlete attempts a sideways maneuver, the ankle will give way leading to a fall. In the cage, it is exceedingly difficult to assess if ankle weakness is secondary to nerve damage or to an ankle injury. However, a NO-GO stoppage should be used in this clinical scenario to protect the fighter from further injury as a high level of concern must be raised for a nerve injury.

6. *Major Tendon Tear:* An acute rupture of a major tendon is not only painful, but results in acute weakness, restriction of motion, and some degree of functional loss.[10] Injuries include rupture of the pectoralis major tendon, triceps tendon, distal biceps tendon, quadriceps tendon, patella tendon, and Achilles tendon. Because they are acute injuries, immediate swelling and bruising will be absent, but deformity, a palatable defect and weakness will be apparent. In the leg, both a quadriceps and patella tendon rupture will lead to the loss of the knee extensor mechanism. An Achilles rupture will be reported by the combatant as a sensation as though they were kicked in the back of the leg. They will have a positive Thompson test with plantar flexion weakness. A triceps rupture will result in posterior elbow pain and an inability to extend the elbow against gravity, but an obvious deformity may be difficult to detect. After a distal biceps tendon injury, the biceps muscle will proximally retract and lead to a loss of supination strength. However, elbow flexion strength may be relatively preserved. A complete avulsion injury of the pectoralis major will result in anterior chest wall pain, medial retraction of the muscle but again, significant strength loss may not be readily appreciated in these athletes. It is important for physicians caring for combat athletes to be familiar with these tendon injuries. Most of these are obvious, but some involve more subtle presenting symptoms that can be confusing during a rapid assessment within a bout. These are NO-GO injuries because they all share a common element. They disrupt the normal biomechanical function of a major muscular-tendinous unit. An impaired fighter who continues to compete with these injuries cannot adequately defend himself and risks additional damage.

7. *Compartment Syndrome:* A compartment syndrome occurs when pressure caused by swelling of an injured muscle builds up within a tight facial space and it overwhelms the body's ability to dissipate this pressure. Left untreated, irreversible muscle damage occurs resulting in permanent weakness and disability.[11] The authors have observed this during MMA matches after repetitive strikes to the leg. This tends to happen towards the end of a bout after an accumulation of multiple blows have occurred. The fighter will report severe leg pain out of proportion to physical findings. Passive stretch of the compartment will accentuate the discomfort. The compartments of the leg may feel tense, paresthesias and pallor of the extremity may occur. This is an emergent medical condition not only requiring a NO-GO stoppage of the bout, but also requiring emergent transfer to a Level I trauma center for evaluation and treatment.

8. *Clavicle fractures and sternoclavicular (SC) dislocations:* These occur in combat sports and are "NO-GO" injuries. They are recognized by pain and deformity about the clavicle and SC joint. These are dangerous and potentially limb or life threatening if the fight is not stopped because of the close proximity of the great vessels to the clavicle and SC joint. A posterior SC dislocation requires emergent transfer to a Level I trauma center because of potential obstruction of the trachea and injury to the great vessels.

9. *Rib fractures:* These can be identified by point tenderness, pain with inspiration, crepitus at the fracture site, and swelling. Besides pain, breathing may be affected by this injury. This "NO-GO" injury has the potential to produce a pneumothorax and is associated with spleen and liver lacerations. A rib fracture has the potential to turn into a life-threatening injury if the combatant is allowed to continue.

10. *Elbow Dislocation:* The elbow is a hinged joint which is inherently stable because of a combination of its secure bony architecture and its stout ligament structure. Although elbow dislocations are not common, they are encountered in combat sports. These high-energy injuries will cause tears in the elbow ligaments, capsule, and can be associated with fractures. Neurovascular injuries are rare but can occur. If addressed acutely, a closed reduction can often be performed at the venue by a physician with experience with these injuries. A careful neurovascular assessment of the extremity is mandatory both pre- and post-reduction of these injuries. Often, after a reduction (either spontaneous or by medical personal) the combatant will feel better and will want to continue. This is a "NO-GO" injury as even after a reduction, this remains a highly unstable situation. If permitted to compete, the elbow is at high risk for a re-dislocation. This has the potential to convert a non-career threatening injury into one that can have long-term consequences such as cartilage damage, fracture, and neurovascular compromise of the extremity.

For combatants above the age of 40 (high-risk combatants), referee and ringside physicians should have a low threshold for stopping a bout if any of the above injuries are suspected. High-risk combatants should undergo a detailed post-fight medical evaluation. If concern for a limb threatening or other devastating orthopedic injury is raised, they should be immediately transferred via onsite ambulance to the nearest Level I trauma center for emergent medical evaluation.

Conclusions

There is an urgent need to make combat sports safer and it is far better to stop a fight early rather than too late. It is recommended that the above proposed "NO-GO" orthopedic criteria and best-practice guidelines be debated by ringside physicians and the wider combat sports medical community. Evidence-based guidelines on these medical stoppages need to be developed in conjunction with the professional boxing and MMA governing bodies. Many of these "NO-GO" criteria are well established in other professional sports. If an ACL tear is suspected in a professional football player, that player will be removed from the game without question. However, this has not been the case in MMA or boxing. The warrior mentality these athletes possess will drive them to continue. In some respects, physicians caring for these athletes are swayed by this mindset and fights at times are allowed to continue despite some of the above injuries. Physicians taking care of combat sports athletes (ringside physicians) come from various disciplines of medicine such as neurology, sports medicine, emergency medicine, ophthalmology, and family medicine. Establishing strict "NO-GO" orthopedic criteria in combat sports, as has been done for traumatic brain injury, will take some of the emotions out of the medical decision making for the physician, referee, governing bodies, and the combatant. This shall also help to standardize medical stoppages in these sports by non-orthopedic physicians. We will not only better protect these athletes and lengthen their careers but minimize the long-term disabilities many may live with even after they retire.

References

1. Drury BT, Lehman TP, Rayan G. Hand and Wrist Injuries in Boxing and the Martial Arts. *Hand Clin.* 2017;33:97-106.

2. Lemme NJ, Ready L, Faria M, DeFroda SF, Gil JA, Owens BD. Epidemiology of boxing-related upper extremity injuries in the United States. *Phys Sportsmed.* 2018;46:503-508.

3. Jensen AR, Maciel RC, Petrigliano FA, Rodriguez JP, Brooks AG. Injuries sustained by the mixed martial arts athlete. *Sports Health*. 2017; 9:64-69.

4. Siewe J, Rudat J, Zarghooni K, Sobottke R, Eysel P, Herren C, Knöll P, Illgner U, Michael J. Injuries in competitive boxing. A prospective study. *Int J Sports Med.* 2015; 36:249-53.

