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I. QUALIFICATIONS

1. I am a physician licensed by the states of Massachusetts and California to practice medicine. I have been practicing medicine in Massachusetts since 1964 and have practiced in the specialty of Neurosurgery for over 45 years. I have been Chief of Neurosurgery Service at the Emerson Hospital in Boston, MA since 1968. Over the last 35 years, I have acquired particular experience in sports-related athletic cervical spine and head injuries.

2. I have authored over 400 publications in the form of book chapters, refereed peer-reviewed articles, books, abstracts and free communications, as well as educational videos. Many of those publications have been specifically on the topic of athletic head injuries, epidemiology, diagnosis, treatment, rehabilitation, and prevention.

3. Over the last 35 years, I have given hundreds of lectures, and spoken and participated in hundreds of scientific meetings, devoted to athletic injuries including head injuries.

4. I am currently an Adjunct Professor of Exercise and Sports Science at the University of North Carolina, Chapel Hill, NC.

5. For nearly two decades, I have served as the Medical Director of the National Center for Catastrophic Sports Injury Research, an ongoing registry instituted in 1982 predominantly for data collection and analysis of head and cervical spine injuries.

6. I am currently Senior Advisor to the Brain Injury Center at Children’s Hospital in Boston, MA.

7. I am currently a Clinical Professor of Neurology and Neurosurgery at Boston University School of Medicine, Boston, MA.

8. I am the Co-Founder, and Clinical Diagnostics and Therapeutics Leader, of the Chronic Traumatic Encephalopathy – Alzheimer’s Disease (CTE-AD) Center at Boston University Medical Center, Boston, MA.

9. Since 1994, I have served on the Board of Trustees of the National Operating Committee on Standards for Athletic Equipment (NOCSAE), and since 2001, I have served
as its Vice President. Most recently, I also served as Chairman of its Scientific Advisory Committee. NOCSAE is responsible for establishing standards for football helmets as well as other athletic equipment.

10. For many years, I have been involved with the American College of Sports Medicine and have served on its Board of Trustees for more than ten years. I have also served as President of the American College of Sports Medicine from 1992 to 1993 and Treasurer from 1996 to 1999.

11. From 1998 to 2001, I was a member of the Advisory Committee for Injury Prevention at the Centers for Disease Control ("CDC"), Atlanta, GA.

12. From 2000 to 2002, I was a member of the Executive Committee, Joint Section of Trauma, for the Congress of Neurological Surgeons/American Association of Neurological Surgeons.

13. I have served as a consultant to many scholastic and professional athletes following severe, athletic cervical spine injuries regarding return-to-play issues. I have also served as a treating physician to numerous scholastic and professional athletes who have sustained sports-related head injuries.

14. I have authored numerous textbook chapters and articles discussing the causes, epidemiology, biomechanics, and pathology of athletic head injuries. I was a principal editor of the Journal of Neurosurgery from 2003 to 2010 and have been section editor for World Neurology from 2011 to the present.

15. Attached as Exhibit 1 is my most recent Curriculum Vitae, which includes a comprehensive list of my publications in the last ten years. Attached as Exhibit 2 is a list of all civil cases in the last four years in which I testified as an expert at deposition or trial. Attached as Exhibit 3 is a list of materials reviewed in preparing this declaration.

16. I am being paid $800 per hour for all of my services, except for deposition testimony which will be billed at a rate of $5,000 per half-day (4 hours), trial testimony which will be billed at a rate of $10,000 per day (8 hours), and non-working travel time, which will be billed at $400 per hour. I have billed $62,500.00 to date.
17. My opinions are based upon my specialized knowledge, skill, expertise, and education in the field of concussion diagnosis, management, and treatment, and the diagnosis of neurodegenerative diseases associated with head trauma and the treatment of their accompanying symptoms. My opinions are also based on the data and articles described herein and I have applied reliable principles to reach my conclusions, all of which are stated to a reasonable degree of scientific certainty.

II. SCOPE OF OPINIONS

18. Plaintiffs have requested that I provide answers to the following questions:

(a) What is a concussion and a subconcussive impact, how do concussions and subconcussive impacts occur in contact sports and in ice hockey particularly, what is the incidence of concussions and subconcussive impacts in contact sports and ice hockey particularly, and what are the effects of repeat concussions and subconcussive impacts on individuals, including ice hockey players and other professional athletes?

(b) Do retired NHL hockey players have an increased risk of developing permanent neurodegenerative impairment, disease, or condition as a result of playing professional ice hockey, and if so, which impairments, diseases, and conditions?

(c) What is an appropriate medical monitoring program for retired NHL hockey players, why is it important to have such a program, and how should the program be administered?

19. The documents I considered in forming my opinions, including those produced by the parties and third parties in this case, are listed in Appendix C, which is attached.

III. SUMMARY OF OPINIONS

20. Concussions and subconcussive impacts are dangerous, with both temporary and permanent effects on the concussed individual, whether an athlete or not. Following a concussive or subconcussive impact, an individual may experience disruption in both
cognition and sleep, emotional disturbance, and physical symptoms ranging from head and neck pain to disorientation. These acute symptoms generally subside in days, but in some circumstances can linger as post-concussion syndrome, which typically subsides in weeks, and in rarer circumstances can linger for years. The most effective initial means of reducing symptom duration is rest; both physical and mental.

21. Following a concussive or subconcussive blow, metabolic, cellular, and subcellular changes in the brain occur, some of which may be permanent. These permanent changes include, among other things, a decline in white matter integrity and neuronal cells in the brain (known as cognitive, cellular, functional, or cerebral reserve), and this decline accelerates the adverse effects of aging on the brain and accelerates the rate at which neuropathologies manifest clinical symptoms. These changes that follow one or many concussive or subconcussive blows increase the risk of developing long term neurodegenerative diseases.

22. Contact sport athletes are at heightened risk of concussive and subconcussive impacts compared to the general population, and typically experience many impacts in a single playing season. NHL players are within the upper tier of risk for concussive and subconcussive blows among these contact sport participants, and are therefore at particular risk for suffering both the acute and permanent effects associated with these blows. Accordingly, a medical monitoring program that can account for the risk of long-term or permanent injury is medically recommended, and essential, for the supervision, diagnosis, and ultimate treatment of retired NHL players.

IV. BACKGROUND ON CONCUSSIONS

A. What is a Concussion?

1. Medical Description

23. Concussion or mild traumatic brain injury (mTBI) has been defined as “a complex pathophysiological process affecting the brain, induced by traumatic biomechanical
forces.\textsuperscript{1} Although concussion most commonly occurs after a direct blow to the head, it can occur after a blow elsewhere that is transmitted to the head or through rotational forces.\textsuperscript{2} Concussions can be defined by the clinical features, pathophysiological changes, biomechanical forces, or a combination of these, that occur, which have each been described in the literature. The neurochemical and neurometabolic changes that occur in concussive injury have recently been more fully explored and explained, though the clinical features of concussions have been known for centuries.

24. Concussions are most commonly characterized by the rapid onset of cognitive impairment that is self-limited and, for most individuals, spontaneously resolves. The acute symptoms of concussion, listed below, are felt in most instances to reflect a functional disturbance in cognitive functioning instead of structural abnormalities, which is why diagnostic tests such as magnetic resonance imaging (MRI) and computerized tomography (CT) scans following concussive or subconcussive impacts most often appear normal. These studies may have their role in assessing and evaluating the head-injured individual whenever there is concern for the associated injuries of skull fracture, when there is intracranial bleeding or seizures, where there is concern for structural abnormalities, or when the symptoms of an individual persist or deteriorate. Notwithstanding the normalcy of diagnostic tests following the occurrence of a concussion, as explained below, there are significant, devastating, and permanent cellular and subcellular changes that take place as a result of suffering from a concussion or, albeit at a decreased level, a sub-concussive hit.

25. According to the Centers for Disease Control (CDC), the following are recognized as symptoms indicative of a concussion:

\begin{itemize}
  \item \textsuperscript{1} R.C. Cantu et al., \textit{An overview of concussion consensus statements since 2000}, 21 \textsc{Neurosurg. Focus} 4 (2006).
  \item \textsuperscript{2} D.F. Meaney et al., \textit{Biomechanical analysis of experimental diffuse axonal injury}, 12 \textsc{J. Neurotrauma} 4 (1995).
\end{itemize}
The NHL itself, albeit only in recent years, has identified the following symptoms as being associated with concussions in its Fact-Sheet for Athletes:

<table>
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<th>Physical</th>
<th>Emotional/Mood</th>
<th>Sleep</th>
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<tbody>
<tr>
<td>Difficulty thinking clearly</td>
<td>Headache</td>
<td>Irritability</td>
<td>Sleeping more than usual</td>
</tr>
<tr>
<td></td>
<td>Fuzzy or blurry vision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeling slowed down</td>
<td>Nausea or vomiting</td>
<td>Sadness</td>
<td>Sleep less than usual</td>
</tr>
<tr>
<td></td>
<td>(early on)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dizziness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty concentrating</td>
<td>Sensitivity to noise or light</td>
<td>More emotional</td>
<td>Trouble falling asleep</td>
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<tr>
<td></td>
<td>Balance problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty remembering new information</td>
<td>Feeling tired, having no energy</td>
<td>Nervousness or anxiety</td>
<td></td>
</tr>
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</table>

26. The NHL itself, albeit only in recent years, has identified the following symptoms as being associated with concussions in its Fact-Sheet for Athletes:³

³ NHL0040512.
27. These changes in alertness and cognition can be relatively mild (such as a slight daze) or profound (unconsciousness), yet both situations are defined as concussions.
These clinical presentations may clear spontaneously, or may linger for prolonged periods of time. For some, the symptoms can last a lifetime.

2. **History of Concussions**

28. Dating as far back as the time of Hippocrates, concussions were recognized as a “commotion of the brain” that resulted in a loss of speech, hearing, and motor function. The term “concussion” has been recognized since at least the 16th century, though its formal description has evolved over time.

29. The understanding of the effects of concussions evolved significantly in the early 20th century. In the first quarter of the 20th century, many believed that concussions were caused by deformation of, or a temporary change in, the form or shape of the skull, causing an anemia of the brain. In 1926, neurologists Osnato and Giliberti first suggested that exposure to mTBI may lead to neurodegenerative changes. Then, in 1928, Martland, a New Jersey pathologist, described “punch drunk syndrome,” a chronic motor and neuropsychiatric condition caused by concussive and subconcussive blows in retired boxers, coined as “dementia pugilistica” in a subsequent study in 1937, and later as chronic traumatic encephalopathy (CTE) in 1949.

30. In 1964, the Congress of Neurological Surgeons updated the definition of concussions to: “[A] clinical syndrome characterized by immediate and transient impairment

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of neural function, such as alteration of consciousness, disturbance of vision, equilibrium, etc., due to mechanical forces.” This definition was updated shortly thereafter to include three grades of severity, with associated clinical presentations. This same paper suggested that, based on the increased danger of multiple concussions in a short duration, a football player concussed three times in a single year should be removed from the sport permanently. It was further posited that it would be “wise to exclude the player permanently from any further play after only one severe concussion.”

31. As early as 1968, Oppenheimer discovered microscopic axonal injury in the brain after mild head injury in humans and animals in post-mortem study, later confirmed by Sekino et al. Other studies during the 1980s and 1990s demonstrated that concussive injury results in ionic flux and hyperacute indiscriminate glutamate release, which can then trigger voltage- or ligand-gated ion channels, creating a diffuse “spreading depression-like” state. Further discussion of these cellular and metabolic changes is found below in Section IV(A)(4–5).

11 Committee on Head Injury Nomenclature of the Congress of Neurological Surgeons. Glossary of head injury, including some definitions of injury to the cervical spine, CLIN. NEUROSURG. 12 (1966).
12 R.C. Schneider & F.C. Kriss Decisions concerning cerebral concussions in football players, 1 MED. SCI. SPORTS 2 (1969); R.C. Cantu, Guidelines for return to contact sports after a cerebral concussion, 14 PHYSICIAN SPORTSMED. 10 (1986).
13 Id.
14 Id.
16 H. Sekino et al., Brain lesions detected by CT scans in cases of minor head injuries, 21 NEUROLOGIA MEDICO-CHIRURGICA 7 (1981).
32. In 2001 and 2004, the First and Second International Symposia on Concussion in Sport, which were held in Vienna, Austria, and Prague, Czech Republic, respectively, defined sports concussion as: “[A] complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces.” Along with the revised definition, the Symposia also refined concussion classification by abandoning a grading scheme for concussions, instead favoring use of combined measures of recovery to determine injury severity or prognosis, and hence individually guide return-to-play decisions.

33. The following chart details the evolved grading of concussions in the 20th century:

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20 Millspaugh, supra n.9.
34. In 2013, the most recent Fourth International Conference on Concussion in Sport, McCrory et al., defined concussion as a brain injury classified by “a complex pathophysiological process affecting the brain, induced by biomechanical forces,” with the following features: (1) being caused by blunt force trauma to the head, “or elsewhere on the body with an ‘impulsive’ force transmitted to the head”; (2) typically resulting in the rapid onset of neurologic impairment, which may resolve spontaneously or up to a number of hours later; (3) may result in neuropathology that clinically reflects functional deficiencies.
over structural injury; and (4) results in a graded set of symptoms, with or without loss of consciousness, which may also be prolonged.²¹

35. Notwithstanding the evolving definition of “concussion” among clinicians and researchers over the course of many decades (indeed, centuries), there have been at least two constants: that trauma to the head, whether in sport, falling off a horse, or from a motor vehicle accident, is exceptionally dangerous, particularly if not treated properly, and that repetitive head trauma may lead to catastrophic sequelae.

3. How Concussions Occur in Sports and in Ice Hockey Particularly

36. Concussions occur when linear and rotational accelerations are impacted to the brain from either direct impacts to the head or indirect impacts that whiplash the head. The source of impact, however, is immaterial. It may come from a boxing glove, a football helmet, a bare knuckled fist in a hockey fight, or a hockey player’s head hitting the ice, glass, or another player. The material issue is the resulting neuronal and axonal disruption (i.e., the concussion) that puts athletes at imminent risk of serious injury or death, as well as a heightened risk of long-term neurodegenerative disease (LTND).

37. During the course of an NFL season, for example, studies have shown that athletes receive more than 1,000 impacts greater than 10 G force, which is slightly more than a fighter pilot receiving doing maximal maneuvers. However, most of the football-related hits to the head exceed 20 G force, and those that result in concussion exceed 60 G.

38. Professor Blaine Hoshizaki of the University of Ottawa School of Human Kinetics and founder of the Neurotrauma Impact Laboratory has opined that during the course of the 1986-87 NHL season, it is believed that athletes receive more than 680 head impacts greater than 9% strain over a 30 game period, imputed to approximately 0.98 impacts per player per game. In the higher range of the periods studied, Professor Hoshizaki reported that athletes receive more than 1674 head impacts greater than 9% strain over a 30

game period, imputed to approximately 2.56 impacts per player per game. A strain in excess of 18% is considered likely to result in a concussion, though it has been reported that strain figures between 5% and 8% result in changes to white matter cells, explored infra section IV.A.5.22

39. While helmets are effective in virtually eliminating skull fractures and dramatically reducing linear forces, they are ineffective in reducing the rotational forces that result in a concussion.

40. Indeed, the NHL’s own concussion consultants have acknowledged on several occasions that helmets worn by NHL players were designed to “mitigate impact energy”23 and not to prevent or reduce concussions.

4. Metabolic Changes

41. After concussion, there is a significant K+ efflux from cells, owing to mechanical membrane disruption, axonal stretch, and opening of voltage-dependent K+ channels. Nonspecific depolarization of neurons leads to release of the excitatory neurotransmitter glutamate, which compounds the K+ flux by activating N-methyl-D-aspartate (NMDA) and D-amino-3-hydroxy-5-methyl-4-isoxazole-propionic acid (AMPA) receptors. In an attempt to restore the membrane potential, the NA+, K+-ATPase works overtime, consuming increasing amounts of ATP. To meet these elevated ATP requirements, there is a marked upregulation of cellular glycolysis, which occurs within minutes after concussion. During this period of hyperglycolysis, there is a commensurate increase in lactate production.

42. In addition to K+ efflux, NMDA receptor activation permits a rapid and sustained influx of Ca2+. Elevated intracellular Ca2+ can be sequestered in mitochondria,

23 NHL2054172.
eventually leading to dysfunction of oxidative metabolism and further increasing the cell’s dependence on glycolysis-generated ATP. Calcium accumulation may also activate proteases that eventually lead to cell damage or death and, in axons, excess Ca2+ can lead to dysfunction and breakdown of neurofilaments and microtubules.

43. These ionic shifts and acute alterations in cellular energy metabolism occur in a posttraumatic setting where cerebral blood flow (CBF) is diminished, although not to ischemic levels. Rather, it is the mismatch between glucose delivery and glucose consumption that may predispose to secondary injury. CBF may remain depressed for several days after TBI, possibly limiting the ability of the brain to respond adequately to subsequent perturbations in energy demand. If increased energy demands are not satisfied there is the potential for increased numbers of neurons and glial cells to enter an injury cascade.

44. After the initial period of profound post-injury ionic disturbance and resultant increase in glucose metabolism, the local cerebral metabolic rate for glucose decreases significantly below baseline, as does oxidative metabolism. Then, gradually in most instances of concussion, these metabolic changes revert to baseline over a 10-day period.

5. Cellular and Sub-Cellular Changes Following Concussive and Subconcussive Blows

45. As postulated by Randolph & Kirkwood in 2009,25 concussive and subconcussive blows sustained over the course of an athletic career cause permanent damage to white matter and likely result in a diminishing of the cerebral reserves26 in the athlete’s


26 “Cerebral reserve” refers to a combination of brain reserve capacity, cognitive reserve capacity, and functional reserve, represented by quantitative measures such as brain size, white and grey matter volume, or neuronal count, and can simplistically be viewed as the number of reserve grey matter and white matter cells in a brain. Those with more cerebral reserve tend to have better clinical outcomes for any given level of pathology. Accordingly, there is some threshold at which clinical deficits will become apparent and those individuals with more cerebral reserve can withstand greater pathology before appearing symptomatic. For example, in the case of Alzheimer’s, the disease will progress longer and more pathology
brain, thereby exacerbating or accelerating the effects of aging on the brain, and leaving the athlete particularly vulnerable to neurodegenerative disorders.

46. Following a concussive or subconcussive event, there is a destructive pathophysiological and biomechanical response that initiates a chain of neurometabolic and neurochemical reactions that include:

- Activation of inflammatory response;
- Imbalance of ionic concentrations;
- Increase in the excitatory amino acids;
- Dysregulation of neurotransmitter release and synthesis;
- Imbalance of mitochondrial functions and energy metabolism; and
- Productions of free radicals.

47. Even after resolution of all clinical symptoms associated with a concussive (or subconcussive) event, there may be long-lasting ultrastructural and functional brain alteration. In fact, several studies in boxers and football players support the interpretation that even asymptomatic subconcussive head trauma, accumulated over the course of an athletic career, can cause long-term brain damage. Such long-term damage, however, may only become apparent once the normal ageing process has contributed to neuronal degeneration.

48. The normal ageing process is associated with significant changes in both grey and white matter in the brain. Grey matter volume loss is susceptible to the effects of ageing, and is particularly salient within the parenchyma of both the frontal and temporal regions. Damage will accumulate before the appearance of clinical symptoms in those who have greater cerebral reserve than in those with less cerebral reserve.

lobes of the brain.\textsuperscript{30} White matter is also highly vulnerable to the ageing process, with an estimated volume loss of 45\% between the ages of 20 and 80 years.\textsuperscript{31} Age-related white matter loss is thought to contribute to the decline in cognitive function typically associated with the normal ageing process, which encompasses domains of information processing speed, psychomotor speed, postural stability, memory, attention, and executive functions.\textsuperscript{32}

49. Through the use of diffusion tensor imaging (DTI), researchers have been able to measure changes to cerebral reserve and white matter volume loss by studying and modeling the quantification of water molecules’ diffusion across brain tissues. A key indicator of white matter decline is a decrease in fractional anisotropy, which refers to the measure of diffusion along the longitudinal axis of the axon. An additional indicator of white matter loss is an increase in mean diffusivity; greater diffusion can be found in membrane-free areas of the brain, compared to the restricted diffusion in areas containing grey and white matter. An increase in mean diffusivity indicates a greater proportion of membrane-free areas present in the subject brain.

50. In testing the brains of contact sport athletes, Tremblay et al. found significant abnormal changes in DTI MRIs, including a decline in fractional anisotropy and an increase in mean diffusivity.\textsuperscript{33} These changes to fractional anisotropy and mean diffusivity were


\textsuperscript{31} D.H. Salat et al., \textit{Age-related alterations in white matter microstructure measured by diffusion tensor imaging}, 26 NEUROBIOL. AGING 8 (2005).

\textsuperscript{32} F.M. Gunning-Dixon et al., \textit{Aging of cerebral white matter: a review of MRI findings}, 24 INT’L J. GERIATR. PSYCHIATRY 2 (2009); D.J. Madden et al., \textit{Cerebral white matter integrity and cognitive aging: contributions from diffusion tensor imaging}, 19 NEUROPSYCHOL. REV. 415 (2009).

\textsuperscript{33} S. Tremblay et al., \textit{Diffuse white matter tract abnormalities in clinically normal ageing retired athletes with a history of sports-related concussions}, BRAIN (2014).
indicative of damage to the white matter of the athletes’ brains as a result of their participation in contact sports.

51. Tremblay’s detected anomalies were related to multiple cognitive and brain structure variables, which, in addition to previous functional and structural characterizations, reveal a clinical profile that fits with the pattern of changes that are typically observed in normal ageing. From this understanding, it is likely that the nature of the interaction between ageing and a history of concussions involves a latent microstructural injury that leaves the brain more vulnerable to the deleterious effects of ageing. Thus, while ageing exerts its own effects on the brain, concussive and subconcussive impacts act synergistically with the normal ageing process, resulting in detectable decline in both structure and function.

52. The following chart, illustrated in “Review: the long-term consequences of microglial activation following acute traumatic brain injury,” demonstrates the impact that a TBI has on short and long term cerebral reserve, thereby accelerating the risk of dementia:

53. DTI metrics, that are sensitive to small alterations in white matter microstructure, allow important parallels to be drawn between normal ageing and ageing with a history of concussive and subconcussive impacts. The reported group differences between older retired athletes that have suffered concussions and those that have not suffered
conussions match a pattern of anomalies that is consistent with the effects of normal ageing. However, studies suggest that the concussed brain is more vulnerable to the pathological effects of normal ageing. This interpretation would be in line with findings of exacerbated cortical thinning and ventricular expansion with advancing age in the same sample of former concussed athletes.\(^\text{34}\)

54. Overall, Tremblay’s results support the notion that structural injury from concussive and subconcussive blows, even if not grossly apparent, might reduce the resilience of the brain and expedite, or compound, the degenerative effects of ageing.\(^\text{35}\) The consequence of this, in practical terms, is that those individuals who have sustained concussive and subconcussive blows will most likely experience age-related cognitive alterations earlier in life compared to those individuals who have not sustained concussive and subconcussive blows. Each concussive or subconcussive blow that affected white matter would, in turn, accelerate the individual’s decline towards a state where neuropathologies clinically manifest.

55. These present, and permanent, changes to white matter have been observed in a variety of studies tracking athletes in contact sports. In fact, a study of varsity university (CIS) hockey players observed an increase in diffusivity in major white matter tracts in the right hemisphere after a single season of hockey, even though CIS hockey is played at a slower and less violent pace than NHL hockey.\(^\text{36}\) Of the 25 players studied, only three reported suffering from a diagnosed concussion, even though the changes to diffusivity were similarly significant in players that did not suffer from a diagnosed concussion. As concluded therein, “[t]his suggests that white matter alterations occur even in the absence of


a diagnosed concussion, which is in accordance with other studies in contact sports where concerns have been raised about the cumulative effects of frequent brain trauma.”

56. In another study, comparing white matter changes in varsity soccer players without diagnosed concussions (yet, who frequently endure concussive and subconcussive blows while “heading” the ball) and varsity swimmers, the researchers detected an “increase in radial diffusivity in soccer players, consistent with findings observed in patients with mild TBI.”

57. As discussed in the study by Professor Blaine Hoshizaki, the average NHL player sustains approximately 0.98 to 2.56 concussive or subconcussive blows to the head – above the minimum threshold for causing white matter damage – in a typical game, depending on the decade of play (with a noted upward trend over time). This would be consistent with findings that athletes in other contact sports, such as boxing and football, suffer thousands of blows to the head over the course of an athletic career.

58. All head trauma, even at the subconcussive level, can result in permanent cellular changes in the brain. This conclusion is consistent with the findings of Tremblay, Zhou (“Our observations demonstrate that after a single concussive episode, there is measurable atrophy 1 year after injury. . . These changes are greater than those we would normally expect to see after 1 year in a control population.”), Smith (discussing that “[a]fter an episode of traumatic brain injury there is a significant decline in cognitive function which recovers, the degree of recovery being dependent on the severity of the head

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37 Id.
39 A.C. McKee et al., Chronic traumatic encephalopathy in athletes: progressive tauopathy following repetitive head injury, 68 J. NEUROPATHOL. EXP. NEUROL. 7 (2009).
40 A.C. McKee et al., TDP-43 Proteinopathy and Motor Neuron Disease in Chronic Traumatic Encephalopathy, 69 J. NEUROPATHOL. EXP. NEUROL. 918 (2010).
injury. Recovery is, however, not complete, resulting in a loss of functional reserve.”),\(^{42}\) Bigler (finding that “[a]lthough the brain adapts when injured except in cases of severe catastrophic injuries, the individual may never return to baseline and then as depicted in the illustration the adverse effects may be either synergistic or additive. Regardless of the mechanism, having a brain injury shortens the time for when the dementia threshold would be achieved.”), and all of the aforementioned studies detecting changes to diffusivity following contact sport participation.\(^{43}\)

6. **Rest is the Hallmark of Initial Concussion Therapy**

   59. Physical and cognitive rest is the hallmark of initial concussion management.\(^{44}\) Acutely, either physical or cognitive exertion may greatly exacerbate concussion symptoms and retard recovery. A 2014 study, assessing the impact of cognitive rest on recovery time for youths, identified a strong correlation between the benefits of cognitive rest and the duration of concussion symptoms or Post-Concussion Syndrome (PCS), including the following graph displaying the duration of symptoms by quartile of cognitive activity-days (shaded areas representing 95% confidence intervals):\(^{45}\)


\(^{44}\) C.W. Majerske et al., *Concussion in sports: postconcussive activity levels, symptoms, and neurocognitive performance*, 43 J. ATHL. TRAIN. 3 (2008).

B. Subconcussive Hits

60. Subconcussive hits, or impacts that do not produce any clinical concussion symptoms, may also adversely affect cerebral function. Evidence that subconcussive hits may adversely affect cerebral function has been reflected in documented changes in cerebral function (e.g., visual working memory declines) and altered dorsolateral prefrontal cortex activation, as assessed by functional MRI imaging in high school football athletes in the absence of clinical signs of concussion. In lay terms, the study on high school football

46 B.E. Gavett et al., Chronic Traumatic Encephalopathy: A Potential Late Effect of Sport-Related Concussive and Subconcussive Head Trauma, 30 CLINICAL SPORTS MED. 179 (2011); A.C. McKee et al., Chronic Traumatic Encephalopathy in Athletes: Progressive Tauopathy after Repetitive Head Injury, 68 J. NEUROPATHOL. EXP.L NEUROL. 709 (2009).

players found that players who received normal football brain trauma and did not report any concussion symptoms still had functional MRI changes that mimicked concussed players.  

61. Similarly, in a 2013 study of college football players, researchers found that the more hits to the head a player absorbed, the higher the levels of a particular brain protein, S100B, that is known to leak into the bloodstream after an athletic head injury. Even though none of the football players in the study suffered a concussion during the season, four players showed signs of an autoimmune response, the presence of S100B antibodies, which has been associated with brain disorders. Brain scans (using diffusion tensor imaging) showed structural brain tissue damage comparable to what one typically observes in the scan of a concussion victim.

62. Studies have concluded that concussion, repeated subconcussive head impacts, or a combination of such impacts, leads to permanent neurodegenerative conditions such as early-onset Alzheimer’s and CTE, mild cognitive impairment, and/or depression.  

C. Second Impact Syndrome  

63. What Saunders and Harbaugh called “the second-impact syndrome of catastrophic head injury” in 1984 was first described by Schneider in 1973. Second impact syndrome (SIS) occurs when an athlete who sustains a head injury – often a concussion or

48 Id.
49 Id.
50 Gavett, supra n. 46.
worse injury, such as a cerebral contusion – sustains a second impact before symptoms associated with the first injury have cleared.54 55 56

64. Typically, the athlete suffers postconcussion symptoms after the first head injury. These may include headache, labyrinthine dysfunction, visual, motor, or sensory changes, or mental difficulty, especially the thought and memory process. Before these symptoms resolve, which may take days or weeks, the athlete returns to competition and receives a second blow to the head.

65. The second blow may be remarkably minor, perhaps only involving a blow to the chest that jerks the athlete’s head and indirectly imparts accelerative forces to the brain. Affected athletes may appear stunned, but usually do not lose consciousness, and often complete the play. The athletes usually remain on their feet for approximately 15 seconds to one minute, but seem dazed. Often, affected athletes remain on the playing field or walk off under their own power.

66. What happens in the next 15 seconds to several minutes sets this syndrome apart from a concussion. Usually within seconds to minutes of the second impact, the athlete – conscious yet stunned – quite precipitously collapses to the ground, semicomatose with rapidly dilating pupils, loss of eye movement, and evidence of respiratory failure.

67. The pathophysiology of SIS is thought to involve a loss of autoregulation of the brain’s blood supply. This loss of autoregulation leads to vascular engorgement within the cranium, which, in turn, markedly increases intracranial pressure and leads to herniation either of the medial surface (uncus) of the temporal lobe or lobes below the tentorium of the cerebellar tonsils through the foramen magnum (Fig. 1). Animal research has shown that vascular engorgement of the brain after a mild head injury is difficult, if not impossible, to

control.\textsuperscript{57, 58} The usual time from second impact to brainstem failure is rapid, taking 2 to 5 minutes. Once brain herniation and brainstem compromise occur, ocular involvement and respiratory failure precipitously ensue. Demise occurs far more rapidly than usually seen with an epidural hematoma. MRI imaging and CT scans are the neuroimaging studies most likely to demonstrate SIS. Although MRI imaging is more sensitive to traumatic brain injuries, especially true edema,\textsuperscript{59, 60} the CT scan is usually adequate to show bleeding or midline shifts of the brain requiring neurosurgical intervention.

\textsuperscript{57} T.W. Langfitt et al., \textit{Cerebral Vasomotor Paralysis Produced by Intracranial Hypertension}, 15 \textsc{Neurology} 622 (1965).

\textsuperscript{58} R.A. Moody et al., \textit{An Evaluation of Decompression in Experimental Head Injury}, 29 \textsc{J. Neurosurg.} 586 (1968).

\textsuperscript{59} L.R. Gentry et al., \textit{Prospective Comparative Study of Intermediate Field MR and CT in Evaluation of Closed Head Trauma}, 150 \textsc{Am. J. Roentgenology} 673 (1988).

\textsuperscript{60} A. Jenkins et al., \textit{Brain Lesions Detected by Magnetic Resonance Imaging in Mild and Severe Head Injuries}, \textsc{Lancet} 445 (1986).
68. While SIS typically does not occur with intracranial bleeding, a number of cases of SIS have been reported where acute hemisphere swelling has occurred in association with a thin subdural hematoma in athletes receiving the second injury while still symptomatic from the first.\textsuperscript{61}

69. Fundamentally, SIS is a particular danger for athletes who are not given appropriate medical care, and rest, following an initial concussive event, particularly among younger athletes. Thus, proper education of both athletes, coaching staff, and medical staff is crucial to recognize concussive events and prevent their rapid recurrence. Unfortunately, for much of the NHL’s (and other professional sports leagues) history, a concussion was regarded as little more than “getting your bell rung” and return-to-play protocols were limited-to-non-existent. This exposed players to the greatest likelihood of suffering from SIS.

D. Incidence of Concussion and Subconcussive Hits in Contact Sports

1. Incidence of Concussions and Subconcussive Hits in Ice Hockey

70. The CDC estimates that 1.6 to 3.8 million concussions occur in sports and recreational activities annually. This figure is likely underestimated, however, as many individuals suffering from mild or moderate concussions do not seek medical care and thus go undiagnosed.62

71. Studies have demonstrated that the rate of concussions in ice hockey at the high school and collegiate level is relatively high, though the sport has a comparatively lower participation rate than other contact sports such as football or soccer. Furthermore, concussions have been demonstrated to be more prevalent in full-check hockey than in non-check hockey, more common in games than in practices, and are positively correlated with the competitive level of hockey being played.63

72. Although I am not able to personally opine to the average number of concussions sustained in an NHL season, some researchers have attempted to study the frequency and rate of concussions in the NHL. Initially, Wennberg and Tator studied ten seasons between 1998 and 2008, finding the mean incidence over the ten seasons to be 1.45

63 Id. at 7.
concussions per 1000 athletic exposures (nearly double the reported figure of 0.72 per 1000 athletic exposures, as reported in a study measuring concussion rates among NCAA hockey players). Various studies have also sought to calculate the average number of concussions in an NHL season, which have reported concussion incidence as follows.

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73. According to Izraelski, however, these estimates may not accurately reflect the true number of concussion-induced retirements, which some have speculated could be double (or more) the officially recorded rates.66

74. In addition to reviewing scientific literature, I have also reviewed certain documents produced by the NHL and third parties that show the common occurrence of concussions in professional ice hockey specifically.

75. In 1997, the NHL launched its flagship “Concussion Program,” which lasted until 2004. According to the Concussion Program Report, disseminated in 2011, NHL team physicians reported 559 concussions during regular season games over the Program’s 7 year period.67 The estimated incidence was 1.8 concussions per 1,000 player-hours and 5.8 concussions per 100 players per season.68

76. From 1997 to 2001, NHL player concussions increased steadily, from 56 recorded concussions in 1997 to 109 in 2001.69 From 2001 to 2009, NHL player concussions leveled-off to roughly 70 recorded concussions per year, not accounting for 2005 and 2006.70

77. The Concussion Program Report also found that 20% of NHL players returned to play during the same game in which they suffered a concussion, and in nearly 10% of cases, they returned to play after seeing a team physician.71 Additionally, video analysis conducted by the NHL of games from 2006 to 2014 shows that 101 out of 186 NHL players who showed visible signs of concussion returned to play later in the same game.72

66 Id. This conclusion is bolstered by reports, such as those from the New York Times, which indicate that NFL concussion research was critically flawed throughout the 1990’s and 2000’s. See A. Schwarz et al., N.F.L. ’s Flawed Concussion Research and Ties to Tobacco Industry, N.Y. TIMES, Mar. 24, 2016.

67 NHL0025775.

68 Id.

69 NHL0072530-531.

70 Id.

71 NHL0025775.

72 NHL1827768, at 771.
78. In 2010, the NHL created a “Concussion Protocol.” After launching the Protocol, NHL player concussions and man games lost to concussion increased. In 2010, 88 NHL players suffered concussions and 418 man games lost were reported. In 2011, 142 NHL players suffered concussions and 1,267 man games lost were reported. Finally, in 2012, 130 NHL players suffered concussions and 1,536 man games lost were reported.

79. I also reviewed documents produced by the NHL confirming its knowledge regarding the commonality of concussions among its players. For example, internal correspondence amongst NHL employees confirms that the League was aware of the risk concussions posed to its business, stating: “We [the NHL] need to protect our players (if necessary from themselves). Our cost from concussions every season is probably millions. What concussions do to prematurely shorten the careers of our good players is also a hidden but real cost. I think the time is right to make the effort to improve what is presently an unacceptable situation.” Another NHL executive was more direct, stating: “I think it simply goes back to concussions [suffered by players] and brain injuries.”

80. Further, the NHL has acknowledged internally that fighting causes concussions and long-term mental health issues, stating: “Fighting raises the incidence of head injuries/concussions, which raises the incidence of depression onset, which raises the incidence of personal tragedies.”

2. Underreporting of Concussions

81. Underreporting of concussions exists in all sports and is a special challenge in a few sports such as football and ice hockey. Football’s rules and rhythms camouflage the problem. In a football game, there is more “stop time” than “go time” – 30 seconds between

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73 NHL0098266, at 268.
74 Id.
75 Id.
76 NHL2477910, at 914.
77 NHL0034241.
78 NHL0155220.
plays and 4 or 5 seconds for the average play. Unless he’s the quarterback, a concussed player isn’t usually speaking in the huddle. He’s wearing a huge helmet, so no one can look into his eyes if they are trying, which they probably are not. Line up these factors and a running back might be able to play a series or even a half before it is discovered he was playing impaired. The similarly armored and unsupervised hockey player faces similar factors, which mask the visible symptoms of concussion.

82. Underreporting of concussions in youth ice hockey has also been documented in several studies, and a recently published one suggests the problem is significant. The study’s primary author, Dr. Paul Echlin, a physician from London, Ontario, worked with researchers from an organization called the Hockey Concussion Education Program.79 Dr. Echlin and his colleagues followed two junior hockey teams in Ontario throughout the 2009-10 season. These were highly competitive teams—a number of players hoped to graduate to college hockey programs. The players’ ages ranged from 16 to 21.

83. The purpose of the study was straightforward: to track the number of concussions reported among the players on the two teams. Just as importantly, Dr. Echlin was also looking for evidence of possible concussions that were missed by either coaches, medical personnel, or the players themselves. Or ones that were simply ignored.

84. When the study was released in 2010, it garnered a great deal of attention. Most significantly, the study empirically proved that ice hockey is very dangerous, in terms of the frequency and severity of head impacts.

85. An earlier study looking at NCAA Division I ice hockey programs observed that the rate of concussions reported was 3.1 concussions per 1,000 man-games played. The Echlin study, observing athletes of roughly the same age playing the exact same sport, found an actual rate nearly 7 times greater than that—21.5 concussions per 1,000 man-games played.