5. Melone CP Jr, Polatsch DB, Beldner S. Disabling hand injuries in boxing: boxer's knuckle and traumatic carpal boss. *Clin Sports Med.* 2009;28:609-21,vii. Review.

6. Lefkowitz T, Flanagan S, Varlotta G. Rehabilitation of orthopaedic and neurologic boxing injuries. *Clin Sports Med.* 2009;28:623-39, vii. Review.

7. LaPrade RF, Chahla J, Moatshe G. Biomechanical evaluation of the medial stabilizers of the patella: response. *Am J Sports Med.* 2019;47:NP41-NP42.

8. Woods RS. Primary Dislocation of left shoulder-joint in boxing. *Br Med J.* 1957;1(5015):387.

9. Sethi NK, Khabie V. Acute unilateral foot drop as a result of direct blunt trauma to the peroneal nerve in a professional mixed marital arts bout: A case report *S Afr J Sports Med* 2017; 29:1.

10. Bents RT, Metz JP, Topper SM. Traumatic extensor tendon dislocation in a boxer: a case study. *Med Sci Sports Exerc.* 2003; 35:1645-7.

11. Tillinghast CM, Gary JL. Compartment Syndrome of the Lower Extremity. In: Mauffrey C, Hak DJ, Martin III MP, editors. *Compartment Syndrome: A Guide to Diagnosis and Management* [Internet]. Cham (CH): Springer; 2019. Chapter 8.

STANDARDIZED CONCUSSION EVALUATION OF BOXERS DURING A FIGHT

Nitin K. Sethi, MD, Dept. of Neurology, New York-Presbyterian Hospital, Weill Cornell Medical Center, New York, NY, USA
(Corresponding Author: sethinitinmd@hotmail.com)

Lily Khabie, University of Pennsylvania, BA Candidate, Premedicine Student

KEY WORDS: boxing; combat sports; concussion; traumatic brain injury

AUTHOR CONTRIBUTIONS: NKS and LK conceived, drafted, and revised the manuscript.

STUDY FUNDING: No targeted funding reported.

DISCLOSURES: NKS serves as Associate Editor, *The Eastern Journal of Medicine* and Editor-in-Chief, *ARP Journal of Combat Sports Medicine*. He also serves as Chief Medical Officer of the New York State Athletic Commission (NYSAC). The views expressed are his and do not necessarily reflect the views of the NYSAC or the ARP. LK reports no disclosures.

DATA SHARING STATEMENT: The authors have no additional data to share.

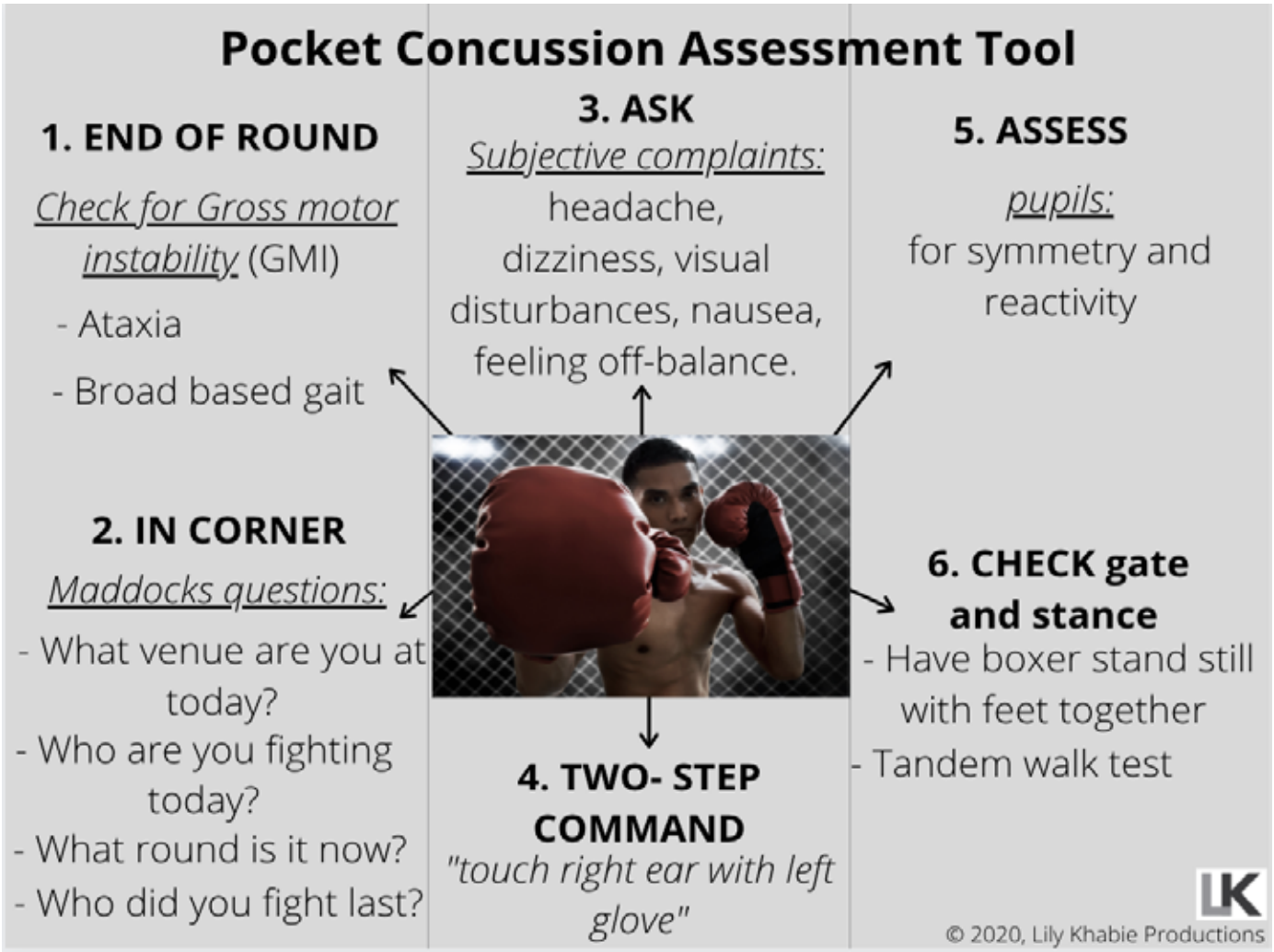
Boxing is a popular combat sport with a large and passionate fan following worldwide. There is high incidence of both acute and chronic neurological injuries in boxing.[1,2] The most common cause of acute boxing-related neurological mortality is a subdural hematoma (SDH).[3,4] Boxers have collapsed and died in the ring or soon after the fight is over because of a large SDH with resultant herniation. Concussions are common in boxing where every punch thrown at the head is thrown with the intention of winning by causing a knock-out (KO). Standardizing concussion evaluation in the ring shall help to protect boxers from acute devastating traumatic brain injury (TBI) which can lead to death or lifelong disability, pain, and discomfort by stopping the fight in time. Ringside physicians come from various disciplines of medicine such as neurology, sports medicine, emergency medicine, ophthalmology, and family medicine. A standardized concussion evaluation shall also ensure uniformity in medical decision making.