86. The Echlin study, however, was more troubling than just the greater number. The study described a culture in which concussions were not treated as a serious health issue or, it seemed, an issue at all. Players described being under pressure from their coaches to continue playing even when they had been told by medical professionals that they had suffered concussions and should take time off and rest. The attitudes of some of the players’ parents were even more puzzling. One told the Echlin research team that it should stop conducting research on the team and let his son go back to thinking about hockey instead of the potential for injury, stating: “He needs to play on instincts and can’t be worried about getting a concussion every time he goes into the corner.” The researchers might have heard more comments like that had they been allowed to complete the season with both teams – they were not. The general manager of one team pulled his team out of the study midway through the season, telling the researchers that he no longer wanted his players submitting to in-game examinations.

87. An interesting angle of the Echlin study is the way in which the researchers collected information. At the hockey games, physician-observers were placed in the stands. When one saw a player get up slowly or noticed that a player seemed stunned from a blow, the observer would note it and, between periods, go to the locker room to examine the player involved. The examinations often turned up concussions that coaches, players, and on-the-bench medical personnel themselves had overlooked. For every one concussion identified by the coaches, players, and training staff, the physician-observers identified seven.

88. Not surprisingly, the NHL has internally acknowledged that underreporting of concussions exists in the league.\footnote{NHL0035193}

E. The Effects of Repeat Concussions and Subconcussive Hits

1. Second Impact Syndrome

89. As mentioned above, SIS is a rare but widely feared complication of mTBI. SIS refers to situations where “an athlete who has sustained an initial head injury, most often
a concussion, sustains a second head injury before the symptoms associated with the first have fully cleared.”\(^{81}\)

90. SIS typically presents as a concussive blow, followed by a second, comparatively minor blow to the head and subsequent lapse into a coma. It is believed that severe cerebrovascular engorgement and cerebral oedema ensue following the second impact leading to brain herniation.\(^{82}\)

2. Post-Concussion Syndrome

91. When post-concussion symptoms persist beyond one month, most refer to this condition as PCS. It can be thought of as a very severe concussion and its presence should be recorded in the medical records. Persistent PCS beyond one year is felt by some to be a contraindication to ever return to a collision sport, and is observed in 10%-15% of mTBIs.\(^{83}\)

While most cases of PCS eventually recover, not every case does in fact recover. These instances of Chronic PCS (CPCS) can be distinguished from CTE by the relative prominence of headaches in CPCS and immediacy of symptoms, as compared to the relative lack of headaches and delayed – often for decades – insidious symptom onset of CTE.\(^{84}\)

92. PCS symptoms can include headaches, fatigue, memory problems, feeling in a fog, depression, impulsivity, and other physical, cognitive, mood, and behavioral problems. There may be treatments that can alleviate some or all of these symptoms and, in almost all cases, they resolve eventually.


93. Although predictors of PCS are not known with certainty, a history of prior concussions appears to increase the risk of PCS.\textsuperscript{85} No study has identified the severity of concussive or subconcussive impact as a factor contributing to the development of PCS.

94. The connection between persistent cases of PCS and CTE at this time is not clear, as CTE develops years after PCS exposure and presents with primarily cognitive, behavioral, and mood symptoms.\textsuperscript{86}

3. Chronic Traumatic Encephalopathy and Other Long-Term Neurodegenerative Diseases

95. Repetitive mTBI can trigger the development of CTE, a progressive neurodegeneration characterized by the widespread deposition of hyperphosphorylated tau (p-tau) as neurofibrillary tangles that begin at the depths of cerebral sulci in a patchy perivascular distribution.\textsuperscript{87} CTE was originally reported in its earliest understanding in 1928


by Harrison Martland, describing the clinical aspects of a progressive neurological deterioration that occurred after repetitive brain trauma in boxers in his seminal study, “Punch Drunk.”88 Later termed “dementia pugilistica,”89 only isolated cases were discussed in medical literature until Corsellis et al. published a series of 15 cases describing the clinical and pathological features, causing dementia pugilistica to be differentiated from other neurodegenerative diseases.90 Corsellis et al. further opined:

“It may well be, therefore, as it is sometimes claimed, that the introduction of stricter medical and administrative control of the number and the nature of contests has considerably reduced the prevalence of cerebral damage. It seems, however, unlikely that all risk can have been eliminated. A single punch, or even many punches, to the head need not visibly alter the structure of the brain, but there is still the danger that, at an unpredictable moment and for an unknown reason, one or more blows will leave their mark. The destruction of cerebral tissue will have then begun and, although this will usually be slight enough in the early stages to be undetectable, it may build up, if the boxing continues, until it becomes clinically evident.”91

Concussions, 30 CLINICAL SPORTS MED. 1 (2011); D.H. Daneshvar et al., The Epidemiology of Sport-Related Concussion, 30 CLINICAL SPORTS MED. 1 (2011); A. Costanza et al., Review: Contact Sport-Related Chronic Traumatic Encephalopathy in the Elderly: Clinical Expression and Structural Substrates, 37 NEUROPATHOLOGY APPLIED NEUROBIOLOGY 570 (2011); R.A. Stern et al., Longterm Consequences of Repetitive Brain Trauma: Chronic Traumatic Encephalopathy, 3 PHYSICAL MED. REHABILITATION S460 (2011); L.E. Goldstein et al., Chronic Traumatic Encephalopathy in Blast-Exposed Military Veterans and a Blast Neurotrauma Mouse Model, 72 SCI. TRANSLATIONAL MED. 134 (2012); T. Saing et al., Frontal Cortex Neuropathology in Dementia Pugilistica, 29 J. NEUROTRAUMA 1054 (2012).

88 Osnato, supra n.7.

89 H.L. Parker, Traumatic encephalopathy (‘punch drunk’) of professional pugilists, 15 J. NEUROL. PSYCHOPATHOL. 57 (1934).

90 J.A. Corsellis et al., The aftermath of boxing, 3 PSYCHOL. MED. 3 (1973).

91 Id.
96. During this era, researchers also recognized that activities other than boxing were associated with dementia pugilistica’s development, which led to the preferred use of terms such as progressive traumatic encephalopathy, and ultimately, CTE.  

97. Alongside the study of boxing-related disability, in 1962 Symonds postulated that, “[i]n the most severe degree of concussion there is widespread irreparable damage. In the slightest degree there may be rapid and complete recovery of cerebral function; but this does not necessarily exclude the possibility that a small number of neurons may have perished – a number so small as to be negligible at the time, but leaving the brain more susceptible as a whole to the effects of further damage of the same kind.” Symonds’ findings were later supported in a study published Rimel et al. in 1981, noting that “[i]t is questionable whether the effects of concussion, however slight, are ever completely reversible,” and again by Ommaya and Gennarelli in 1983.

98. In fact, in 1975, studies were touting evidence of intellectual dysfunction as a result of cumulative concussions, as Gronwall and Wrightson concluded that, “[w]hatever the mechanism for this fall-off in intellectual performance, doctors do have a duty to convince the controlling bodies and participants in sports where concussion is frequent that the effects are cumulative and that the acceptance of concussion injury, though gallant, may be very dangerous.” In light of the scientific developments forming the foundation for the modern understanding of LTND, the modern definition of CTE merely memorialized the panoply of definitions and studies.

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92 M. Critchley, Punch-Drunk Syndromes: The Chronic Traumatic Encephalopathy of Boxers, HOMMAGE À CLOVIS VINCENT (1949) (Fr.); M. Critchley, Medical Aspects of Boxing, Particularly from a Neurological Standpoint, BR. MED. J. 357 (1957).


99. CTE may manifest in cognitive, mood, behavioral, and motor disorders and is clinically associated with symptoms of irritability, impulsivity, aggression, depression, short-term memory loss, and heightened suicidality.\(^97\)

100. Often there can be a delay of years, or even decades, between the end of the repetitive head impacts (\textit{i.e.}, the end of playing the contact sport) and the beginning of the symptoms. CTE often presents with recent memory loss and other cognitive impairments similar to those experienced by people with Alzheimer’s disease. People with CTE can also have changes in behavior (\textit{e.g.}, impulsivity, rage, aggression, having a short fuse) and mood (\textit{e.g.}, depression, hopelessness, feeling suicidal). Less commonly, there can be movement disorders such as parkinsonism (\textit{i.e.}, tremor, difficulty walking or speaking, stiffness). Some people with CTE may first have behavior or mood problems. Others may first have cognitive difficulties, with changes in mood and behavior later.

101. With advancing disease, more severe neurological changes develop that include dementia, gait and speech abnormalities, and Parkinsonism. In late stages, CTE may be clinically mistaken for Alzheimer’s disease or frontotemporal dementia.\(^98\) A subset of cases with CTE is associated with motor neuron disease\(^99\) that could be diagnosed clinically as Amyotrophic Lateral Sclerosis (ALS) or “Lou Gehrig’s Disease.”

102. The neuropathological changes of CTE are distinctive and easily distinguished from other tauopathies, including Alzheimer’s disease and frontotemporal dementia. With CTE, there is atrophy of the cerebral cortex, medial temporal lobe, diencephalon, and mammillary bodies with enlarged ventricles; cavum septum pellucidum, often with fenestrations; extensive p-tau-immunoreactive neurofibrillary tangles and astrocytic tangles in the frontal and temporal cortices, particularly around small cerebral vessels and at the


\(^{98}\) B.E. Gavett et al., \textit{Mild Traumatic Brain Injury: A Risk Factor for Neurodegeneration}, 2 ALZHEIMER’S RES. THERAPY 18 (2010); Gavett, \textit{supra} n. 46.

\(^{99}\) McKee, \textit{supra} note 39.
depths of cerebral sulci; extensive p-tau-immunoreactive neurofibrillary tangles in limbic regions, diencephalon, and brainstem nuclei; extensive degeneration of axons and white matter fiber bundles; TAR DNA-binding protein 43 (TDP-43) immunoreactive intraneuronal and intraglial inclusions occur in most cases with absent or minimal amyloid-B peptide deposits.  

103. In 2008, the Center for the Study of Traumatic Encephalopathy (CSTE) at Boston University School of Medicine established the CSTE brain bank at the Bedford VA Hospital in Bedford, MA under the direction of Dr. Ann McKee to analyze the brain and spinal cords after death of athletes, military veterans, and civilians who experienced repetitive mTBI. Through this effort, CSTE has comprehensively analyzed the brain and spinal cord of 165 donors for evidence of CTE, as well as for all other neurodegenerative diseases including Alzheimer’s disease, frontotemporal lobar degeneration, Parkinson’s disease, Lewy body disease, and multiple system atrophy.

104. The CSTE reported the results of their initial analysis of donated brains in the aptly-named journal, Brain. CTE was found in 68 of 85 cases including 64 athletes, 21 military veterans, and 1 individual who indulged in serious head-banging behavior. Of the athletes, 49 were football players, 34 were former professional football players, 9 had played only college football, and 6 had played only high school football. Later, in 2015, McKee et al examined an additional cohort of NFL player brains, and CTE was found in 87 out of 91 brains examined by the CSTE.

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105. Though widespread studies of deceased NHL player brains have not been performed at a similar rate as in the NFL, several NHL players have been posthumously diagnosed with CTE. This includes Bob Probert, Reggie Fleming, Rick Martin, Steve Montador, and Derek Boogaard, with other suspected-yet-undiagnosed cases such as the suicides of enforcers Rick Rypien and Wade Belak.

106. In a December, 2015 study published by the Mayo Clinic, researchers analyzed 1,721 donated brains, identifying 66 males who participated in contact sports during their youth and young adult years.\(^\text{103}\) Of these 66 brains, 32% had CTE pathology, whereas none of the 198 brains of individuals without documentation of participation in contact sports exhibited CTE pathology.

V. INCREASED RISK OF DEVELOPING A NEURODEGENERATIVE DISEASE AS A RESULT OF PLAYING PROFESSIONAL ICE HOCKEY

107. Participating in a contact sport has been known for decades to increase an individual’s risk for developing a LTND disease. These athletes, particularly those who make it to the professional level, are exposed to thousands of blows to the head over the course of many years. CTE, among other LTND diseases, has been diagnosed in a wide range of individuals with a history of head trauma, including football players, soccer players, hockey players, boxers, wrestlers, and soldiers who have received battlefield mTBIs and TBIs.\(^\text{104}\) It is typically diagnosed in older retirees, but has been reported in athletes as young as 17, who only played sports in high school or college. Given the wide range of people that are diagnosed, and the ever-growing increase in reported cases, CTE is clearly more prevalent than previously thought, and the same is certainly true of other LTND diseases.


108. Though limited studies have been performed of the risks of neurodegenerative disease specifically associated with a career in NHL hockey, numerous studies on NFL players provide an excellent parallel through which risks can be inferred for NHL players.

109. In one recent cohort mortality study of 3,439 former NFL players, the mortality rate for retired players was significantly lower to that of U.S. men, yet mortality was significantly higher for all neurodegenerative causes combined. Specifically, mortality attributed to neurodegenerative disease was discovered to be three times greater than that of the general population.

110. Using a retrospective self-report study sent to the National Football League Retired Player’s Association, Guskiewicz et al. found a higher incidence of mild cognitive impairment (MCI) and depression in former NFL athletes with a history of concussion compared to those who did not have a history of concussion. More specifically, retired players with three or more reported concussions had a fivefold prevalence of being diagnosed with MCI and a threefold prevalence of reported significant memory problems compared with those players without a history of concussion.

111. The following chart, included in Guskiewicz’s paper, demonstrates the relationship between cognitive impairment and the number of self-reported sustained concussions. Whether the cognitive impairment was diagnosed by a doctor, self-reported, or reported by a spouse or relative, Guskiewicz identified a clear correlation between number of self-reported concussions and cognitive impairment:

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106 Id.

107 Guskiewicz, supra n. 51.
112. In a later follow-up study specifically analyzing the relationship between self-reported concussions and depression, Guskiewicz again submitted questionnaires to retired NFL athletes and interpreted those results.\textsuperscript{108}

113. When asked if their TBIs affected their cognitive abilities, of the retirees who had sustained one or two self-reported previous concussions, 11.5\% (95\% CI: 9.4, 13.6) reported that the injuries have had a permanent effect on their thinking and memory skills as they aged. This increased to 31.1\% (95\% CI: 27.4, 34.8) in those with three or more self-reported previous concussions, again suggesting a positive correlation between a higher number of concussions, and the perception that those concussions impair cognitive functioning, consistent with Guskiewicz’s previous study.\textsuperscript{109}

114. Likewise, retired NFL players reporting three or more prior concussions were three times more likely to be diagnosed with depression, and those with one or two prior concussions were one and a half times more likely to have been diagnosed with depression, relative to retirees with no concussion history.\textsuperscript{110}

115. In another study examining chronic depression among World War II retirees, after accounting for age, education, and health conditions, an 18.5\% lifetime prevalence of depression was observed in veterans who suffered a head injury during their military service.

\textsuperscript{108} K.M. Guskiewicz et al., \textit{Recurrent concussion and risk of depression in retired professional football players}, 39 MED. SCI. SPORTS EXERC. 6 (2007).

\textsuperscript{109} \textit{Id.}

\textsuperscript{110} \textit{Id.}
which was significantly higher than the observed 13.4% lifetime prevalence for those without a history of head injury.\textsuperscript{111}

116. This link between repeated concussive and subconcussive blows and an increased risk of developing an LTND disease has been recently acknowledged by Jeff Miller, the NFL’s senior vice president of health and safety, in the case of retired NFL players.\textsuperscript{112}

VI. MEDICAL MONITORING FOR RETIRED NHL PLAYERS

A. Retired NHL Players Require Medical Monitoring More than the Average Person or General Population

117. As discussed above, the majority of NHL players are exposed to multiple – in many cases hundreds, if not thousands – of blows to the head over the course of their NHL careers. This is due to the high number of full-contact activities to which NHL players are exposed. First, NHL players compete in 82 regular season games, all full-contact, every NHL season. Additionally, NHL players compete in numerous pre-season and mid-season practice activities, including full-contact scrimmages. Many also compete in the NHL playoffs, which is also full-contact. Finally, the average NHL player participates in numerous seasons during his NHL career.

118. Given this high level of activity, and given the physical way in which professional hockey is played (see supra Section IV(D)(1)), I believe NHL players as a group have suffered cellular and subcellular injuries from repeated concussive and subconcussive blows, from which the general population does not suffer.

\textsuperscript{111} T. Holsinger et al., Head injury in early adulthood and the lifetime risk of depression, 59 ARCH. GEN. PSYCHIATRY 1 (2002).

\textsuperscript{112} Nancy Armour, Armour: NFL exec’s admission of link between football and CTE long, USA TODAY, Mar. 16, 2016 12:15 a.m. EDT, http://www.usatoday.com/story/sports/nfl/2016/03/15/nfl-cte-concussions-congress/81799838/.
B. Purpose and Goals of a Medical Monitoring Program for Retired NHL Players

119. Concussions and sub-concussive hits that are unrecognized put athletes at considerable risk of potentially catastrophic sequelae from re-injury. Repetitive head trauma – whether concussion or subconcussive hits – from participation in contact sports such as football, soccer, ice hockey, basketball, field hockey, lacrosse, and wrestling can lead to a permanent decrease in brain function, including, among others: memory loss, early Alzheimer’s disease, early Alzheimer’s-like disease called CTE, movement disorders such as parkinsonism, ALS, and emotional disturbances. Also, as discussed above, one of the most notable complications of concussion is SIS. In this syndrome, an athlete who is recovering from an initial concussion sustains a subsequent concussive injury, resulting in diffuse brain swelling and severe, permanent neurological dysfunction or death. Thus, timely diagnosis and prompt treatment can help prevent more serious concussion complications.

120. Here, the purpose of a medical monitoring program for retired NHL players is to determine whether they are suffering from PCS or a neurodegenerative disease or condition resulting in cognitive impairments or behavioral or mood disturbances. Athletes may not have any idea that the debilitating symptoms that they are experiencing were caused by their head injuries – and thus are not seeking the available treatments and counseling that they need to ease their symptoms associated with their head injuries.

121. Specifically, armed with a diagnosis of PCS or a neurodegenerative disease such as CTE or early Alzheimer’s, NHL retirees will be able to seek the intervention and treatment they need. Treatment of PCS or treatment of the symptoms of a neurodegenerative disease focuses on helping the person return to an active, functional lifestyle. Treatment incorporates physical and cognitive therapy and counseling programs to help alleviate difficulties associated with mTBI (for PCS) or the cognitive, behavioral, or mood symptoms associated with a neurodegenerative disease. It may include physical therapy for difficulties with motor and vestibular sensitivity; occupational therapy to address daily activities and functional vision deficits; speech and language therapy to improve language skills and cognitive deficits; and psychological counseling to cope with impulse control problems,
depression, anxiety, panic attacks, or simply concerns at home or work. Athletes may be prescribed medication in cases that fail to respond to physical, cognitive or psychological therapy alone. This is especially true when one symptom dominates all others.

122. Treatments for PCS or the cognitive, behavioral, or mood symptoms of a neurodegenerative disease are aimed at easing the specific symptoms in order to allow the injured person to lead a more normal life. Moreover, the symptoms of PCS or a neurodegenerative disease often improve after the affected person learns that there is a cause for his or her symptoms. This is particularly true with PCS, where the symptoms may improve with time. Education about the disorder or disease can ease a person’s fears and help provide peace of mind, including gaining the knowledge that their symptoms are not genetic and will not pass down to children.