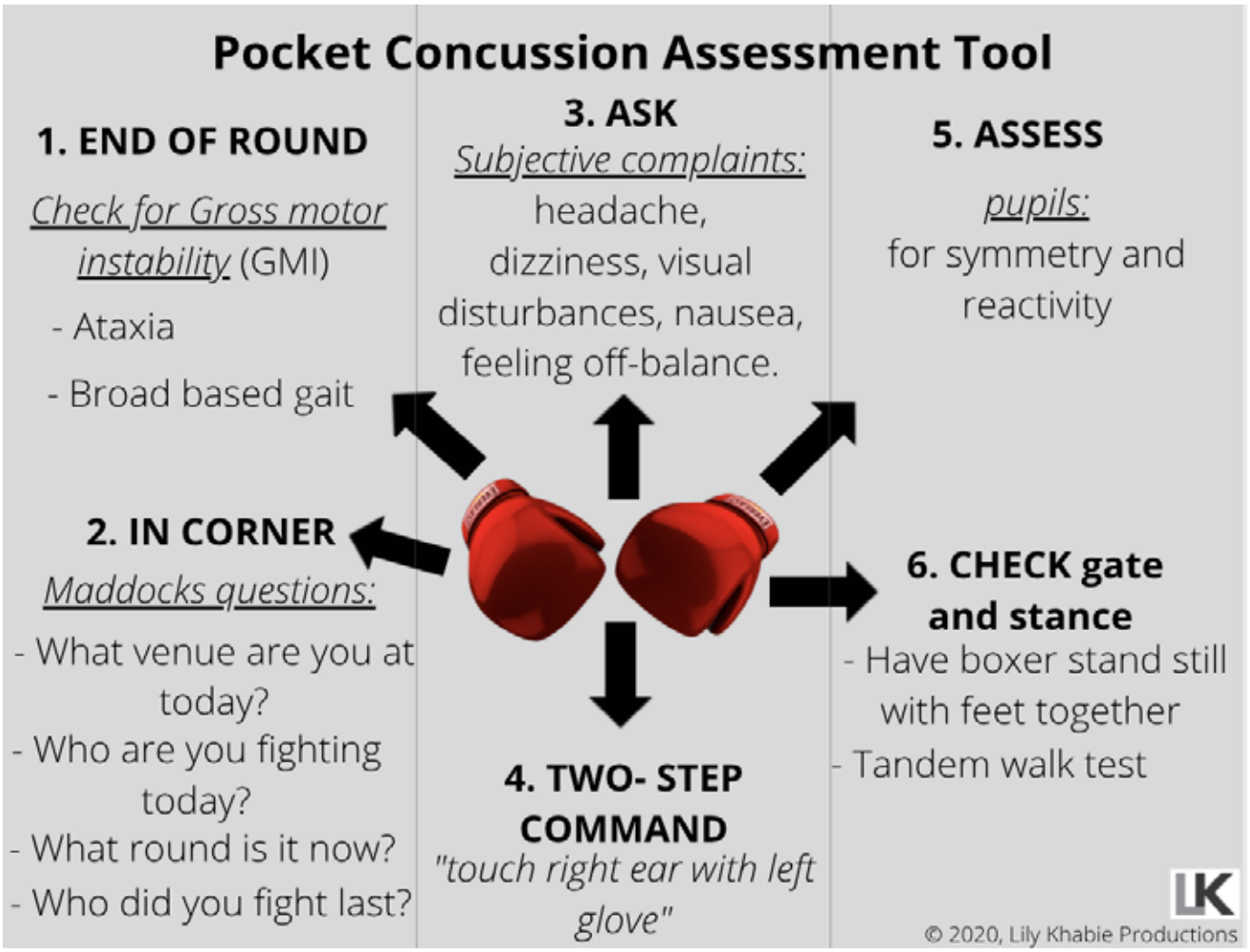
Evaluation for concussion in a boxer is carried out usually between rounds. In the 1-minute period between rounds, the boxer is in his corner sitting on a stool. The chief second is the head trainer

or cornerman for a boxer and is in the ring in between rounds to administer advice and otherwise take care of his charge. The concussion evaluation has to be carried out while respecting the time the chief second has with his boxer and starts with observation of the boxer as he makes his way to his corner after the bell to signal the end of the round. Any gross motor instability (GMI) with the boxer ataxic and exhibiting broad based gait should raise concern for concussion. Such a boxer merits further medical evaluation to rule out concussion. In the corner the ringside physician should assess the boxer's cognitive status with the use of Maddocks questions. Maddocks questions include but are not restricted to:

a) What venue are you at today?
b) Who are you fighting today?
c) What round is it now?
d) Who did you fight last?

The ringside physician should then conduct a focused neurological evaluation of the boxer in the ring by inquiring about subjective complaints such as headache, dizziness, visual disturbances, nausea, and feeling off-balance. The boxer should be asked to execute a two-step command such as touch your right ear with your left glove. Brainstem integrity should then be assessed by evaluation of the cranial nerves. The pupils should be assessed





for symmetry and reactivity. This assesses the integrity of cranial nerves II and III. Assessment of the extraocular movements is then carried out to check for the integrity of midbrain and pons (cranial nerves III, IV, and VI). Lastly assessment of cerebellar function and infratentorial compartment is carried out by checking gait and stance. This boxer should be asked to stand still with feet together or do the tandem walk test.

The ringside physician should be skilled to carry out the above examination in about 20 seconds so as not to intrude on the chief second's time with his boxer. A ringside physician should stop the fight on medical grounds if concern for concussion and TBI is raised and he cannot guarantee the health and safety of the boxer going forward.