123. For example, one symptom of PCS is headaches. Many athletes with headaches may try to self-medicate, but overuse of over-the-counter and prescription pain relievers may actually contribute to persistent post-concussion headaches. Thus, a diagnosis of PCS will allow an athlete to seek proper treatment for their headaches. Medications commonly used for migraines or tension headaches, including some antidepressants, appear to be effective when these types of headaches are associated with PCS. These medications may include Amitriptyline, which has been widely used for post-traumatic injuries, as well as for symptoms commonly associated with PCS such as headaches, irritability, dizziness, and depression. Amantadine, Nortriptyline, Propranolol, or Verapamil can also help greatly.

124. Another symptom of PCS, as well as of CTE, Alzheimer’s, Lewy Body Dementia, and Frontal Lobe Dementia, is a problem with memory and thinking, such as an inability to organize or multitask. Athletes with these problems may believe that they are suffering from Attention-Deficit Disorder (ADD) or Attention-Deficit/Hyperactivity Disorder (ADHD) but in fact, with an appropriate diagnosis of PCS or a neurodegenerative disease, could obtain cognitive therapy. Cognitive rehabilitation can address thinking problems through a number of treatment approaches.

125. Cognitive rehabilitation may include education in order to improve an individual’s understanding of thinking processes. With increased awareness, people may
start to feel a sense of control and support and will realize their symptoms are not uncommon or genetic.

126. Cognitive rehabilitation may include compensating. Therapists can provide individuals with practical ideas they can implement to compensate for cognitive difficulties. These suggestions are tailored to meet each person’s specific needs for improving functioning at home and/or work. The use of memory aids and time management techniques are examples of compensatory strategies.

127. Cognitive rehabilitation may include process-specific training, which consists of intensive exercises designed to provide repetitive practice in identified problem areas such as attention. Through this practice, individuals develop a greater understanding of where breakdowns occur and how to manage them outside of the treatment setting. The overall goal of cognitive therapy is to increase the individual’s ability to meet the cognitive demands of daily life.

128. For difficult cognitive or thought symptoms (e.g., feeling in a fog) or problems with concentration or memory, the neurostimulants in the methylphenidate group—Ritalin, Adderall, Concerta, Strattera, and Amantadine—can also be very beneficial.

129. Specific mood symptoms of PCS and CTE include severe depression, anxiety, and panic attacks. Some treatment options include psychotherapy and/or medication such as Lexapro or Zoloft. Trouble falling asleep can be helped by melatonin and the prescription medications Trazodone or Ambien. Other non-medical therapies that are employed with success in persons suffering from mood problems include vestibular therapy (i.e., head and eye exercises) if dizziness or balance are primary symptoms, and upper cervical spine physical therapy for pain in the upper neck and back of the head.

130. Specific behavioral symptoms of those clinically diagnosed with PCS or a neurodegenerative disease include anger management and impulse control problems. Psychotherapy and counseling is often the first step in treatment of these behavioral symptoms. Pharmaceuticals such as Lexapro may also be employed by clinicians if therapy and counseling prove not to be adequate at alleviating the symptoms.
131. Ultimately, the goal of a medical monitoring program, in determining whether a retired NHL player has PCS, a mid- to late-onset neurodegenerative condition, or other neurological condition associated with head trauma, is to provide the retired NHL players with the information that they need to seek and receive treatment outside the confines of this medical monitoring program.\textsuperscript{113}

C. Benefits to Retired NHL Players of Early Intervention through a Medical Monitoring Program

132. A medical monitoring program will benefit Retired NHL Players in numerous ways. First, medical monitoring will categorize Retired Players according to their specific medical condition. This categorization is useful because it will identify Retired Players who may benefit from new treatments aimed at addressing, and ideally alleviating, their specific medical condition.

133. Next, medical monitoring will assist in identifying and modifying Retired Players’ behavior for known or suspected contributory comorbidities (\textit{e.g.}, alcohol use, smoking, etc.). Identification and modification is useful because it can ultimately lead to correction and elimination of potential comorbidities.

134. Finally, medical monitoring will potentially qualify Retired Players for various other medically necessary interventions (\textit{e.g.}, psychological examinations, support groups for individuals, supports groups for families, life planning, etc.). Intervention opportunities are useful because they provide a long-term care plan for Retired Players, not simply a “one-and-done” testing situation.

\textsuperscript{113} The proposed medical monitoring program is similar to the NHL’s independent medical examinations (“IMEs”) in both function and purpose. The NHL’s expert, Dr. C. Warren Olanow, suggested that the IMEs feature “a neurological examination, bloodwork, brain imaging (MRI), neuropsychological testing and psychiatric evaluation.” \textit{See} Dkt. 403-6 \textsuperscript{23}. The goals of these tests were to determine the presence of symptoms and rule out causes other than LTNDs, and “diagnos[e] disorders of the central and peripheral nervous systems, determin[e] the need for investigations to establish or confirm a diagnosis, and plan[] therapy for these disorders” \textit{Id.} at \textsuperscript{25}. These are the same goals of the proposed medical monitoring program discussed below.
135. At bottom, while there is at present no cure for any of the neurodegenerative diseases associated with repetitive head trauma, there are many ways in which individuals clinically diagnosed with a neurodegenerative disease may alleviate some or all of the cognitive, behavioral, or mood symptoms associated with such a disease and function better in their daily lives.

D. **Recommended Medical Monitoring Program and Associated Costs**

1. **Overview of Scope and Costs**

136. In my opinion, based on my experience and consensus best practices, the medical monitoring program should include focused neurocognitive, visual, and balance assessments as part of the overall neurological examination. Specifically, it would be reasonable to perform (a) a comprehensive history and neurological examination (to be done by a board certified neurologist, neurosurgeon, or physician trained in concussion management), (b) blood tests of pituitary function, (c) a neuropsychological examination, and (d) a standard MRI with susceptibility weighted imaging with medial temporal lobe (hippocampus) volume averaging.

137. Concussion and subconcussive hits may cause trauma to the calcarine cortex, which is in the back of the brain and controls vision, and the cerebellum, which is at the top of the neck and where balance and coordination are measured. These areas are assessed in the neurological assessment. Concussions and subconcussive hits may also cause trauma to the thinking and reasoning parts of the brain (i.e., the medial temporal and frontal lobes). These areas are assessed in the neurocognitive assessment.

138. The neurological assessment would include a detailed prior concussion history; assessment of conditions that affect concussion recovery such as ADD, ADHD, depression, anxiety disorder, panic attacks, migraine, seizure disorders; a symptom checklist; a detailed neurological examination with special focus on cognitive, visual eye tracking with smooth pursuit and saccadic assessment or use of the King-Devick Test; and a balance assessment, such as with the Modified Balance Error Scoring System. Based on my experience, as well as published costs, the estimated physician cost for the neurological assessment is $3,000.00
per person. The neurological assessment would be conducted by a physician with experience in the diagnosis, treatment, and management of concussion.

139. A comprehensive neuropsychological assessment should be carried out by a neuropsychologist experienced in concussion, PCS, and degenerative brain disorders carrying and utilizing a full battery of cognitive, behavioral, and mood tests. This testing will likely cost $3,500.00. In my opinion, retired NHL players should be examined at the outset of the program and then should return for the same examination once every five years or when symptomatic.

140. A standard MRI with susceptibility weighted imaging with medial temporal lobe (hippocampus) volume averaging should also be a part of the baseline assessment. The MRI itself would cost approximately $2,350.00, and the professional radiology services for reviewing the MRI would cost approximately $260.00.

141. Blood work to assess Pituitary gland function, T-4, TSH, ACTH, cortisol, growth hormone, testosterone and the genetic marker apolipoprotein E should also be done and would cost approximately $1,140.00.

142. If this medical monitoring program were approved, Request for Proposals would be issued to regional hospitals or centers across the United States and Canada to provide the described tests by the medical personnel described within the range of costs described. It is well known that such centers would include, but not be limited to, tertiary institutions (i.e., teaching hospitals or trauma centers).

143. Moreover, prior to the initial appointment of each retired NHL player, the NHL would facilitate the transfer of the files and data maintained by the NHL (such as baseline and post-injury neuropsychological testing) and respective Club Teams (such as files maintained by the Team’s athletic trainer(s)) reflecting the individual retired NHL player’s medical history, testing, and care to the physician conducting the medical monitoring program.

144. The tests and examinations to be conducted at each retired NHL player’s appointment(s) are described in detail below.
2. Neurological Assessment

145. The first component of the medical monitoring program is the neurological assessment, which should be performed by a board-certified neurologist or neurosurgeon specializing in concussions or CTE. The neurological assessment measures critical brain functions that can be adversely affected by head trauma, such as thought, balance, and vision.

146. The neurological assessment first includes a concussion history, a medical history with respect to conditions that may affect concussion recovery, and an assessment of current symptoms. In accordance with the consensus best practices, the retired NHL player would complete an intake sheet. Attached as Appendix D is an example of a concussion intake sheet that I use in my practice and I recommend for use here.

147. On the first page, the retired NHL player would list every single concussion they have ever had, the date of each concussion, and every single symptom they experienced for each concussion. For every symptom, the retired NHL player scores the symptom on a scale of 0 (not present) to 6 (severe). Based on that page, the physician scores the symptom load and score and determines not just how many previous concussions the patient had, but also how severe they were. This is important as a tool because not all concussions are equal and those with higher symptom scores, and those that last a long time, are of more concern.

148. On the second page, the retired NHL player would disclose conditions which affect concussion recovery and which will affect when the patient is truly asymptomatic. For example, if a patient has a history of migraines, the migraines may get worse from a concussion. However, the patient would be considered asymptomatic once the migraines were reduced back to the pain level, or baseline level, that preexisted the concussion. This is important as a tool to allow the physician to determine when the patient is asymptomatic as it relates to the concussions.

149. On the third page, the retired NHL player would disclose the symptoms they are experiencing on the day of presentment. While this third page lists the same symptoms as on the first page, the information sought is limited to that day’s symptoms. This is
important as a baseline to compare with in the future to determine whether symptoms have improved or completely resolved.

150. Next, the physician would conduct a complete neurological examination, which includes three keys parts that tend to have a great chance to show abnormalities.

151. First is the cognitive part, in which the physician tests memory, attention, and learning, all of which is tested in greater detail by the neurocognitive assessment tool described below.

152. The second part tests eye-tracking and vision and can be done using the King-Devick Test. Published studies show that deficiencies in saccadic eye movements can be an indicator of mTBI. Studies published in Neurology and the Journal of the Neurological Sciences have determined that post head-trauma related deficiency in the King-Devick Test is an indicator of mTBI or concussions. The King-Devick Test is based on the time needed to perform rapid number naming. The Test involves reading aloud a series of single digit numbers from left-to-right on three test cards as quickly as possible without making any errors. The King-Devick Test takes two minutes to complete. The cost of the Test is $1.75 per player for 1,000 players.

153. The third part tests balance and can be done using the Modified Balance Error Scoring System (BESS). Balance assessment or posturography integrates three systems in the body: somatosensory (i.e., and individual’s ability to determine touch, temperature, and their body’s position in space); visual (i.e., an individual’s ability to see movement); and vestibular (i.e., an individual’s ability to balance or maintain equilibrium). Concussed athletes have difficulty integrating information from the three components of the balance mechanism. The Zurich Consensus Statement provides that “postural stability testing provides a useful tool for objectively assessing the motor domain of neurologic functioning, and should be considered a reliable and valid addition to the assessment of athletes suffering from concussion, particularly where symptoms or signs indicate a balance component.”

114 K.M. Galetta et al., The King-Devick test as a determinant of head trauma and concussion in boxers and MMA fighters, 76 NEUROLOGY 17 (2011).
Modified BESS consists of two stances—standing on one leg and standing with one foot in front of the other—on a firm, foam surface. A study published in the Clinical Journal of Sports Medicine demonstrates that the Modified BESS provides reliable, objective information for clinicians. This test takes approximately five minutes to complete.

3. Neurocognitive Assessment (a/k/a neuropsychological testing)

154. The second component of the medical monitoring program is the neurocognitive assessment or neuropsychological (NP) testing performed by a neuropsychologist with specialized training in concussions or CTE. The NP assessment tests cognitive functioning or the thinking and reasoning parts of the brain (i.e., medial temporal and frontal lobes). The Zurich Consensus Statement confirms that “[t]he application of NP testing in concussion has been shown to be of clinical value and continues to contribute significant information in concussion evaluation.” The NP assessment should include a combination of paper-and-pencil and computer-based testing. The testing can be carried out by a trained technician. If the results are abnormal, however, the results would need to be interpreted by a neuropsychologist.

155. Standard pencil-and-paper NP tests have proven useful for identifying cognitive deficits resulting from concussions. The tests are designed to assess various domains of cognitive functioning such as short-term memory, working memory, attention, concentration, visual spatial capacity, information processing speed, and reaction time. The tests assist in quantifying the severity of the brain injury. The paper-and-pencil tests take approximately one hour to administer and complete. The standard tests that would be used include:


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<th>Neuropsychological Domains Examined and Tests</th>
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<tr>
<td><strong>Domain</strong></td>
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<td>Effort/Symptom Validity</td>
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<td>Estimated Premorbid Intelligence</td>
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<td>Attention and Psychomotor Speed</td>
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156. The NP testing should include a mood and behavioral evaluation. The assessment of mood and behavioral functioning would include: the *Hamilton Depression*
Rating Scale and the Columbia Suicide Severity Rating Scale, both structured interviews; and the Brief Inventory of Executive Functioning – Adult Version, a paper and pencil rating scale that has a self-rating and an informant-rating, the latter to be completed by a spouse, significant other, adult child, friend, or other individual close to the retired NHL player when available. The neuropsychologist trained in concussions or CTE should conduct the interview, but may also be conducted by a neuropsychiatrist with similar training.

4. Blood and Urine Testing

157. Laboratory testing of blood and urine should also be included in any medical monitoring program. Such testing is used to assist in better diagnosis of a neurodegenerative disease, to better understand the disease process, and to monitor levels of therapeutic drugs.

5. MRI Testing

158. MRI testing of retired NHL hockey players’ brains should also be included in any medical monitoring program. Such testing is used to rule out other causes of symptoms (e.g., a brain tumor) similar to those symptoms of an individual suffering from a neurodegenerative disease.

6. Testing for Neurodegenerative Diseases

159. The aforementioned testing serves as effective differential diagnosis; many of the neurodegenerative diseases that NHL players are particularly susceptible to can only be diagnosed with medical certainty post-mortem, at the time of this declaration. For example, Alzheimer’s disease can only be definitively diagnosed post-mortem, though a doctor may be able to diagnose Alzheimer’s disease with reasonable medical likelihood based on the assessment of clinical symptoms and differential diagnosis, as demonstrated in the below chart.
Diagnosis of CTE, similarly, cannot yet be completed with absolute certainty unless tested post-mortem.

Further, differential diagnosis of CTE will often include

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117 Multiple avenues of research are presently being explored to find ways to either definitively diagnose CTE in vivo, or at least provide greater diagnostic precision in living
Alzheimers disease and frontotemporal dementia, as well as other, more rare forms of neurodegenerative disease such as Parkinson’s disease and amyotrophic lateral sclerosis (ALS). Testing for symptoms, signs, and in some cases images of these and other LTNDS currently allows one to make findings consistent with probable neurodegenerative disease, and allows one to move from a “possibility” of LTND, to a “probability” and thereby initiate more targeted clinical and diagnostic treatment. In the near future, it is hopeful that definitive diagnosis will be available in living patients, thereby providing greater certainty and flexibility in managing LTNDS.

VII. CONCLUSION

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: 11.9.16

ROBERT C. CANTU, M.A., M.D., FACS,
FAANS, FICS, FACSM

patients suspected to be suffering from LTNDS. Researchers at Mount Sinai are researching the use of PET scans with T807 ligands, to identify abnormalities in the brain structure, with promising initial results. See D. Dickstein et al., Structural MRI and Molecular PET Imaging (AV45 and AV1451) in the Diagnosis of Chronic Traumatic Encephalopathy In Vivo: Study of a Retired NFL Player, 86 NEUROLOGY 16, SUPPL. P4-046 (2016). Dr. Robert Stern of Boston University is currently in the nascent stages of a multi-year project, entitled “Diagnostics, Imaging, and Genetics Network for the Objective Study and Evaluation (DIAGNOSE) of Chronic Traumatic Encephalopathy (CTE),” which seeks to develop in vivo biomarkers for CTE and improve clinical diagnostic criteria. DIAGNOSE CTE Research Project, BOSTON U., https://www.bu.edu/cte/our-research/diagnose-cte-research-project/ (last visited June 30, 2016). Likewise, UCLA is exploring the use of [F-18] FDDNP to bind with tau proteins, which can thereby be detected on a PET scan and potentially reveal patterns of tau protein tangles consistent with CTE or other forms of LTND. See J.R. Barrio et al., In vivo characterization of chronic traumatic encephalopathy using [F-18] FDDNP PET brain imaging, 112 PROC. NAT’L ACAD. SCI. 16 (2015).
EXHIBIT “1”
CURRICULUM VITAE

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Co-Founder and Medical Director Sports Legacy Institute (SLI), Waltham, MA

EDUCATION:
1960  B.A.  University of California, Berkeley
1962  M.A.  University of California, San Francisco
1963  M.D.  University of California, San Francisco