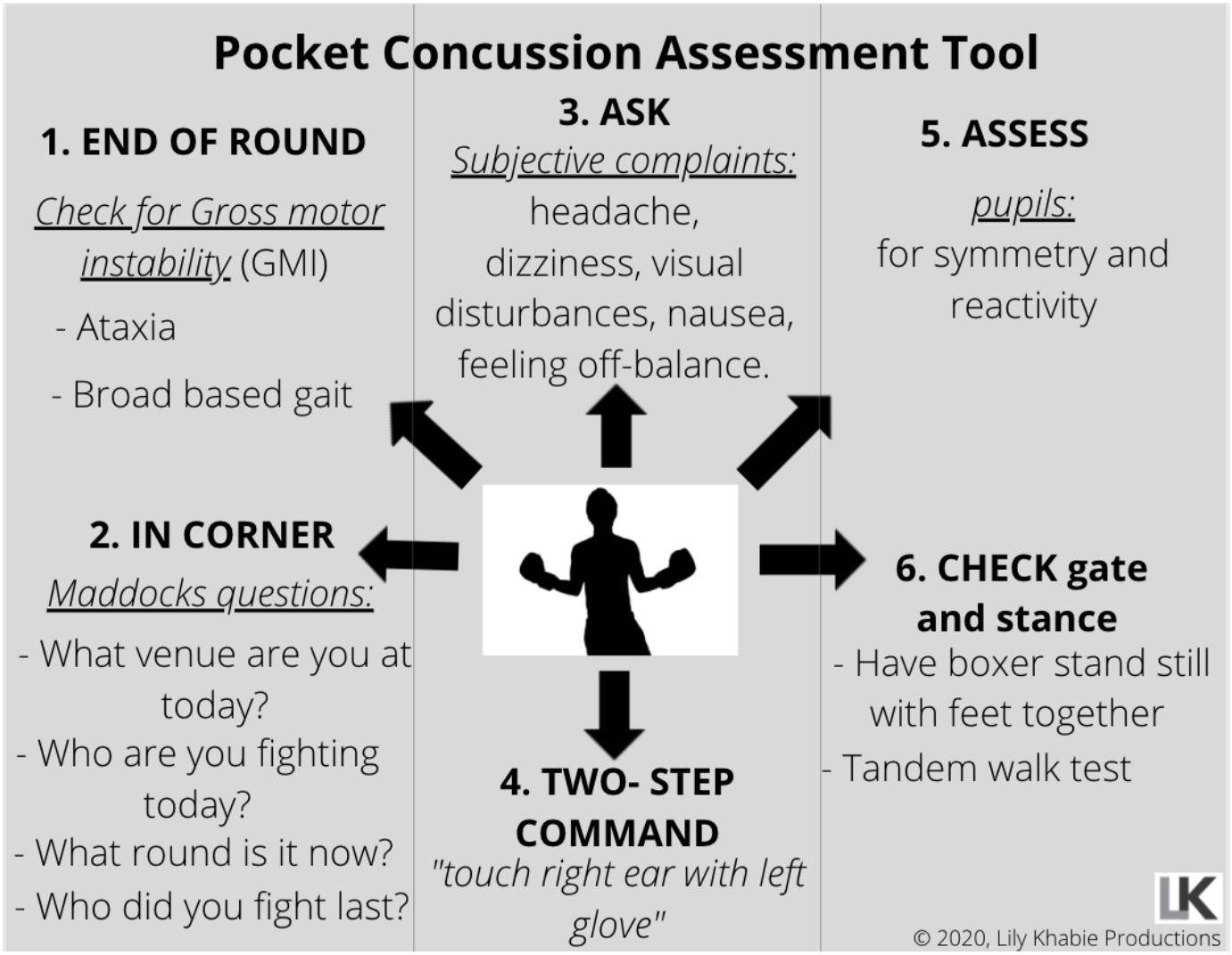
References

1. Neidecker J, Sethi NK, Taylor R, Monsell R, Muzzi D, Spizler B, Lovelace L, Ayoub E, Weinstein R, Estwanik J, Reyes P, Cantu RC, Jordan B, Goodman M, Stiller JW, Gelber J, Boltuch R, Coletta D, Gagliardi A, Gelfman S, Golden P, Rizzo N, Wallace P, Fields A, Inalsingh C. Concussion management in combat sports: consensus statement from the Association of Ringside Physicians. *Br J Sports Med.* 2019;53(6):328-333. doi: 10.1136/bjsports-2017-098799.

2. Erlanger DM. Exposure to sub-concussive head injury in boxing and other sports. *Brain Inj.* 2015;29(2):171-4. doi: 10.3109/02699052.2014.965211.

3. Jayarao M, Chin LS, Cantu RC. Boxing-related head injuries. *Phys Sportsmed.* 2010;38(3):18-26. doi: 10.3810/psm.2010.10.1804.

4. Potter MR, Snyder AJ, Smith GA. Boxing injuries presenting to U.S. emergency departments, 1990-2008. *Am J Prev Med.* 2011 Apr;40(4):462-7. doi: 10.1016/j.amepre.2010.12.018.



HOW MUCH DOES A U.S. RINGSIDE PHYSICIAN MAKE?

Adam Saby, MD, Ronald Reagan UCLA Medical Center, Los Angeles, CA, USA
(Corresponding Author: asaby@ucla.edu)

John Neidecker, DO, ATC, FAOASM, Campbell University School of Osteopathic Medicine, North Carolina, USA

KEY WORDS: combat sports; compensation

AUTHOR CONTRIBUTIONS: AS–data abstraction and analysis, writing; JN – methodology, writing

DISCLOSURES: N/A

ACKNOWLEDGMENTS: Special thanks to Tina E. Jackson for survey development, data analysis, and figure development.

Introduction

For ringside physicians, combat sports event coverage varies based on the jurisdiction. Prefight physical exams can take place the day before, at the weigh-in, or a couple of hours prior to the event. Medical paperwork and forms can be different among commissions. In some states, a commission assigns a physician for event coverage, whereas in other states a promotion hires the physician. Naturally, it is reasonable to expect that physician compensation differs as well.

In 2018, the Association of Ringside Physicians (ARP) sent out its first survey to investigate ringside physician compensation throughout the United States of America (USA). Due to the complexity of compensation, the survey was improved and sent out to the ARP membership in 2019. The results show the "where" and "what" ringside physicians make for combat sports event coverage in the USA.

Methods

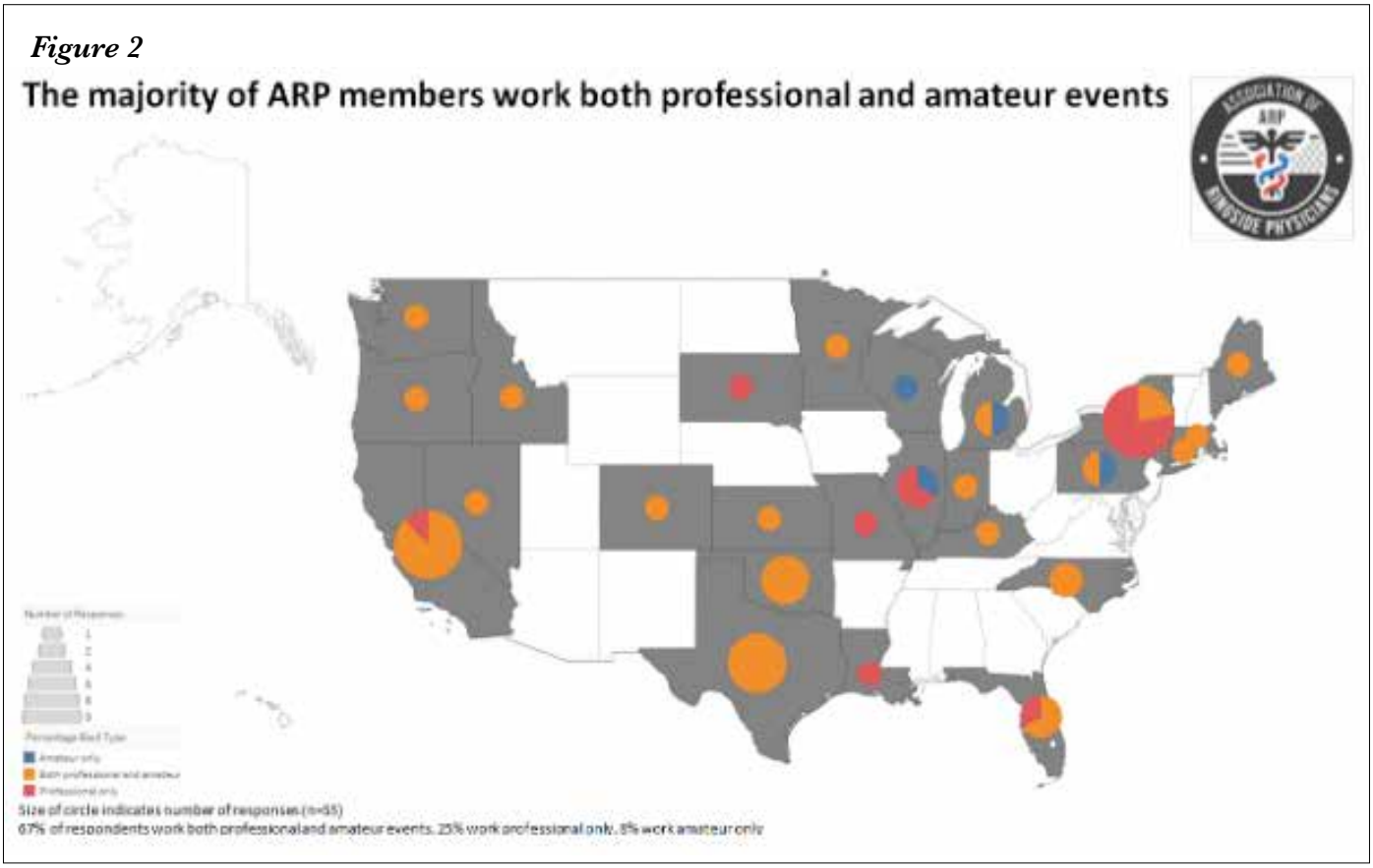
ARP members were asked to complete a 2019 Compensation Survey via email, from December 2, 2019 to January 2, 2020. All ARP physician members with an email registered under the ARP listserv were included. Members were excluded if they only practice ringside medicine outside of the USA. Those who practice in multiple states were asked to complete one survey for each state. Surveys were sent to 155 members practicing in the USA and 64 responses (41.3%) were returned. Nine responses were incomplete and excluded from the final results.

Results

A total of 55 completed responses were received from ARP members working across 25 states. New York, California, and Texas had the highest level of responses (Figure 1) while other states, including Maine and Oregon, had one response each.

Figure 1

Figure 2



ARP members across the USA working both amateur and professional combat sporting events (Figure 2) made up 67% of total responses. For members working one type of event, there were roughly three times more working professional events (25%) than amateur events (8%).

Looking at the number of events worked annually (Figure 3), 66.6% of members worked 1-10 professional events/year. An even greater portion of members, 80.5%, worked 1-10 amateur events/year. The option of 4-6 events worked per year received more responses than any other category for both professional and amateur events.

USA average compensation for amateur events (Figure 4), not including weigh-ins or travel, was $321/event. This reflects 39 responses, with earnings as low as $100 in Michigan to as high as $950 in Maine per amateur event. Average USA compensation for professional events (Figure 5), not including weigh-ins or travel, was $533/event. This reflects 49 responses, with earnings as low as $100 in Idaho to as high as $950 in Maine per professional event. Responses claiming $0/event were removed from these calculations.

Each state's hourly rate per professional event was also calculated (Figure 6). Rates were as low as $25/hour in Colorado to as high as $417/hour in South Dakota. Average USA hourly rate for a professional event was $90/hour.

Regarding which entity (Promoter ▲, Commission ■, Promoter via Commission ●) pays a ringside physician and by how much, mixed answers were obtained across the USA and within states (Figure 7). In jurisdictions where only one entity