PROFESSIONAL EXPERIENCE:
1963 - 1964  Intern in Surgery, Columbia-Presbyterian Hospital, New York, NY
1964 - 1967  Assistant Resident in Neurosurgery, Massachusetts General Hospital
1964 - 1967  Research Fellow in Physiology, Harvard Medical School
1967 - 1968  Chief Resident in Neurosurgery, Boston City Hospital
1967 - 1968  Teaching Fellow in Surgery, Harvard Medical School
1967 - 1968  Clinical Assistant in Neurosurgery, Massachusetts General Hospital
1968 - 1973  Clinical and Research Fellow in Neurosurgery, Massachusetts General Hospital
1968 - 1969  Assistant in Surgery, Harvard Medical School
1969 - 1973  Instructor in Surgery, Harvard Medical School
1968 - 1970  Acting Assistant Director Neurosurgery, Boston City Hospital
1968 - 1970  Director of Pediatric Neurosurgery, Boston City Hospital
1968 - 1973  Clinical Associate in Neurosurgery, Massachusetts General Hospital
1968 - 1970  Chief of Neurosurgery Service, Emerson Hospital, Concord, MA
1970 - 1995  Neurosurgical Consultant, Cutler Army Hospital, Fort Devens, MA
1970 - 1975  Neurosurgical Consultant, Nashoba Community Hospital, Ayer, MA
1976 - 1978  Chief of Neurosurgery Service, Nashoba Community Hospital, Ayer, MA
1979 - 1980  Chairman, Department of Surgery, Emerson Hospital, Concord, MA
1980 - 1993  Director, Service of Sports Medicine, Emerson Hospital, Concord, MA
1989 - 1991  Chairman, Department of Surgery, Emerson Hospital, Concord, MA
1989 - 1993  Medical Director, National Center for Catastrophic Sports Injury Research
1991 - 1993  Board of Trustees, Emerson Hospital, Concord, MA
1991 - 1993  Director, Emerson Health System, Inc.
1992 - 1993  President, American College of Sports Medicine
1994 - 1995  Clinical Instructor in Pediatrics, Boston University School of Medicine
1994 - Board of Trustees, National Operating Committee on Standards For Athletic Equipment (NOCSAE)
1996 - Vice-President, National Operating Committee on Standards for Athletic Equipment (NOCSAE)
1998 - 2000 Scientific Advisory Panel on Sports Medicine, Knoll Pharmaceutical Company
1998 - 2000 Advisory Committee for Injury Prevention, Centers For Disease Control, Atlanta, GA
2000 - Executive Committee Joint Section on Neurotrauma, Congress Neurological Surgeons/American Association Neurological Surgeons
2001 - Co-Chairman, NASCAR Safety Task Force, American College Sports Medicine, Indianapolis, IN
2002 - Editorial Board, Current Sports Medicine Reports
2002 - Editorial Board, American Journal of Medicine & Sports
2002 - Neurosurgical Consultant, Boston College Eagles football team
2003-2010 Neurosurgical Consultant, Boston Cannons professional Lacrosse team
2003 - Editorial Board Principal Sports, Neurosurgery
2003- Adjunct Appointment, Brigham and Women’s Hospital, Boston, MA
2004-2010 Chairman, Department of Surgery, Emerson Hospital Concord, MA
2005- Board of Directors, Massachusetts Brain Injury Association, Westborough, MA
2007- Medical Advisory Board of the State Boxing Commission, Boston, MA
2007 - Founding Member and Medical Director Sports Legacy Institute (SLI), Waltham, MA
2007 - Clinical Professor Neurology and Neurosurgery, Boston University School of Medicine, Boston, MA
2009 -2013 Co-Director Center for The Study of Traumatic Encephalopathy (CSTE), Boston University Medical Center, Boston, MA
2010 - Senior Advisor to NFL’s Head, Neck and Spine Committee
2010- Fellow of the American Association of Neurological Surgeons (FAANS)
2010 - Member/Co-Chair Equipment and Rules Committee, NFLPA Mackey/White TBI Committee
2010- Fellow American Association Neurological Surgeons
2012 - Adjunct Staff Department Neurosurgery, Senior Advisor Brain Injury Center Children’s Hospital Boston, Boston, MA
2013 - International Rugby Board Concussion Advisory Group – United Kingdom
2014- Clinical Diagnostics and Therapeutics Leader CTEC, member BUADC Executive Committee
2015- Medical Director and Director of Clinical Research, Dr. Robert C. Cantu Concussion Center, Emerson Hospital, Concord, MA
2015- USA Rugby Medical & Risk Committee sub-committee for Sports Concussion
2015- Institute of Sports Law and Ethics Board –Santa Clara University

SERVICE TO PROFESSIONAL SOCIETIES

NATIONAL SOCIETIES:

American College of Sports Medicine
Board of Trustees 1978 -
Ambassador 1988 –
President-elect American College of Sports Medicine, 1991 - 1992
President: American College of Sports Medicine, 1992 - 1993
Treasurer: American College of Sports Medicine, 1996 – 1999
Associate Editor: Medicine and Science in Sports and Exercise, 1986 - 1998
Associate Editor: Exercise and Sports Science Reviews, 1986 - 2000
Editorial Board: The Physician and Sportsmedicine, 1989 -
Editorial Board: Clinical Journal of Sports Medicine, 1991 -
American Association of Neurological Surgeons
Chairman, Sports Medicine Section, 1985 – 1988

American Medical Tennis Association
Board of Directors, 1984 – 1987

REGIONAL SOCIETIES:
New England Chapter, American College of Sports Medicine

Executive Committee: 1980 - 1982
President: 1981 - 1982
Board of Trustees: 1982 - (Chairman, 1983)

PROFESSIONAL CONSULTANT:
1983 - 1985 Advisory editor in sports medicine to The Collamore Press, Lexington, MA
1984 - Technical advisor, Milner-Fenwick Company, Baltimore, MD
1985 - Consultant, United States of America Amateur Boxing Federation, Inc.
1986 - Consultant, Exercycle Corporation, Woonsocket, RI
1986 - 1988 Consultant, Reebok Corporation, Avon, MA
1994 - Athletic Advisory Board, Hartwell Medical
1994 - 2000 Consultant, NordicTrack, Chaska, MN
2000- Executive Committee Joint Section on Neurotrauma, Congress Neurological Surgeons/American Association Neurological Surgeons
2002- Neurosurgical Consultant to Boston College Eagles football team
2003-2010 Neurosurgical Consultant to Boston Cannons professional Lacrosse team
2003 Principal – Sports Section, Neurosurgery
2003- NOCSAE Consultant to the NFL Concussion Committee
2004- Board of Directors, Massachusetts Brain Injury Association, Westborough, MA
2007- Medical Advisory Board of the State Boxing Commission, Massachusetts
2007 - Founding Member and Chairman Medical Advisory Board Sports Legacy Institute, Waltham, MA
2014 - International Rugby Board Advisory Board – United Kingdom

FELLOWSHIPS:
1975 Fellow, American College of Surgeons
1981 Fellow, International College of Surgeons
1981 Fellow, American College of Sports Medicine
2010 Fellow, American Association Neurological Surgeons (FAANS)

HONORS AND AWARDS:
California Scholastic Federation Award
Kraft Award (top twenty freshmen), University of California, Berkeley, 1956-57
Borden Research Award, 1963
Microcirculatory Travel Award, 1963
Candidate Group Prize, Massachusetts Chapter, American College of Surgeons, 1969
Honor Award in Medicine, New England Chapter, American College of Sports Medicine, 1987
Distinguished Service Award, American Association for the Improvement of Boxing, 1991
Rocky Marciano Medical Award, American Association for the Improvement of Boxing, 1995
Citation Award, American College of Sports Medicine, 1996
Special Citation Award, New England Chapter, American College Sports Medicine, 2002
Educator of the Year Award from the American Association of Professional Ringside Physicians 2004
Dr. Ernst Jokl Sports Medicine Award 2010 from The United States Sports Academy 2010
Community Clinician of the Year 2013 from The Middlesex Central District Medical Society and The Massachusetts Medical Society
ETHOS Award, Institute for Sports Law and Ethics, University of Santa Clara 2014
Wise Up! Pioneer “Grandfather of the Concussion Movement” Award 2014

LICENSES TO PRACTICE MEDICINE:
By written examination in California, 1963 #: 21223
By written examination in Massachusetts, 1964 #: 28386

SPECIALTY BOARD CERTIFICATION:
American Board of Neurological Surgery, 1970

MEMBERSHIPS:
Social Fraternities: Phi Kappa Psi
Nu Sigma Nu (President, Phi Chapter, 1962-1963)
Scholastic Fraternities California Scholastic Federation
Tower and Flame
Phi Eta Sigma
Phi Beta Kappa (junior year)
Alpha Omega Alpha

PROFESSIONAL SOCIETIES:
American Academy of Sports Physicians
American Association for the Advancement of Science
American Association for the Improvement of Boxing
American Association of Neurological Surgeons
American Association of Professional Ringside Physicians
American Association for the History of Medicine
American College of Angiography
American College of Sports Medicine
American College of Surgeons
American Federation of Clinical Research
American Heart Association
American Medical Association
American Physiology Society
American Society for Pharmacology and Experimental Biology
California (Medical) Alumni Society
Congress of Neurological Surgeons
International College of Surgeons
International Society for Pediatric Neurosurgery
Massachusetts Medical Benevolent Society
Massachusetts Medical Society
Microcirculatory Society
New England Neurosurgical Society
North American Spine Society
Presbyterian Hospital Alumni Society
Society of Military Surgeons
Society of Neuroscience
BACKGROUND SUMMARY

Currently Dr. Cantu’s professional responsibilities include those of Medical Director and Director of Clinical Research, Dr. Robert C. Cantu Concussion Center at Emerson Hospital in Concord, Massachusetts, Clinical Professor of Neurology and Neurosurgery, Clinical and Therapeutics Leader AD and Center for the Study of Traumatic Encephalopathy, Boston University School of Medicine, Boston, MA; Founding member and Medical Director Concussion Legacy Foundation (formerly SLI), Waltham, MA; Adjunct Professor Exercise and Sport Science and Medical Director National Center for Catastrophic Sports Injury Research, University of North Carolina, Chapel Hill, NC; Co-Director, Neurologic Sports Injury Center, Brigham and Women’s Hospital, Adjunct Staff Department Neurosurgery and Senior Advisor Brain Injury Center Children’s Hospital Boston, Boston, MA; Boston, Chief of Neurosurgery Service, Associate Chairman Department of Surgery, and Director of Sports Medicine at Emerson Hospital in Concord, Massachusetts, Neurosurgical Consultant Boston Eagles football team. He has authored over 415 scientific publications, including 32 books on neurology and sports medicine, in addition to numerous book chapters, peer-reviewed papers, abstracts and free communications, and educational videos. He has served as associate editor of Medicine and Science in Sports and Exercise and Exercise and Sports Science Review, and on the editorial board of The Physician and Sports Medicine, Clinical Journal of Sports Medicine, and Journal of Athletic Training. In 2003 Dr. Cantu became the section head for the Sports Medicine Section of Neurosurgery.

He grew up in the northern California community of Santa Rosa. In 1960, he received his B.A. degree from the University of California Berkley where he pitched on the varsity baseball team. Jointly, in medical school and graduate school, he received his M.A. degree in endocrinology in 1962, and in 1963, his M.D. from the University of California Medical School in San Francisco. Following a surgical internship at Columbia-Presbyterian Hospital in New York City in 1963-1964, he began a neurosurgery residency at Massachusetts General Hospital in Boston, and simultaneous position of research fellow in physiology at Harvard Medical School. Upon completion of his residency in 1968, he joined the neurosurgery staff at MGH, where his practice and laboratory were located, while assuming the position of acting assistant director of neurosurgery and director of pediatric neurosurgery at Boston City Hospital. After five years of academic neurosurgery with Harvard Hospitals, Dr. Cantu entered private neurosurgery practice at the suburban Emerson Hospital in Concord, Massachusetts where he currently serves as Chairman of Surgery, Chief Neurosurgical Service and Director Service of Sports Medicine.

In addition to his professional responsibilities, Dr. Cantu is medical director of the National Center for Catastrophic Sports Injury Research, located in Chapel Hill, North Carolina, an ongoing registry instituted in 1982 for data collection and analysis of spine and head injuries. From this data important contributions have been made in sport safety and accident reduction; most notably football rule changes concerning tackling and blocking with the head, the establishment of football helmet standards, improved on-the-field medical care, and coaching techniques. He also serves on the Board of Trustees as Vice President and chairman of scientific committee of NOCSAE (National Operating Committee on Standards for Athletic Equipment).

Dr. Cantu also is Co-Director of the Neurological Sports Injury Center at Brigham and Women’s Hospital in Boston, MA.

For many years, Dr. Cantu has been actively involved with the American College of Sports Medicine (ACSM), the oldest and largest sports medicine and exercise science organization in the world, and served as President of this organization from 1992 to 1993 and served as treasurer from 1996 to 1999. Dr. Cantu has received recognition from the college being named as the recipient of their Citation Award in 1996. This year Dr. Cantu gave the organizations most prestigious J.B. Dill Lecture on the History of Concussions at ACSMs annual meeting in New Orleans.

As spokesperson for ACSM, he has participated in nationally televised sports programs speaking on diverse sports issues and has appeared on “Larry King Live” discussing the Chris Benoit case in conjunction with Chris’ father Michael Benoit, “ESPN Outside the Lines” discussing the Chris Benoit case, Canadian Television also discussing the Chris Benoit case as well as other media avenues, “NFL Today” with Bryant Gumbel and Terry Bradshaw, discussing the effect of artificial turf on cervical spine injuries, and football injuries on CNBC’s “The Real Story”. He has been interviewed for World News Tonight with Peter Jennings, CBS Evening News with Katie Couric, Dan Rather, and NBC Evening News with Brian Williams regarding gender and concussion incidence. He has been a spokesperson for ACSM on NASCAR deaths and safety issues surrounding NASCAR and has been interviewed for “World News Tonight” with Peter Jennings regarding NASCAR deaths and specifically Dale Earnhardt’s death as well as safety issues in auto racing. Dr. Cantu also appeared on “ABC World News Tonight” with Bob Jamison regarding the Korey Stringer death from heat stroke as well as WGBH Channel 2 in Boston, NPR radio interview, WEEI Boston radio interview and ESPN’s “Outside the Lines”, all discussing the issue of heat stroke. He has discussed the health issues of football players with Mary Carillo on HBOs Inside the NFL and has done an interview regarding sports related injuries in cheerleading on Inside the NFL. Dr. Cantu has also been interviewed by Bob Costas on HBOs Inside the NFL regarding Concussion in Professional Sports and was the key speaker on Designer Steroids...
Dr. Robert Cantu, Curriculum Vitae 8 Revised July 2016

for Comcast Cable Network. Dr. Cantu is currently serving as the Consultant for NOCSAE to the NFL Concussion Committee and Co-Chairman for the NASCAR Safety Task Force with ACSM. Dr. Cantu has done safety presentations for drivers and teams of CART as well as NASCAR. Dr. Cantu has been interviewed by ESPN Outside the Lines Tom Friend regarding Baby Joe Mesi and his return to boxing after a controversial subdural hematoma. Dr. Cantu continues to be an outspoken advocate for the sport of boxing and continues to advocate for the safety of that sport and its participants. Recently Dr. Cantu has done several interviews on Concussion in the NFL with ESPN, HBO and the Boston area news channels. Dr. Cantu has recently been involved with the NFL meeting in NYC regarding concussions and guidelines for concussions with Roger Goodell. Most recently Dr. Cantu has appeared on Brian Williams Rock Center with Kate Snow discussing concussion issues.

As an author of numerous books as well as articles on sports medicine topics, he is frequently invited to participate in symposiums addressing a wide range of sports medicine topics including anabolic steroid use; eating disorders in female athletes; acute and chronic brain injury in boxing; and on-the-field evaluation and medical management and return to play guidelines following head and spine sports injuries. Dr. Cantu’s most recent book “Concussion and Our Kids” was released September 19, 2012 from Houghton Mifflin Harcourt.

He has served as a consultant to many scholastic and professional athletes on the return to collision sports after a head injury or spine injury, and is active speaking on a variety of health-related interests including the overall benefits of moderate regular exercise; the special health and exercise concerns of senior citizens; and sports safety issues with high school athletic trainers, coaches, students and parents. He currently serves as the Neurosurgical consultant to the Boston College Eagles Football team and served as the Neurosurgical consultant to the Boston Cannons professional Lacrosse team from 2003 to 2010. He recently was asked by the NFL Commissioner Roger Goodell to give two presentations at the NFL’s concussion meeting in Chicago.

Practicing what he preaches, Dr. Cantu has enjoyed long-distance running since 1967. An official entrant in many Boston Marathons, he has also enjoyed the “long runs” at Newport and New York City,. Besides running, Dr. Cantu is a serious tennis player, for many years ranked in the men’s senior singles in New England (NELTA) region. Dr. Cantu has two children, Rob and Elizabeth and a grandchild Jeremy and lives with his wife Tina in Lincoln, Massachusetts.
PUBLICATIONS: 415

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BOOK CHAPTERS


91. Montenigro PH, Sisniega DC, Cantu RC: Prevention of Sports-Related Concussion and Brain Injury:

REFFERED ARTICLES


33. **Cantu RC**: Oculomotor palsy with posterior communicating artery aneurysm: Outcome with carotid ligation versus medical therapy. *Inter Surg* 1969; 52:144-150.


42. Cantu RC, Hegsted DM: Comparison of cerebrovascular perfusion after ischemia in normal and atherosclerotic 
   10:229-232.
44. Price DL, Harris JL, New PFJ, Cantu RC: Cardiac myxoma; a clinicopathologic and angiographic study. *Arch Neurol* 
47. Wilkinson HA, Ferris EJ, Muggia AL, Cantu RC: Central nervous system tuberculosis; a persistent disease. 
   *J Neurosurg* 1971; 34:15-22.
49. Cantu RC, Snyder M: Effects of anticoagulants, vasodilators, and dipyridamole on post-ischemic cerebral vascular 
50. Cantu RC: Use and abuse of carotid angiography in assessing brain ischemia in cases of increased intracranial 
52. Cantu RC: A simplified technique of anterior spinal fusion using Methyl Methacrylate (Acrylic). *Inter Surg* 1974; 
   59:110-111.
55. Cantu RC: Guidelines to return to contact sports after cerebral concussion. *The Physician and Sportsmedicine* 
   1986; 14:75-83.
   17(10).


193. Currie DW, Comstock D, Fields SK, **Cantu RC**: A Paired Comparison of Initial and Recurrent Concussions Sustained by US High School Athletes Within a Single Athletic Season; *Head Trauma Rehabil*: DOI: 10.1097/HRO.0000000000000240.


**BOOKS**


3. Cantu RC: Health Maintenance Through Physical Conditioning

4. Cantu RC: The Exercising Adult

5. Cantu RC: Sports Medicine in Primary Care

6. Cantu RC: Diabetes and Exercise


8. Cantu RC: Regaining Health and Fitness


10. Cantu RC: Clinical Sports Medicine

11. Cantu RC, Butler RB, Moore MJ: Neurology in Primary Care


15. Mueller FO, Cantu RC, Van Camp SP: Catastrophic Injuries in High School and College Sports
    Champaign, IL, Human Kinetics, 1996.


17. Cantu RC: Neurologic Athletic Head and Spine Injuries

    Philadelphia, PA Mosby, Inc. 2002

    Philadelphia, PA Mosby, Inc. 2003


NON-REFEREED ARTICLES


ABSTRACTS AND FREE COMMUNICATIONS


20. **Cantu RC**: Discogenic disease: surgical and non-surgical approaches. 1987; ACSM Clinical Conference, Keystone, CO.


26. Ross SE, Guskiewicz KW, **Cantu RC**: Balance recovery following cerebral concussion in collegiate athletes. ACSM Clinical Conference, Baltimore, MD *MSSE* 2001; 33:S145.


SPORTS MEDICINE EDUCATIONAL VIDEOS

• Diabetes and Exercise
  Cantu, RC.
  Milner-Fenwick Company; 1984

• Sports Medicine and the Primary Care Physician
  Cantu RC, Siegel AJ, Childs HD.
  Network for Continuing Medical Education; 1990

  The preschool-sports physical, life-style modification in the well patient; special emphasis given to assisting physicians to help patients make life-style changes necessary to reap the benefits of regular physical activity.