Figure 3

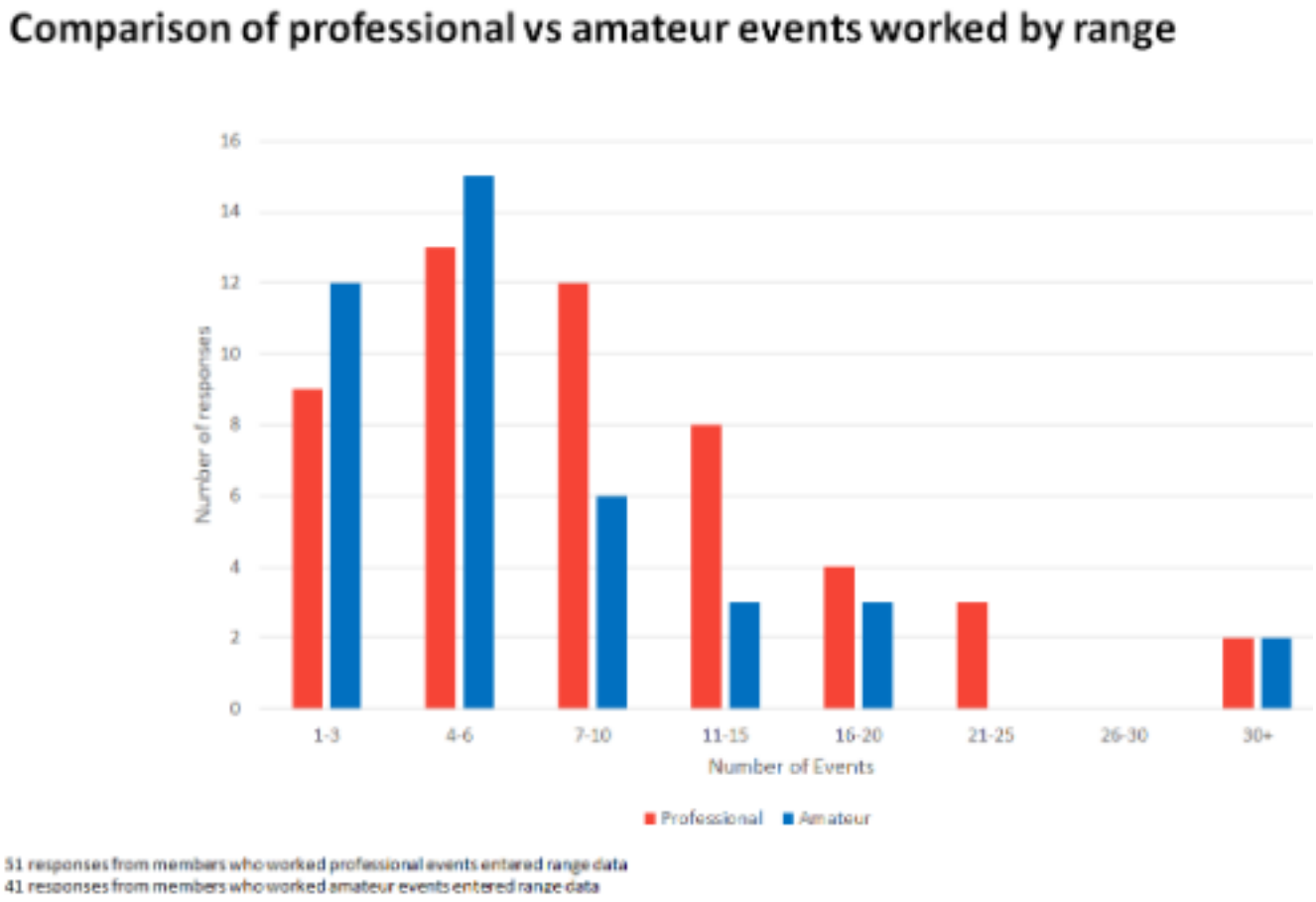


Figure 4

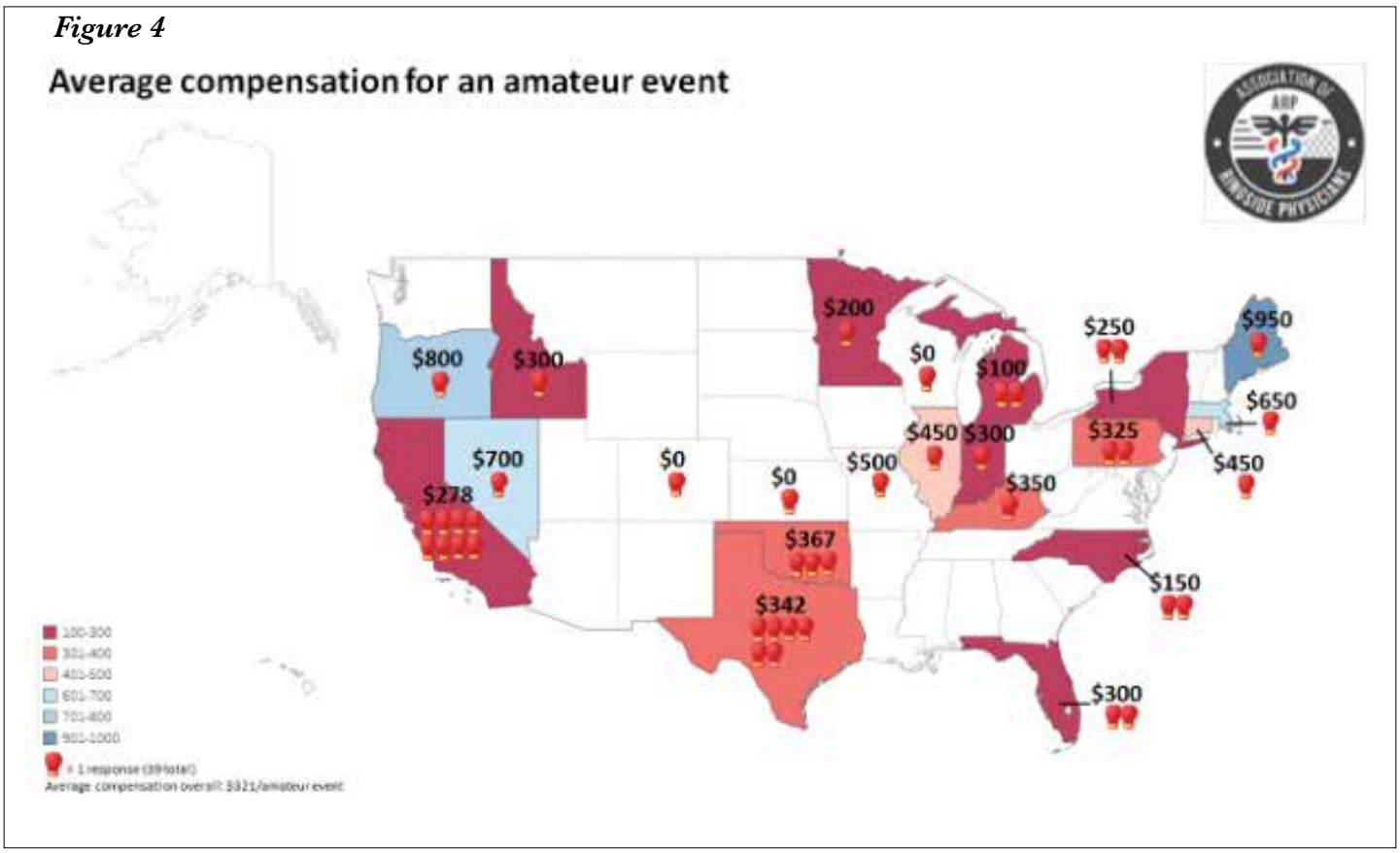


Figure 5

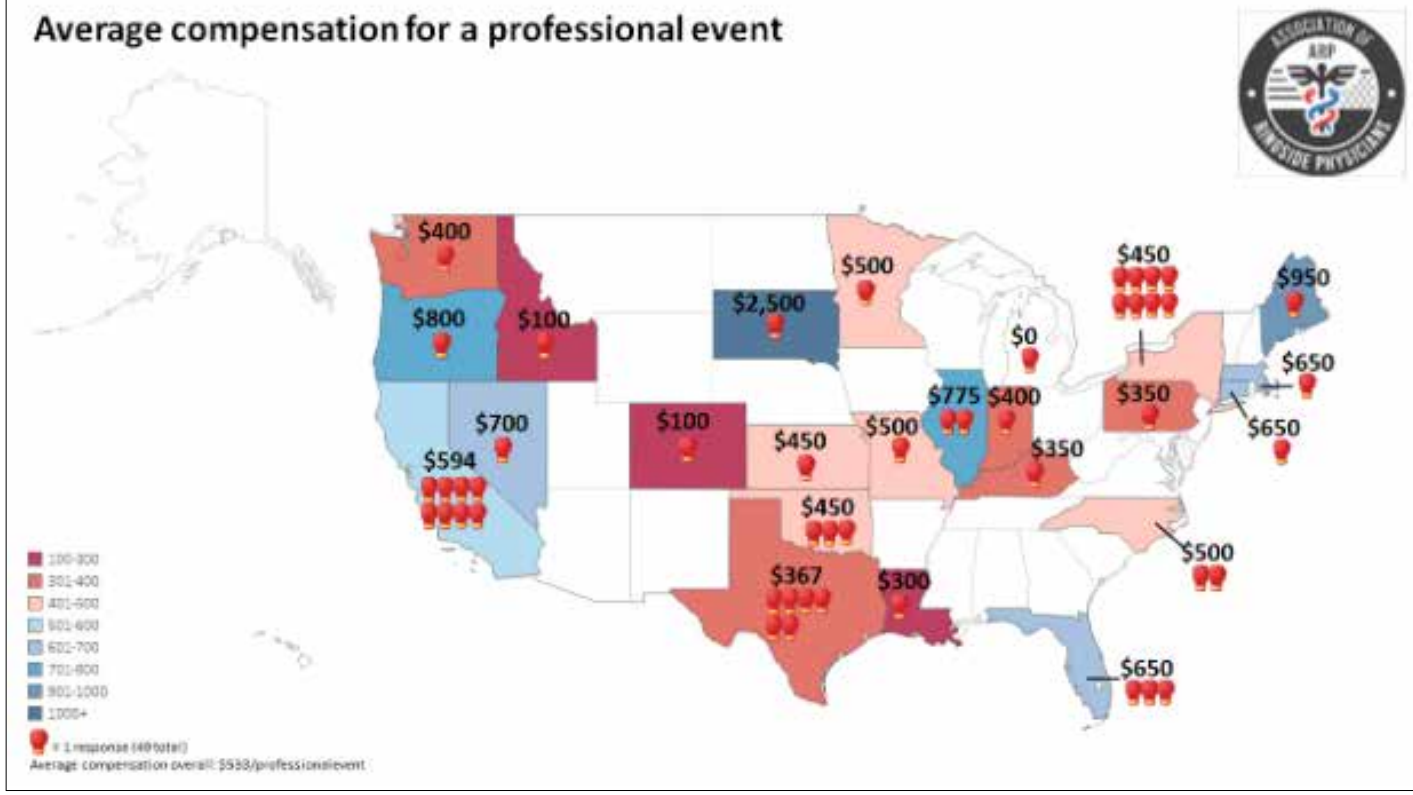
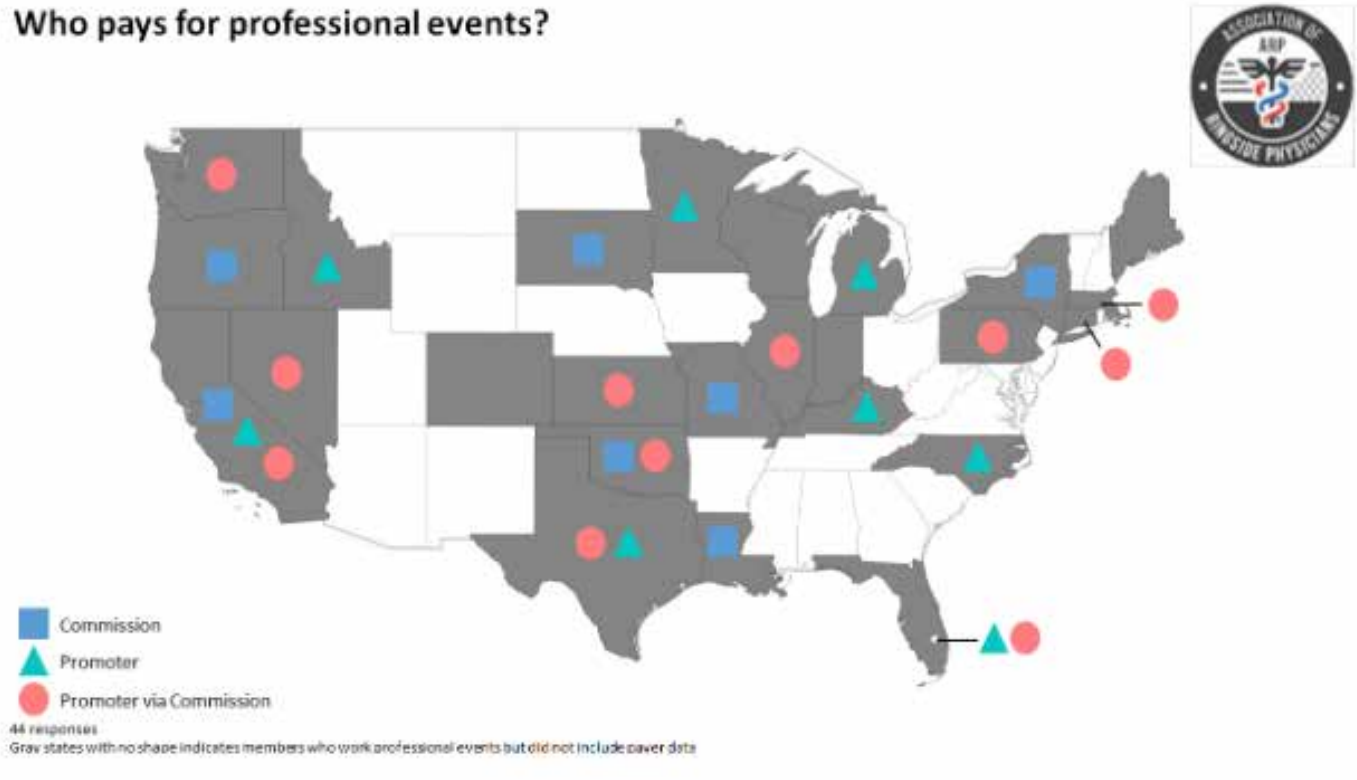


Figure 6

Figure 7



paid a physician, Commission-controlled states had a median compensation of $400 per professional event, whereas Promoter-controlled states had a median compensation of $500 per professional event.

Discussion

The 2019 ARP Compensation Survey shows that while we received a sizeable response rate (41.3%) from our USA members, the majority practice ringside medicine in a handful of states. States with only one response each set the upper and lower limits of event compensation. These singular responses do not reflect the average experience of ringside physicians across the USA.

We can draw better conclusions about ringside medicine compensation in the USA as a whole. The majority of ARP members worked both professional and amateur events. Furthermore, most members worked 1-10 amateur events/year (80.5%) and 1-10 professional events/year (66.6%).