• ACSM’s Guidelines for the Team Physician
  Cantu RC, Herring SA, Kibler WB, Micheli LJ, Puffer JC.
  Williams & Wilkins Electronic Media; 1992

  Cantu RC: “Athletic Head and Neck Injury”

• ACSM: 39th Annual Meeting
  Cantu RC, Jordan BD, Sennett BJ, Micheli LJ, Hainline B.
  CME Conference Video, Inc.; 1992

  Cantu RC, Jordan BD: “Sports Neurology”

• ACSM Sports Medicine CAQ Review
  Cantu RC, Stoller D, Saal J, Smith AD, Shoor S.
  CME Conference Video, Inc.; 1993

  Cantu RC: “Functional Anatomy & Biomechanics: Exam of the Patient with Low-Back Pain”

  Cantu RC: “Lumbar spinal stenosis: Dx and Management”

  Cantu RC: “Indications for Surgery and Return to Competition After Lumbar Spine Injury”

  Cantu RC: “Legal Aspects of Sports Medicine and Role of the Team Physician”

  Cantu RC: “Epidemiology, Recognition, and Acute Management of Closed Head Injury/Concussion”

  Cantu RC: “Return to Competition After Head Injury”

  Cantu RC: “Fractures and Dislocations of Cervical Spine”


  Cantu RC: “Case Presentations: Transient Quadriplegia”

• ACSM/Wyeth Ayerst Laboratories
  Spellbound Productions; 1994

  Cantu RC: “Cervical Spine Injuries”

  NATA
IN PRESS


2. Cantu RV, Cantu RC. Cervical Spine chapter for Lyle Micheli due October

3. Chapter on “Concussion” *Head Trauma and Brain Injury.*
RECENT LECTURE PRESENTATIONS

11.3.16  2016 Chronic Traumatic Encephalopathy Conference
          “History of Concussion & CTE”
          Metcalf Trustee Center Boston University
          Boston, MA

10.27.16  5th International Consensus Conference on Concussion in Sport
          Berlin, Germany

10.22.16  The Ultimate Concussion Conference
          “Why Children are at Greater Risk of Concussion:”
          Hollywood Beach Marriott
          Hollywood, FL

10.20.16  DRI Annual Meeting
          “Concussion Diagnosis and Management - The Past, Present and Future”
          Sheraton Boston Hotel and Hynes Convention Center
          Boston, MA

8.16.16   Virginia Tech Helmet Ratings Symposium
          Dulles Airport Marriott
          Dulles, VA

7.30.16   The Association of Ringside Physicians 2016 Annual Medical Seminar
          “Second Impact Syndrome”
          Monte Carlos Resort & Casino
          Las Vegas, NV

6.19.16   NOCSAE Summer Board Meeting
          SAC presentation
          “Definition of Concussion
          Sheraton Kansas City Hotel
          Kansas City

5.20.16   The 13th Annual Sports Concussion, Traumatic Brain and Spine Injury Conference
          “History of Medical Management of Sport-Related Concussion”
          The Joseph B. Martin Conference Center at Harvard Medical School
          Boston, MA

4.29.16   Sports Neuropsychology Society’s 4th Annual Sport Concussion Symposium
          “A Debate on the Relationship between Head Trauma and CTE”
          The Westin Houston, Memorial City Hotel
          Houston, TX

4.20.16   Carlisle for the Friends of the Carlisle COA
          “What You Should Know About Concussions Especially In Our Youth”
          Gleason Public Library
          Carlisle, MA

4.14.16   Hackley School
          “What You Should Know About Concussions Especially in Our Kids”
4.13.16  Hackley School
“Concussions, Athletics and Kids”
Tarrytown, NY

3.26.16  Oklahoma State University for Health Sciences
“How to Best Manage a Concussion”
Tulsa, OK

3.25.16  Oklahoma State University for Health Sciences
“How to Best Manage Concussion”
Tulsa, OK

3.3.16   USA Rugby Sports Medicine Symposium
“World Rugby Video Program-Team Approach to TX Concussions”
Aria Resort & Casino
Las Vegas, NV

1.28.16  NOCSAE Winter Board Meeting
SAC Presentation
Royal Palms
Phoenix, AZ

1.12.16  2016 NASCAR Summit
“How to Best Manage Concussion”
Daytona Beach, FL

1.8.16   Emerson Hospital Clinical Conference
“Why Children are at Greater Risk of Head Injury and How to Prevent Concussions”
Emerson Hospital
Concord, MA

12.10.15 National Center for Catastrophic Sport Injury Research (NCCSIR) Meeting
“How History of National Center for Catastrophic Sport Injury Research”
Rizzo Conference Center
Chapel Hill, NC

11.3.15  International State-of-the-Science (SoS) Meeting
“Clinicopathologic Phenotypes of Chronic Traumatic Encephalopathy: Distinct Traumatic Risk-Factors”
Booz Allen Hamilton headquarters
McLean, VA

10.30.15 The Twentieth Boston Sports Medicine Symposium
“Concussion Update”
Boston Marriott Hotel
Newton, MA

10.14.15 Targeted Evaluation & Active Management (TEAM) Approach to Treating Concussion
Beyond a “One Size Fits All” Approach

*10.28.15 Brok National Education Seminar
St. Julien Hotel
Boulder, CO
10.9-12.15 International Rugby Union Meeting
“What is Concussion? The Science of the Injury and How to Recognize it”
London, England

*10.7.15 Texas Lutheran University
Concussion Summit
Keynote Speaker: “Concussions and TBI”
Sequin, TX

10.6.15 Oak Foundation
Chapel Hill
N Carolina

10.4.15 Dr. Robert C. Cantu Concussion Center
“Importance of New Advances in Concussion Research, Early DX and TX”
310 Baker Ave
Concord, MA

*9.25.15 Concussion Retreat
Keynote Speaker: “Current Research: Concussion”
Ontario, Canada

*7.30.15 Concussion Forum
Keynote Speaker: “Prevention of Concussions”
Smyth County Hospital
Marion, VA

*7.30.15 Concussion Forum
Keynote Speaker: “Concussion: Past, Present and Future”
Smyth County Hospital
Marion, VA

*6.23.15 Concussion A National Challenge
Keynote Speaker: “Reducing the Incidence of Concussive and Sub-Concussive Head Trauma in
Football/Collision Sports”
Global Center for Health Innovation
Cleveland, OH

6.13.15 NOCSAE Summer Board Meeting
SAC presentation
Park Hyatt Chicago
Chicago, IL

6.12.15 NOCSAE Summer Board Meeting
SAC presentation
Park Hyatt Chicago
Chicago, IL

6.2.15 Concussion Prevention Meeting
“Why Youth Are At Greater Risk of Head Injury”
U Mass Lowell

6.2.15 Concussion Prevention Meeting
"Concussions in Professional Sports"
U Mass Lowell

5.26.15
SLI
"Historical Perspectives"
Waltham, MA

5.15.15
Children’s Hospital Sports Medicine Meeting
“Practice Like the Pros”
Martin Conference Room, Harvard Medical School
Boston, MA

*3.26.15
NEASM Annual Meeting
Keynote Speaker: “From Concussion to CTE, Myth, Fiction and Fact”
Central Connecticut State University
New Britain, CT

3.6.15
BIA of CT
“Management of Concussion: Yesterday, Today and Tomorrow”
“Workshop: Biomarkers currently being trialed for concussion, sub-concussive, post concussion syndrome and chronic traumatic encephalopathy”
Hartford, CT

2.27.15
Wise Up Initiative Conference
“Concussive and Sub-Concussive Trauma- How It Can Be Prevented/Minimized?”
Birmingham, AL

*2.26.15
Grand Rounds
University of Alabama Hospital
“One Update on Concussion and Sub-Concussive Trauma – Why The Pediatric Population Is At Greater Risk?”
Birmingham, AL

2.25.15
Project Play Summit Aspen Institute
Newseum
Panel Participant
Washington, DC

2.19-20.15
NFL/NFLPA Engineering Meeting
“Report on King Devick Test”
Indianapolis, IN

2.12-13.15
USA Rugby Meeting
“Short and Long Term Results of Repetitive Sub-Concussive and Concussive Head Injury”
Las Vegas, NV

1.23.15
USA Lacrosse Meeting
Baltimore, MD

1.20.15
NCAA Meeting
NYC

1.15-18.15
NOCSAE Meeting
SAC presentation
Phoenix, Arizona

1.11-12.15
Meeting with NASCAR
Charlotte, NC

11.24.14  Safe Sports Think Tank 2014
How do we advance the science of prevention?
“How do we develop Evidence to Inform Safe Play”
Washington, DC

11.21.14  NOCSAE Grant Reviews
Chapel Hill, NC

11.17.14  IRB World Rugby Conference and Exhibition’
“Concussion – Driving Cultural Change”
London, England

11.7.14   SAC Meeting
Atlanta, GA

11.4.14   International State-of-the-Science Meeting
“What NOCSAE and I have learned from 40 years of concussion research and helmet testing”
Booz Allen Hamilton headquarters
McLean, VA  22102

11.1.14   2014 ARP Annual Convention “Ringside Medicine: Back to the Basics”
“Post Fight Neurological Evaluation”
Vdara Hotel & Spa
Las Vegas, Nevada

10.30.14  SLI Awards Banquet
Introducing People

*10.24.14  French Rugby Federation
“Return to Play After Cervical Spine Injury”
Biarritz, France

10.23.14  French Rugby Federations
“Second Impact Syndrome Update”
Biarritz, France

*10.16.14  31st Annual BIA Colorado Conference
“Concussion Management: Yesterday, Today Tomorrow”
Colorado Convention Center
Denver, CO

10.14.14  NHL Presentation
“Concussion/Post Concussion Syndrome and CTE”
Boston, MA

10.8.14   Oakmeadow School
“ImPACT Testing and Concussion Management”
Littleton, MA

8.13.14   Western University
“Sport Safety and Accident Reduction, Including The Establishment of Helmet Standards”
“Treatment Outcomes, Signs and Symptoms and Contemporary Treatment Strategies”
London, ON, Canada
7.31.14 #C4CT Concussion Awareness Summit
“Current State of Sport Concussion”
United Nations Headquarters
NYC, NY

7.18.14 Third Annual Western Slope Sports Medicine Clinical Symposium
“Concussion Management – Yesterday, Today, Tomorrow”
Grand Junction, CO

7.15.14 Hit Count Meeting

6.20.14 NOCSAE Summer Meeting
SAC presentation
Boston, MA

6.5.14 Concord Rotary Club
“Why Youth Are At Increased Risk of Concussion”
Concord, MA

5.29.14 White House Concussion Summit
Washington, DC

5.23.14 11th Annual Sports Conference
“Practice Like Pros”
Martin Conference Center
Harvard Medical School
Boston, MA

5.16.14 9th Annual Brain Injury Rehabilitation Conference
“Update on Chronic Traumatic Encephalopathy”
“Management of Concussion in Student Athletes”
Liberty Station conference Center
San Diego, CA

5.8.14 New England Youth Concussion forum
“Concussion Past, Present, Future”
Gillette
Foxboro, MA

“Concussions: The Current Concussion Lessons We Have Learned”
Hilton Orlando at Lake Buena Vista Hotel
Orlando, FL

4.6.14 AMSSM
“Neurological Assessment and Concussion Management”
“Breaking Backbones: Diagnosis and Management of Spinal Fractures in Athletes”
Hyatt Regency New Orleans
New Orleans, LA

3.29.14 ARP Mid Term Board Meeting
Miami, FL

3.21.14 Mackey White TBI Committee Meeting
Waldorf Astoria, Orlando
Orlando, FL

3.17.14  Brain Injury Association of South Carolina
         “Short Term and Long Term Results of Repetitive Sub-Concussive and Concussive Head
         Injury”
         Columbia, SC

2.27.14  Press Conference
         “House Bill 5113, An Act Concerning Youth Athletics and Concussion”
         Hartford, CT

1.29.14  C4CT Concussion Awareness Summit
         “Long Term Consequences of Repetitive Brain Trauma: CTE and Neurodegeneration”
         United Nations
         NYC, NY

1.23.14-1.24.14  5th Annual USA Rugby sports Medicine Symposium
         “Short Term and Long Term Results of Repetitive Sub-Concussive and Concussive Head
         Injury”
         Las Vegas, NV

1.17.14  NOCSAE Winter Board Meeting 2014
         SAC Presentation
         Royal Palms
         Phoenix, AZ

1.9.14   NASCAR Meeting
         John Bobo, Steve O’Donnell, Jim Cassidy, Thomas Gideon, P.E., John Patalak, P.E.
         Daytona, FL

12.14.13  Beth Israel Deaconess Hospital
         “Risks for and Management of Patients with Concussions”
         Dedham Holiday Inn
         Dedham, MA

12.13.13  NCCSIR
         Chapel Hill, NC

11.25.13  Safe Sports Think Tank: Exploring the relationship between childhood sports-related
         concussions and long-term cognitive outcomes
         “What Should Parents Know About Short and Long-Term effect of Concussions, and Should
         Parents Limit Sports Activities For Children Who Have Suffered Multiple Concussions”
         Washington, DC

11.14.13  Press Conference
         Legislative Office Building
         Albany, NY

10.25.13  Boston Sports Medicine Symposium 2013
         “How to Reduce the Risk of Concussions and CTE in Collision Sports”
         Waltham Woods conference Center
         Waltham, MA

10.24.13  ARP Annual conference
         “Relationships Between CTE and Concussive Exposure in Contact Sports”
         Symposium: Concussion and Action Points
10.16.13  Annual Emerson Hospital Auxiliary  
“The Concussion Crisis: Where Are We Today?”  
Nashawtuc Country Club  
Concord, MA

10.4.13  Reading Hospital  
Grand Rounds  
“Concussion Crisis in Youth Sports”  
Thun/Janssen Auditorium  
West Reading, PA

9.26.13  Belmont Hill School  
“Concussion Update”  
Belmont, MA

9.17.13  Emerson Hospital Cooperator Dinner  
“The Concussion Crisis in 2013”  
Emerson Hospital  
Concord, MA

9.12.13  Fourth Annual Sports Law & Ethics Symposium  
“Concussion Update”  
Santa Clara, CA

*8.18.13  LA84 Foundation  
“The Concussion Crisis in Youth Sports”  
Los Angeles, CA

8.10.13  Massachusetts Coaches’ Association  
“Practice Like Pro’s”  
Worcester, MA

7.13.13  AOSSM 2013 Annual Meeting  
“Concussion in Sports”  
Sheraton Chicago Hotel & Towers  
Chicago, IL

6.28.13  NOCSAE Summer Board Meeting  
SAC report  
Fairmont Olympic Hotel  
Seattle, WA

5.17.13  10th Annual Sports-Related Conference on Concussion and Spine Injury  
“Cervicogenic Headache, Upper Cervical Spine”  
Martin conference Center at Harvard Medical School  
Boston, MA

4.24.13  Mackey-White TBI Committee Meeting  
Westin Grand Central  
New York, NY

4.11.13  New England Patriots Alumni Club, Inc.  
“Concussion Update”
CBS Scene, Patriots Place
Foxboro, MA

4.10.13
SLI Reception
Boston Harbor Hotel
Boston, MA

4.8.13
NOCSAE SAC Meeting
Westin Atlanta Airport Hotel
Atlanta, GA

3.22.13
8th Annual Brain Injury Rehabilitation Conference
“The Concussion Crisis-Later Life Consequences”
“Why We Need to Re-Think How Youth Sports Are Played”
Sheraton Carlsbad Resort
Carlsbad, CA

3.9.13
Second Matthew Gfeller Neurotrauma Symposium
“Are Professional Sports Athletes Different From the Rest?”
Chapel Hill, NC

1.27.13
NOCSAE Board Meeting
SAC Presentation
Fairmont Olympic Hotel
Seattle, WA

12.1.12
APR Winter Board Meeting
Atlantic City, NJ

11.16.12
NOCSAE Grant Meeting
Chapel Hill, NC

11.14.12
“Concussion and Our Kids”
Park School of Baltimore
Baltimore, MD

11.4.12
4th International Consensus Conference on Concussion in Sport
Writing Group
FIFA House
Zurich Switzerland

10.31.12 -
4th International Consensus Conference on Concussion in Sport
“The NFL and Brain Safety First Since Zurich 2008
11.4.12
FIFA House
Zurich Switzerland

10.27.12
Boston Sports Symposium
“Protecting the Athlete’s Brain”
Waltham Woods Conference Center
Waltham, MA

10.26.12
2012 Brain Trauma and the Athlete Conference
“Case Presentations and Discussion of Concussion, Post-Concussion Syndrome
And CTE”
The Conference Center at Bentley College
10.26.12  2012 Brain Trauma and the Athlete Conference
           “Graduated Return to Play and Academics”
           The Conference Center at Bentley College
           Waltham, MA

10.26.12  2012 Brain Trauma and the Athlete Conference
           “Pathophysiology and Biomechanics of Concussion, Head Injury, and
           Second Impact Syndrome”
           The Conference Center at Bentley College
           Waltham, MA

10.25.12  2012 Hit Count Symposium
           “Evidence of Dose-Related Brain Damage and Disease-Is there a Threshold?”
           Waltham, MA

10.13.12  Eighteenth Annual Brain Injury Symposium
           Keynote Speaker
           “Short and Long-term Consequences of Repetitive Head Trauma, Post Concussion
           Syndrome – CTE Chronic Traumatic Encephalopathy”
           JW Marriott Hotel
           Miami, FL

10.12.12  2nd Annual Conference Concussion in Athletics: From Brain to Behavior”
           “Consequences of “Ignorance & Arrogance” in accurate assessment of sport-related
           Concussions”
           Penn State University, PA

9.30.12   Cleveland Clinic Lou Ruvo Center for Brain Health
           “Chronic Traumatic Encephalopathy (CTE) Conference 2012”
           “CTE in the NFL: What Changes Have Been Made and What More Needs to be Done?”
           Frank Gehry – designed Keep Memory Alive Center
           Las Vegas, NV

8.15.12   St. Mary’s Healthcare
           Gloversville High School
           “Short and Long-term Consequences of Repetitive Head Trauma, Post Concussion
           Syndrome – CTE Chronic Traumatic Encephalopathy”
           Gloversville, NY

8.15.12   St. Mary’s Healthcare
           Amsterdam High School
           “Short and Long-term Consequences of Repetitive Head Trauma, Post Concussion
           Syndrome – CTE Chronic Traumatic Encephalopathy”
           Amsterdam, NY

7.19.12   Center for the Study of Traumatic Encephalopathy
           Presentation to President BU

6.14.12   NOCSAE Board Meeting
           NOCSAE Scientific Advisory committee Report to the Board
           Intercontinental Hotel
           Kansas City, MO
6.1.12 ARP Annual Meeting  
"Concussion and Head Trauma in Martial Arts"  
San Francisco Marriott Marquis  
San Francisco, CA

5.26.12 Congress AQMS 2012  
"Concussion Update 2012"  
Grenville-sur-la-Rouge  
Montreal Canada

5.18.12 Children’ Hospital Annual Sports Medicine Meeting  
Sports-Related Conference on Concussion and Spine Injury  
Joseph B. Martin Conference Center  
Boston, MA

5.11.12 Injuries in Football 2012  
"Head and Spine Injuries in Football: Concussion: Where are We Now"  
Andrews Institute  
Destin, FL

4.24.12 FC Stars of MA  
"Concussion Prevention"  
Nashawtuc Country Club  
Concord, MA

4.23.12 National School Board Association Meeting  
"Head Injuries"  
Boston Convention Center  
Boston, MA

4.18.12 NOCSAE Retreat  
Westin Atlanta Airport  
Atlanta, GA

4.13.12 Emerson Hospital Grand Rounds  
"Current Concepts and Future Trends in Concussion Evaluation, Management and Treatment"  
Assembly Room A/B  
Emerson Hospital  
Concord, MA