The average event compensation, not including weigh-ins or travel, was $321/amateur event and $533/professional event. Regarding which entity pays physicians, the promoter, or commission, there was significant variance across the country as well as within states. Promoter-controlled states had a higher median income per professional event than commission-controlled states, $500 versus $400, respectively.

Finally, the average USA hourly rate was $90/hour for professional events. While this figure is lower compared to other forms of medical practice, it may explain why members practice ringside medicine. After all, when asked "Why do you practice ringside medicine?" the majority of members answered, "I love the sport."

Conclusion

Our survey shows that physician compensation for combat sports event coverage can vary significantly throughout the USA. We hope this study gives ringside physicians a reference when negotiating with promoters for compensation. Commissions can also use this information when setting compensation rates for their respective ringside physicians. The ARP plans to repeat this survey in the next 5-10 years to assess for any changes in future compensation.

Information and Submission Instructions for Authors

General and Formatting Guidelines:

All manuscripts must be in written in English, using UK or American English spellings. All materials must be submitted electronically to Nitin Sethi, Editor-in-Chief, at sethinitinmd@hotmail.com.

Submissions must:

- Be submitted in Microsoft Word format (.doc or .docx);
- Be double-spaced with 1" margins;
- Be typed in a commonly-used font (Times Roman, Helvetica, Arial, or similar), no smaller than 11 points.
- Include page numbers

Abbreviations and Acronyms

The use of abbreviations and acronyms, except for those that are quite common in combat sports medicine is strongly discouraged. Authors should be careful to ensure that idiosyncratic acronyms are not included in the submitted version, as this will improve readability for the editors and the reviewers. In addition, authors will be asked to remove idiosyncratic acronyms in any accepted materials.

Photos, Figures and Tables

ARP encourages the submission of photos, slides, graphs, charts, etc. that serve to complement or reinforce the information provided. At initial submission, all tables and figures may be embedded in the main document file. Materials accepted for publication must have the associated figures submitted individually and appended to the main document at final submission (see below for formatting instructions). Manuscript preparation should follow the guidelines provided in the AMA Manual of Style (10th edition or later). If a figure has been published previously, authors must cite the original source and submit written permission from the copyright holder to use it. This permission must be submitted at the time of manuscript submission.

Letters to the Editor

Letters will be published as space permits and at the discretion of the editors.

Title Page

An article's title page must include the following information:

- Title
- Names of all authors and institution where work was done (if applicable)
- Word count
- Key words
- Acknowledgment of grant support (if applicable)
- The contact email for the primary author.

References

References should be listed in the order in which they appear in the article and should be formatted using the *AMA Manual of Style.*

Examples:

Print Journal (1-6 authors)

Nathan JP, Grossman S. Professional reading habits of pharmacists attending 2 educational seminars in New York City. *J Pharm Practice.* 2012;25(6):600-605.

Print Journal (more than six authors)

Geller AC, Venna S, Prout M, et al. Should the skin cancer examination be taught in medical school? *Arch Dermatol.* 2002;138(9):1201-1203.

Electronic Journal Article

Without a Digital Object Identifier (DOI)

Aggleton JP. Understanding anterograde amnesia: disconnections and hidden lesions. *Q J Exp Psychol.* 2008;61(10):1441-1471. http://search.ebscohost.com/login.aspx?direct=true&db=p-bh&AN=34168185&site=ehost-live Accessed March 18, 2010.

With DOI:

Gage BF, Fihn SD, White RH. Management and dosing of warfarin therapy. *The American Journal of Medicine.* 2000;109(6):481-488. doi:10.1016/S0002-9343(00)00545-3.

Journal Article with No Named Author or Group Name:

Centers for Disease Control and Prevention (CDC). Licensure of a meningococcal conjugate vaccine (Menveo) and guidance for use--Advisory Committee on Immunization Practices (ACIP), 2010. *MMWR Morb Mortal Wkly Rep.* 2010;59(9):273.

Entire Book

Rantucci MJ. Pharmacists Talking With Patients: A Guide to Patient Counseling. 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2007.

Book Chapter

Solensky R. Drug allergy: desensitization and treatment of reactions to antibiotics and aspirin. In: Lockey P, ed. Allergens and Allergen Immunotherapy. 3rd ed. New York, NY: Marcel Dekker; 2004:585-606.

Website

Canadian Press. Generic drugs to be bought in bulk by provinces. CBC News. http://www.cbc.ca/news/canada/saskatchewan/ story/2013/01/18/drug-costs-provinces.html. Published January 18, 2013. Updated January 18, 2013. Accessed February 4, 2013.

Types of Submissions:

Basic Science and Research Articles

Our suggested maximum article length is 30 typewritten pages (including references), and shorter manuscripts are welcome. It is also suggested that the introductory and discussion sections be limited to approximately 1500 words each. Please consult with the editorial office if your manuscript departs significantly from these guidelines.

Basic science and research articles should include the following subcategories, clearly labeled in the manuscript:

1. Abstract of no more than 300 words in length, which summarizes the main points of the article. Please include 3-5 keywords that facilitate search engine optimization (SEO) and that are consistent with the title, headers, and abstract.
2. Introduction
3. Body
4. Results
5. Discussion
6. Conclusion/Summary
7. References

Case Studies

Case studies should include four distinct and labeled sections:

1. Introduction
2. Statement of Purpose
3. Findings
4. Conclusion
5. References

Commentaries

Commentaries on recently published works may be considered for publication. As commentaries are generally based on insights and opinions of the author, no strict guidelines are required. Authors may consider:

1. Abstract (not to exceed 150 words)
2. Introduction
3. Discussion
4. Summary and Conclusion
5. References

If applicable, authors must provide grant funding sources, acknowledgments, a conflict of interest statement, and the name and email address for comments. Grant funding sources should be also provided at submission and will be reported in the published paper.

Figures. Authors should construct figures with notations and data points of sufficient size to permit legible reduction to one column of a two-column page. As a guide, no character should be smaller than 1 mm wide after reduction. Standard errors of the mean should be depicted whenever possible. Rules should be at least 1/2 point. Use of shading should be limited. There are two preferred formats for electronic figures, photographs, or other artwork that accompany the final manuscript: Encapsulated PostScript (EPS) and Portable Document Format (PDF).

Copy-editing and page proofs. The editor reserves the right to copy-edit manuscripts. The corresponding author will receive page proofs for final proofreading. These should be checked and returned within two days of receipt.

Copyrights: The Association of Ringside Physicians will publish a work only upon the authors' signing and submitting copyright transfer agreements. These agreements should be completed, signed, and submitted by the authors upon acceptance of the manuscript.

All manuscripts considered for publication are screened for plagiarism using several plagiarism detection websites. These websites include (but not limited to) Dupli Checker, quetext, Copyleaks, PaperRater, and Plagiarisma.