4.11.12 FC Stars of MA  
"Concussion Prevention"  
Nashawtuc Country Club  
Concord, MA

3.26.12 NFLPA Annual Meeting  
Mackey-White Traumatic Brain Injury Committee  
Marco Island Marriott  
Marco Island, FL

"Concussion Crisis in Professional Sports"  
Panelist  
Harvard Law School
Cambridge, MA

3.23.12 Parker Memorial DBP CME Program BU/BMC
“Youth Concussions: Diagnosis, Management Including Return to Play and Prevention”
Boston University School of Medicine
Boston, MA

3.21.12 FC Stars of MA
“Concussion Prevention”
Nashawtuc Country Club
Concord, MA

3.18.12 NHL Meeting
New York, NY

3.11.12 APR Meeting
JW Marriott
Indianapolis, IN

2.25.12 Professional Football Chiropractic Meeting
“Concussion Management: Short and Long-term Consequences of Mismanaging a Concussion”
Indianapolis, IN

2.25.12 Professional Football Chiropractic Meeting
“Catastrophic and Long-Term Outcomes After Traumatic Brain Injury”
Indianapolis, IN

1.28.12 LifeBridge Health Concussion Symposium
“Chronic Effects of Concussive Injury”
Sinai Hospital of Baltimore Zamoiski Auditorium
Baltimore, MD

1.25.12 Syracuse Neuroscience Grand Rounds
“Short and Long Term Consequences of Mismanaging a Concussion”
Upstate Medical University
Syracuse, NY

1.21.12 NOCSAE Board Meeting
SAC Report to Board of Trustees
Royal Palms
Phoenix, AZ

1.7.12 Eastern Athletic Trainers Association
“Concussion Update”
Copley Plaza
Boston, MA

12.10.11 Beth Israel Deaconess Hospital Core Curriculum Series
“Traumatic Brain Injury: From Concussions to More Severe Injuries”
Dedham Holiday Inn
Dedham, MA

12.9.11 Retired Men’s Association
“Concussion Update”
First Baptist Church
Sudbury, MA
12.5.11 Congressional Hearings Testimony
NOCSAE
Congress
Washington, DC

11.17.11 Hyannis Rotary Club Luncheon
“Concussion Crisis”
Hyannis Country Club
Hyannis, MA

11.14.11 NOCSAE Youth Football Helmet Meeting
Westin Atlanta Airport
Atlanta, GA

11.4.11 Boston Shoulder and Sports Symposium 2011
“Concussion Update”
Conference Center at Waltham Woods
Waltham, MA

10.28.11 2011 Brain Trauma and Athletic Conference
Boston University Center for the Study of Traumatic Encephalopathy
“Return to Play Guidelines and Step-by-step Clinical Recommendations”
Framingham Sheraton
Framingham, MA

10.27.11 APR Annual Meeting
“Chronic Traumatic Encephalopathy”
Omni Orlando Resorts Championship Gate
Orlando, FL

10.24.11 Harvard University Lunch Time Learning Talk
“The neurophysiological cascade of concussion and brain damage – what is going on in the
grey/white matter? Brain stem trauma – shearing/tearing – CNS damage from whiplash
direct blows
Murr Center, Harvard University
Boston, MA

9.26.11 2011 Boston Public Schools Advanced Concussion Training
“Concussion Management for Coaches”
Northeastern University
Boston, MA

9.22.11 Athletics Committee Williams College
“New Trends in Concussion Management”
Williams College
Williamstown, MA

9.22.11 Athletics Committee Williams College
“Concussion for Coaches and Trainers”
Williams College
Williamstown, MA

9.21.11 Grand Rounds Haywood Hospital
“Current Evaluation and Management of Concussion”
Henry Haywood Hospital
Gardner, MA

7.23.11 1st Annual USOC Sports Medicine Symposium
“Keynote Presentation: Current Concepts and Future Trends in Concussion Evaluation,
Management, and Treatment
Olympic Training Center
Colorado Springs, CO

7.17.11 ATSNJ 2nd Annual Sports Concussion Summit
“Keynote Presentation: Long-Term Effects of Concussion
Wyndham Princeton Forrestal Village
Plainsboro, NJ

6.17.11 NOCSAE Board Meeting
“Report of the Scientific Advisory Committee Meeting of 4.22.11
Carolina Inn
UNC Chapel Hill

6.4.11 2011 Jacksonville Concussion Summit
“Concussion Management in your Community”
Brooks Rehabilitation Hospital
Jacksonville, FL

5.28.11 Canadian Athletic Trainers Association Annual Meeting
“Chronic Traumatic Encephalopathy”
Banff, Alberta Canada

5.27.11 Sports-Related Conference on Concussion & Spine Injury
“How the NFL Has Become a Leading Concussion Advocate”
Fenway Park
Boston, MA

5.11 Sports Related Concussion and Cervical Spine Injury Symposium
“Everything You Wanted to Know About Sports Related Concussion:
Epidemiology/Incidence/Research”
Rust Auditorium – North Shore University Hospital
Manhasset, NY

5.6.11 Andrews Institute “Injuries in Football” Conference
“Concussion: More Than Just a Headache”
Destin, FL

4.30.11 Inaugural UNC Matthew Gfeller Center Sport-Related Neurotrauma Symposium
“Catastrophic and Long-Term Outcomes of TBI”
UNC Chapel Hill

4.30.11 Inaugural UNC Matthew Gfeller Center Sport-Related Neurotrauma Symposium
“Pharmacological Interventions and Return-To-Play After Spinal Injury”
UNC Chapel Hill

4.29.11 Head Injury Symposium: Stunts & Tumbling, Cheerleading and other female sports
“Keynote Message, The Latest on the Concussion Crisis”
Omni Parker House Hotel
Boston, MA

4.22.11 NOCSAE Scientific Advisory Committee Meeting
Westin Atlanta
Atlanta, GA

4.1.11 MMS and DPS Sports Concussion Symposium and State Laws
“Concussion Management and Prevention”
Mass Medical Society Conference Room
Waltham, MA

3.23.11 RI Primary Care Physicians Corporation
“Concussion Management – New Strategies”
Crowne Plaza
Warwick, RI

3.19.11 Massachusetts Neurology Society
“Traumatic Brain Injury – Pathophysiologic Mechanisms”
Newton Marriott
Newton, MA

2.26.11 Joint Commission on Sports Medicine and Science
“Boxing Policy/Legislation: How it Can Be Improved”
Philadelphia Convention Center
Philadelphia, PA

2.26.11 Joint Commission on Sports Medicine and Science
“Concussion Landscape”
Philadelphia Convention Center
Philadelphia, PA

2.25.11 NFL Players Association Mackie/White TBI Committee
“Concussion and the Role of the Helmet”
Conrad Hotel
Indianapolis, Indiana

02.02.11 39th Annual INS Meeting
“Chronic Traumatic Encephalopathy: Long-term Consequences of Repetitive Brain Trauma”
Boston, MA

1.14.11 Washington DC Children’s Hospital
National Forum on Youth Sport Concussion Taking Action State by State
“The Concussion Landscape”
Children’s National Medical Center
Washington, DC

1.11.11 Brigham Young University College of Life Sciences
Sports Concussion and Brain Injury Seminar
“Brain Injuries and Concussions”
Brigham Young University, Provo, UT
<table>
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<tr>
<th>Date</th>
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<tr>
<td>12.13.10</td>
<td>NFL Players Association Meeting</td>
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<td>Mackey-White TBI Committee Members</td>
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<td>Washington, DC</td>
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<td>12.8.10</td>
<td>NFL Meeting</td>
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<td>“NOCSAE: Current and future helmet standards”</td>
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<td>11.18.10</td>
<td>Retired Athletes Meeting</td>
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<td>Chapel Hill, NC</td>
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<td>11.10.10</td>
<td>Get aHead Workshop: Emerging Knowledge and Significance of Sports-Related Concussions</td>
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<td>“International Perspective On Concussions”</td>
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<td>Dartmouth-Hitchcock Medical Center</td>
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<td>Hanover, NH</td>
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<td>11.04.10</td>
<td>AAPRP Annual Meeting The Brain and Neck In Boxing and Related Sports</td>
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<td>“Concussion Definitions and Clinical Manifestations”</td>
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<td>Omni Orlando Resort at ChampionsGate</td>
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<td>Orlando, FL</td>
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<td>11.01.10</td>
<td>Hockey Concussion in Canada</td>
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<td>Hockey Concussion Education Project (HCEP) – an Independent Physicians’ Study –</td>
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<td>Presentation of findings – Press Conference</td>
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<td>InterContinental Toronto Centre – Ontario Room</td>
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<td>Toronto, Canada</td>
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<td>10.29.10</td>
<td>Boston Shoulder and Sports Symposium 15th Annual</td>
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<td>“Update Athletic Head and Neck Injuries”</td>
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<td>Mass Medical Society Conference Center</td>
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<td>Waltham, MA</td>
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<td>10.20.10</td>
<td>Ice Hockey Summit: Action on Concussions</td>
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<td>“Incorporating Hockey and Medical Knowledge with Action Items for Prevention”</td>
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<td>Mayo Clinic</td>
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<td>Rochester, MN</td>
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<td>10.13.10</td>
<td>Lincoln Sudbury Regional High School Sports Conference</td>
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<td>“Concussion in Sports Update”</td>
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<td>LSRHS Auditorium</td>
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<td>Sudbury, MA</td>
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<td>“Gender and Age Effects On Concussion”</td>
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<td>22nd Annual Ironman Sports Medicine Conference in Conjunction with the 2010</td>
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<td>Ford Ironman World Championships</td>
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<td>Royal Kona Resort</td>
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<td>Kailua-Kona, HI</td>
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<td>“Overview of Sports Related Concussion”</td>
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10.1.10  BU Second Annual Head Trauma in the Athlete Conference  
Massachusetts Medical Society Auditorium  
Waltham, MA

9.23.10  Emerson Hospital Youth Sports Injury Symposium  
Concussions in Sports  
Concord Carlisle High School Auditorium  
Concord, MA

9.22.10  New Hampshire Pediatric Society  
“Concussion Recognition, Management and Long term Sequellae”  
SERESC Conference Center  
Bedford, NH

9.15.10  Brigham and Women’s Hospital CORE Meeting  
“Head Injuries and Athletes and Return to Play”  
Brigham and Women’s offsite at Chestnut Hill  
Chestnut Hill, MA

8.21.10  Athletic Trainers Association of New Jersey Concussion Summit  
“Management of Concussion 2010”  
Philadelphia, PA

6.28.10  “Coaches and Concussion”  
Hooksett, NH

6.17.10  “Physical Fitness and Sports Medicine – Post Concussion”  
“Short and Long Term Consequences of Mismanaging Concussion”  
8th Annual Symposium on Men’s Health  
Mass Medical Society Headquarters  
Waltham, MA

6.12.10  United States Sports Academy  
2009 United States Sports Academy Ernst Jokl Sports Medicine Award Presentation  
To Dr. Robert Cantu  
Harvard University  
Cambridge, MA

5.18.10  Association of Chief Executives of Sport  
“Short and Long Term Consequences of Mismanaging Concussion”  
Antlers Hilton Hotel  
Colorado Springs, CO

The Seventh Annual Sports-Related Conference on Concussion & Spine Injury  
Presented by Brigham and Women’s Hospital  
Fenway Park  
Boston, MA

5.7.10  Keynote Speaker  
“Chronic Traumatic Encephalopathy”  
Neurology in the News  
The University of Toledo, Department of Neurology and Center for Continuing Medical
Education
Eleanor N. Dana Conference Center – University of Toledo
Toledo, Ohio

4.29.10  “Concussion in Sports Presentation at the CDC”
National Center for Injury Prevention and Control
Centers for Disease Control and Prevention
Atlanta, GA

4.26.10  “2010 Sports and Society Colloquium”
Brown University, Salomon Hall
Providence, RI

4.22.10  “Short and Long Term Consequences of Mismanaging an Athletic Concussion”
2010 Injuries in Football Course
Andrews Institute
Pensacola, FL

4.8.10   “Short and Long Term Consequences of Mismanaging Concussion”
Massachusetts General Hospital Neurosurgery Grand Rounds
Ether Dome, MGH
Boston, MA

4.7.10   “Short and Long Term Consequences of Mismanaging a Concussion”
Boston University Grand Rounds
Boston University School of Medicine Continuing Medical Education
Boston, MA

Is Football Bad for the Brain?
Forensic Scientific, Medical-Legal and Societal Aspects of Concussion Debate
The Cyril H. Wecht Institute of Forensic Science and Law

3.12.10  “Update on NFL Concussion Committee Experiences”
Is Football Bad for the Brain?
Forensic Scientific, Medical-Legal and Societal Aspects of Concussion Debate
The Cyril H. Wecht Institute of Forensic Science and Law

3.7.10   “Interactive Case Studies
Youth Sports Concussions: Education to Legislation
Kane Hall Rm 130
University of Washington Campus
Seattle, Washington

3.6.10   Keynote Speaker
“Chronic Traumatic Encephalopathy”
Youth Sports Concussions: Education to Legislation
Kane Hall Rm 130
University of Washington Campus
Seattle, Washington

2.18.10  “The Short and Long Term Consequences of Mismanaging Concussion”
Concussion and Mild Traumatic Brain Injury: Update 2010
CSM Annual Meeting
Omni San Diego Hotel
San Diego, CA

1.26.10
NFL Players Association Concussion Committee
Medical Committee
Breakers
Palm Beach, FL

1.9.10
“Concussions”
Eastern Athletic Trainers Association Annual Meeting
Marriott Copley
Boston, MA

11.10.09
“Managing Concussion”
Pediatric Brain Injury Conference – BIA-MA
Best Western Royal Plaza
Marlborough, MA

11.6.09
“Panel Discussion on TBI”
Partnership for Military Medicine Symposium
Omni Shoreham Hotel
Washington, DC

10.30.09
“Concussions”
Fourteenth Annual Boston Shoulder and Sports Symposium 2009
Conference Center
Waltham Woods, Waltham, MA

10.29.09
CNN - Lou Dobbs
“Testimony before U.S. House Judiciary Committee”
Time Warner Building – CNN Headquarters, NYC
New York, NY

10.29.09
“Testimony Before U.S. House Judiciary Committee – Hearing on Legal Issues Relating To Football Head Injuries”
Rayburn Building
Washington, DC

10.16.09
“Study of Traumatic Encephalopathy”
The American Association of Professional Ringside Physicians, Inc.
2009 Annual Medical Seminar
Mohegan Sun
Uncasville, CT

10.2.09
Welcoming Remarks
“Overview of Current Concussion Consensus Statements Including Zurich Conference”
Concussion and the Athlete
Boston University Medical Center School of Medicine Continuing Education
Gillette Stadium, Foxboro, MA

10.2.09
“Panel Discussion”
Concussion and the Athlete  
Boston University Medical Center School of Medicine Continuing Education  
Gillette Stadium, Foxboro, MA

10.2.09  
“Chronic Traumatic Encephalopathy and the Athlete – Update from the Center for the Study Of Traumatic Encephalopathy”  
Concussion and the Athlete  
Boston University Medical Center School of Medicine Continuing Education  
Gillette Stadium, Foxboro, MA

9.3.09  
“Traumatic Brain Injury in Sports: When Can the Athlete Return to Play?”  
XIV World Congress of Neurological Surgery of the WFNS  
Boston, MA

6.18.09  
“The Concussion Dilemma: Are We Headed in the Right Direction”  
60th NATA Annual Meeting and Clinical Symposia  
Henry B. Gonzalez Convention Center  
San Antonio, TX

5.27.09  
“Managing Sports Related Concussion in the Youth and Adolescent Athlete”  
American College of Sports Medicine Annual Meeting  
Seattle, WA

5.20.09  
“Overview of Sports Concussion Consensus Statements and Chronic Traumatic Encephalopathy”  
Brain Injury Association of New Hampshire 26th Annual Brain Injury and Stroke Conference  
Radisson, Manchester, NH

5.15.09  
“Playing with Post Concussion Symptoms: Alarming Rates and Prevalence”  
3rd Annual National Summit on Concussion and Other Sports Medicine Injuries  
Westin Hotel LAX  
Los Angeles, CA

5.15.09  
“What Should a Concussion Evaluation Consist Of”  
3rd Annual National Summit on Concussion and Other Sports Medicine Injuries”  
Concurrent Afternoon Session  
Westin LAX  
Los Angeles, CA

5.14.09  
Keynote Address:  
College Athletic Trainers’ Society  
2009 Spring Symposium for Athletic Trainers and Team Physicians  
The Orleans Hotel and Casino  
Las Vegas, Nevada

5.9.09  
“Concussion Management: Yesterday, Today and Tomorrow”  
Sanford Sports Medicine Symposium  
Sanford University South Dakota Medical Center  
Sioux Falls, South Dakota

5.9.09  
“Return to Play Issues Following Cervical Spine Injury”  
Sanford Sports Medicine Symposium  
Sanford University South Dakota Medical Center  
Sioux Falls, South Dakota

5.9.09  
“Catastrophic and Long Term Effects of Concussion”
Sanford Sports Medicine Symposium
Sanford University South Dakota Medical Center
Sioux Falls, South Dakota

5.9.09        “On-the-Field Management of the Concussed Athlete”
Sanford Sports Medicine Symposium
Sanford University South Dakota Medical Center
Sioux Falls, South Dakota

5.1.09        “Overview: Current Concussion Guidelines from the International Study Group”
6th Annual Sports Conference
BWH Hospital Conference
Fenway Park
Boston, MA

4.27.09        “Coaches Education Initiative”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

4.27.09        “Celebrity Athletes – Is Management the Same?”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

4.27.09        “Legal Case Discussion Sport and the Law”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

4.21.09        “Traumatic Brain Injury & Physiological Disorders Facing Athletes Post Performance”
Summit on Health of the Former Professional Athlete
LaQuinta Spa and Resort
Palm Springs, CA

4.13.09        “Pharmacological Interventions in Management of Spine Injuries”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

4.13.09        “Return to Play After Spinal Injury”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

4.13.09        “Spine Injuries and Contraindications to Participation in Collision Sports”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

4.5.09        “Current Concussion Classification and Return to Play Criteria”
First Annual Spring Current Concepts in Sports Related Concussions Symposium
Athletic Trainer Solutions
St. Paul Catholic High School
Bristol, CT

3.16.09  “Overview of Injury Types and Associated Complications”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

3.16.09  “Anatomy and Biomechanics of Spine Injuries in Sport”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

3.16.09  “Spine Injuries – Which Sports are at Greatest Risk and Why?”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

2.16.09  “Case Studies”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

2.16.09  “Parkinson’s Disease”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

2.16.09  “Chronic Traumatic Encephalopathy”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

2.16.09  “Post Concussion Syndrome”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

1.27.09  Press Conference
Chronic Traumatic Encephalopathy
In Association with the Super Bowl
Tampa, Florida

1.26.09  “Anatomical Dissection of the Brain”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

1.26.09  “Headaches in the Athlete”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC

1.26.09  “Epilepsy and Athletics”
Neurologic Head and Spine Injuries Semester Course Lecture
University of North Carolina – Doctorate Program Presentation
Chapel Hill, NC
1.26.09        “Stroke in Athletes”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC  

1.26.09        “Malignant Brain Edema and Second Impact Syndrome”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC  

1.26.09        “Intercerebral Hematoma”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC  

1.17.09        “Current Testing and Return to Play Issues/Guidelines – Zurich Update”  
London Hockey Concussion Summit  
London Hilton Hotel  
London, Ontario, Canada  

1.12.09        “Ionic and Metabolic Consequences of Concussion”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC  

1.12.09        “Athletic Head Injuries – Which Sports are at Greatest Risk and Why?”  
Neurologic Head and Spine Injuries Semester Course Lecture  
University of North Carolina – Doctorate Program Presentation  
Chapel Hill, NC  

1.9.09        “Post Concussion Syndrome and Traumatic Encephalopathy”  
Emerson Hospital Medical Staff Clinical Conference  
Emerson Hospital, Concord, MA  

1.6.09        “Post Concussion Syndrome and Traumatic Encephalopathy”  
Boston University Grand Rounds Presentation  
Boston, MA  

10.30-31.08        “Is Immediate Return to Play in the Same Game Ever Justified?”  
3rd International Conference on Concussion in Sport  
Hotel Zurichberg  
Zurich Switzerland  

10.18.08        “Pituitary Dysfunction in Professional Boxing and the National Football League”  
2008 Annual Medical Seminar, AAPRP  
Paris/Bally’s Resort & Casino  
Las Vegas, Nevada  

10.3.08        “Return to Boxing After Subdural Hematoma – When?”  
World Boxing Association Medical Seminar, 87th Annual Convention  
Hotel Barcelo Bavaro Palace  
Punta Cana, Dominican Republic
9.18.08  “Traumatic Brain Injury and Shaken Baby Syndrome”
14th International Conference Child Abuse Allegations: Separating Scientific Fact from Fiction
Riviera Hotel and Casino
Last Vegas, NV

7.24.08  “Preventive Aspects of Sports Concussion”
New Developments in Sports-Related Concussion Conference
Sheraton Station Square
Pittsburgh, PA

6.21.08  “Concussion in Sports”
New York State Public High School Athletic Association (NYSPHSAA)
Saratoga, NY

6.11.08  “Neurotrauma in Sports”
Symposium on the Prevention of Spinal Cord Injuries and Concussions in Hockey
Hockey Hall of Fame
Toronto, Canada

5.28.08  “Neuropsychological Assessment of the Concussed Athlete: Only One Piece of the Concussion Puzzle”
ACSM 55th Annual Meeting
Indianapolis, IN

5.9.08   “Concussion in Women Athletes”
2008 Sports Related Conference on Concussion and Spine Injury
Brigham and Women’s Hospital
Fenway Park
Boston, MA

5.3.08   “Concussion in Sports”
The Hill School
Pottstown, PA

5.1.08   “Concussion and High School Sports, Risks and Management”
Arlington High School
Arlington, MA

4.19.08  “Concussion in Sports: Does Gender Matter?”
The National Concussion Summit
Concussion in Sports: Advancing Health and Safety
Marriott Hotel
Marina del Rey, CA

4.18.08  “Concussion in Sports: Does Gender Matter?”
The National Concussion Summit
Concussion in Sports: Advancing Health and Safety
Marriott Hotel
Marina del Rey, CA

4.3.08   “Concussions and Sports”
Winchester High School
Winchester, MA
3.13.08        “Clinical Models for Concussion Management and Return to Play”
Fourth International Meeting on Minor Traumatic Brain Injury in Sports
Hotel Crystal, St. Moritz, Switzerland

3.8.08        “Concussions and the Sports Legacy Institute”
Joint Commission on Sports Medicine and Science 2008
New Orleans Hilton Riverside
New Orleans, LA

12.13.07        “Current Advances in Concussion Management/Traumatic Encephalopathy”
Grand Rounds
Brigham and Women’s Hospital
Boston, MA

11.29.07        “Concussion in Sports”
Two presentations to student assemblies
Concord Carlisle High School
Concord, MA

11.28.07        “Concussion and Sports”
Presentation for parents, coaches, trainers, nurses and physicians
Concord Carlisle High School
Concord, MA

11.26.07        “Chronic Traumatic Encephalopathy/Concussion”
Boston Medical Center Grand Rounds
Boston Medical Center
Boston, MA

11.29.07        “Update Baby Joe Mesi”
Medical Advisory Board Meeting
Massachusetts Boxing Commission
McCarthy Building
Boston, MA

11.29.07        “More Than Just a Bump on the Head”
Concord Carlisle High School Students Presentation
Two Presentations One hour each to student body
Concord, MA

11.28.07        “More Than Just a Bump on the Head”
Concord Carlisle High School Parents Presentation
Concord, MA

11.26.07        “Concussion and Sports Related Head Injury”
Neurosurgery/Surgery Grand Rounds
Boston University Medical Center
Boston, MA

11.15.07        “Joe Mesi Update”
AAPRP Annual Meeting
Intercontinental Hotel and Resort
San Juan, Puerto Rico
10/29/07  “Concussion in High School”
Woburn High School
Woburn, MA

10/26/07  “Concussion and Sudden Death: Coping With Two Crises”
Independent School Health Association Annual Meeting
New Canaan Country School
New Canaan, CT

9/27/07  “Concussions in High School”
Austin Prep School
Reading, MA

9/24/07  “The Concussion Crisis in Football”
U Mass Lowell Athletic Department Meeting
McGauvran Hall
Lowell, MA

9/17/07  “History of Concussion and Second Impact Syndrome”
New Hampshire Interscholastic Athletic Association
Annual Meeting
Courtyard by Marriott
Concord, NH

7/13/07  “Concussion/Brain”
The American Orthopedic Society for Sports Medicine Annual Meeting
TELUS Convention Center
Calgary, Canada

7/12/07  “Spine Instructional Course”
The American Orthopedic Society for Sports Medicine Annual Meeting
TELUS Convention Center
Calgary, Canada

6/1/07    The D.B. Historical Lecture
“The Evolution of Sports-related Concussion Recognition, Management and Prevention: The
Science, the Art and the Politics.”
Annual Meeting ACSM
New Orleans, Louisiana

5/5/07   “Concussion: How to make the diagnosis and Overview of Current Concussion Consensus
Statements”
Sports Specific Rehabilitation Program
High Performance Sports, Inc.
Peabody, MA

4/30/07  “Concussion Management and Diagnosis”
New England University Medical Department Seminar
New England University
Biddeford, ME

4/27/07  “Overview of Current Concussion Consensus Statement”
2007 Sports Related Conference on Concussion and Spine Injury
Fenway Park
Boston, MA

4.20.07  “Traumatic Encephalopathy Among NFL Players”
The Marriott Hotel
Los Angeles, CA

The National Concussion Summit: Concussion in Sports: The Under-Recognized Public Epidemic
The Marriott Hotel
Los Angeles, CA

4/18/07  “Argument to Ban Boxing – Analysis of Neurological Injury”
75th Annual Meeting of the American Association of Neurological Surgeons
Washington, DC

3/15/07  “Can the Recognition and Treatment of Hypopituitarism After mTBI Influence Post Concussion Syndrome”
Third International Meeting on Minor Traumatic Brain Injuries in Sports
St. Moritz, Switzerland

3/14/07  “How Many Concussion Are Too Many”
Third International Meeting on Minor Traumatic Brain Injuries in Sports
St. Moritz, Switzerland

12/8/06  “Cervical Spine Return to Play Issues”
ACSM - Advanced Team Physician Course
Omni Orlando Resort at Championsgate
Orlando, FL

12/8/06  “MBTI Return to Play Issues”
ACSM Advanced Team Physician Course
Omni Orlando Resort at Championsgate
Orlando, FL

11/9/06  “Concussion Management”
Acute Management of Mild Traumatic Brain Injury in Military Operational Settings
Department of Defense Meeting
Washington, DC

10/24/06  “A Case of Concussion in Pop Warner Football”
Playing It Safe
Brain Injury Association of Massachusetts Sports Injury Conference
Best Western Royal Plaza Hotel
Marlborough, MA

9/15/06  “Intracranial Bleeding in Boxing/The Joe Mesi Story Round 3”
American Association of Professional Ringside Physicians
2006 Annual Medical Seminar
Luxor Hotel and Casino
Las Vegas, NV

9/9/06        “Neurosurgery Head and Neck Injury Update”
Emerson Hospital Fall Sports Primer
Harvey Wheeler Community Center
Concord, MA

05/19/06      Case Presentations
Sports Related Concussion and Spine Injury Conference 2006
Brigham and Women’s Neurological Injury Center
Fenway Park
Boston, MA

05/13/06      “Management of Cervical Injuries and Related Disorders”
Sports Medicine and Football: The 2006 Perspective
AOSSM Meeting
Seminole Hard Rock Hotel and Casino
Hollywood, FL

05/12/06      Physical Examination Spine
Sports Medicine and Football: The 2006 Perspective
AOSSM Meeting
Seminole Hard Rock Hotel and Casino
Hollywood, FL

03/10/06      “Return to Boxing After Intracranial Hemorrhage”
USA Boxing Physician Symposium 2006
US Olympic Training Center
Colorado Springs, CO

03/10/06      “Acute and Chronic Brain Injuries in Boxing”
USA Boxing Physician Symposium 2006
US Olympic Training Center
Colorado Springs, CO

03/07/06      “Acute TBI Assessment and Secondary Prevention”
Armed Forces Epidemiological Board Meeting
Armed Forces Medical Intelligence Center
Fort Detrick Frederick, MD

02/24/06      “Evolution of the Understanding of Concussion”
Concussion in Youth Sports Summit
Brain Injury Association of New Jersey
Stadium Club at Giants Stadium
Rutherford, NJ

10/28/05      “PASSOR: Sub-Acute Assessment and Management: Grading Systems: Initial Symptom
Management: Second Impact Syndrome: When to Order Imaging”
American Academy of Physical Medicine and Rehabilitation
2005 Annual Assembly
Philadelphia Marriott Downtown
Philadelphia, PA
10/28/05  “PASSOR: Concussion/Mild Traumatic Brain Injury: Return to Play and Function Decision Making”
         American Academy of Physical Medicine & Rehabilitation
         2005 Annual Assembly
         Philadelphia Marriott Downtown
         Philadelphia, PA

10/27/05  “PASSOR: Vienna Conference Update and Future Decisions: Meet the Experts”
         American Academy of Physical Medicine & Rehabilitation
         2005 Annual Assembly
         Philadelphia Marriott Downtown
         Philadelphia, PA

6/25/05   “Catastrophic Spine Injury in American Football – effect of athlete education and rule change”
         1st World Congress on Sports Injury Prevention
         Holmenkollen Park Hotel
         Oslo, Norway

5/20/05   “What’s New in Concussion Research and Overview of Prague Concussion Consensus Statement”
         Brigham and Women’s 2nd Annual Sports Medicine Symposium
         Gillette Stadium
         Foxboro, MA

5/20/05   “NATA/AFCA Spearing in Football Task Force Recommendations”
         Brigham and Women’s 2nd Annual Sports Medicine Symposium
         Gillette Stadium
         Foxboro, MA

5/13/05   “Concussion in Sports”
         Mass Academy of Family Physicians Annual Meeting
         Fort Point Sheraton
         Leominster, MA

4/30/05   “Interesting Sport Medicine Cases of Concussion in Athletes”
         Concussion in Sports Conference
         Penn State University
         The Penn Stater Conference Center Hotel
         University Park, PA

4/29/05   “Concussion Classification: Scales and Categories”
         Concussion in Sports Conference
         Penn State University
         The Penn Stater Conference Center Hotel
         University Park, PA

3/10/05   “Catastrophic Spinal Injuries in Football”
         5th Annual Sports Medicine and Neurotrauma Review
         Portofino Bay Hotel
         Orlando, FL
3/10/05  “Management of Difficult Spine Cases In Athletes”
5th Annual Sports Medicine and Neurotrauma Review
Portofino Bay Hotel
Orlando, FL

3/12/05  “When to Retire After a Concussion”
5th Annual Sports Medicine and Neurotrauma Review
Portofino Bay Hotel
Orlando, FL

3/12/05  “Can Second Impact Syndrome Be Eliminated?”
5th Annual Sports Medicine and Neurotrauma Review
Portofino Bay Hotel
Orlando, FL

3/12/05  “Recommendations from 2004 NATA Position Statement”
5th Annual Sports Medicine and Neurotrauma Review
Portofino Bay Hotel
Orlando, FL

3/12/05  “2004 Prague International Concussion Conference Consensus Statement”
5th Annual Sports Medicine and Neurotrauma Review
Portofino Bay Hotel
Orlando, FL

3/15/05  “Concussion, Head and Neck Injuries”
Spring Sports Primer
Emerson Hospital/Harvey Wheeler Community Center
West Concord, MA

2/9/05  “Alanto-Occipital Dislocation – A Largely Preventable Previously Fatal Injury”
Motorsports Safety Conference
American College of Sports Medicine Team Physician Pre Conference Course
Hyatt Regency on the Boardwalk
San Antonio, TX

11/5/04  “National Football League (NFL) and NCAA Football Study”
IIHF Meeting
Second International Symposium on Concussion in Sport
Prague, Czech Republic

11/6/04  “How can we prevent diffuse brain swelling/SIS in children?”
IIHF Meeting
Second International Symposium on Concussion in Sport
Prague, Czech Republic

11/6/04  “When Should an Athlete Retire Following Concussion”
IIHF Meeting
Second International Symposium on Concussion in Sport
Prague, Czech Republic
9/23/04  “Primary Care Management of Closed Head Injuries”
Southboro Medical Group Meeting
Southboro, MA

7/18/04  “Concussion Guidelines - Current Status”
University of Pittsburgh Medical Center
New Developments in Sports – Related Concussion
The Westin Convention Center
Pittsburgh, PA

6/24/04  NFL Meeting
NFL Headquarters
New York, NY

6/16/04  Press Conference
“Position Statement on Sports – Related Concussion”
National Athletic Trainers Association Annual Meeting
Baltimore, MD

5/22/04  “Diffuse Brain Injuries”
The William W. Backus Hospital Trauma Department
Athletic Injuries of the Head and Neck
Foxwood Resort Casino
Uncasville, CT

Sports Concussion and Spine Injury Conference
Brigham and Women’s Hospital
Fenway Park
Boston, MA

5/1/04  “Challenges In Identifying and Treating Sports Injuries”
2004 AANS Annual Meeting
Orlando Convention Center
Orlando, FL

4/6/04  “Concussions in the Active Child, Adolescent, and Young Adult: Current Concepts, New
Findings and Re-Education”
Massachusetts Medical Society Meeting
Waltham, MA

9/11/03  “Head Injury and the Risk of Alzheimer’s Disease and Depression
American Association of Ringside Physicians
Aladdin Hotel
Las Vegas, Nevada

7/4/03  “Effects of Dehydration on Race Car Drivers”
Daytona Pepsi 400 Race
Daytona International Speedway
Daytona Beach, Florida
6/21/03 “Cervical Spinal Stenosis – A Contraindication for Collision Sports”
International Academy for Sports Dentistry 2003 Annual Meeting
Caribe Hilton Hotel
San Juan, Puerto Rico

6/20/03 “Cerebral Concussion Controversies in Sports”
International Academy for Sports Dentistry 2003 Annual Meeting
Caribe Hilton Hotel
San Juan, Puerto Rico

5/30/03 “Emergency Care of the Spine Injured Athlete”
American College of Sports Medicine Annual Meeting
San Francisco Convention Center
San Francisco, California

5/30/03 “On-the-Field Management of the Spine-Injured Athlete”
American College of Sports Medicine Annual Meeting
San Francisco Convention Center
San Francisco, California

5/30/03 “Life After Football: History of Concussive Injuries, Onset of Neurologic Disorders, and Mental Health Issues in former NFL Players”
American College of Sports Medicine Annual Meeting
San Francisco Convention Center
San Francisco, California

5/9/03 “Athletic Head and Spine Injuries and Return To Play Decisions”
3rd Annual Legacy Neurosurgery Symposium
Legacy Good Samaritan Hospital
Portland, Oregon

4/29/03 “Challenges in Identifying and Testing Sport Injuries”
American Association of Neurological Surgeons Annual Meeting
San Diego, CA

Texas ACMS Annual Meeting
Omni Houston Hotel Westside
Houston, Texas

1/16/03 “ACSM Motorsports Taks Force Committee Report”
International Council Motorsports Sciences
Mirage Hotel
Las Vegas, Nevada

2/7/03 “Brain Fatalities in American Football Over the Last 55 Years”
3rd Annual Neurotrauma and Sports Medicine Review
Grand Floridian Hotel
Orlando, Florida

2/7/03 “Interesting Sports Medicine Cases: A Potpourri of Head and Spine Cases”
3rd Annual Neurotrauma and Sports Medicine Review
2/7/03  “Ongoing Concussion Controversy”
3rd Annual Neurotrauma and Sports Medicine Review
Grand Floridian Hotel
Orlando, Florida

2/8/03  “On-going Cervical-Spinal Stenosis Controversy”
3rd Annual Neurotrauma and Sports Medicine Review
Grand Floridian Hotel
Orlando, Florida

12/5/02  “Closed Head Injuries”
Thirtieth Annual Meeting Cervical Spine Research Society
Fontainbleu Hilton Hotel
Miami Beach, Florida

12/5/02  “On-the-Field Evaluation of Head Injuries”
Thirtieth Annual Meeting Cervical Spine Research Society
Fontainbleu Hilton Hotel
Miami Beach, Florida

9/26/02  “Concussion Guidelines and Return to Play Criteria”
Greater New York State Orthopedic Association
Saratoga, N.Y.

7/20/02  “Concussion in Sports Medicine”
New Developments in Sports Related Concussion
University of Pittsburgh School of Medicine
Pittsburgh, PA

6/19/02  “Concussion in Sports Medicine”
Sports Medicine Core Curriculum Series Harvard Medical School
Massachusetts General Hospital
Boston, MA

6/16/02  “Introduction to the Problem: The Grading Scale and RTP Dilemma”
National Athletic Trainers Association: Annual Meeting
Dallas, TX

6/5/02  “Concussion in Athletic Sports-Controversies Regarding Grading and Return to Play Guidelines”
Connecticut Athletic Trainers Association Annual Meeting
Trinity College
Hartford, Connecticut

6/1/02  “On-the-Field Evaluation of Head and Neck Injured Athletes”
American College of Sports Medicine: Annual Meeting
St. Louis, MO

5/31/02  “Prehospital Care of the Spine-Injured Athlete: A Critical Look at the Task Force Document”
American College of Sports Medicine: Annual Meeting
St. Louis, MO
5/31/02 “On-the-Field Evaluation of Head and Neck Injuries”
American College of Sports Medicine: Annual Meeting
St. Louis, MO

5/30/02 “The Pros and Cons of Neuropsychological Testing in Concussion”
“The Practical Use of Neuropsychological Testing: Clinically and in Research”
American College of Sports Medicine: Annual Meeting
St. Louis, MO

4/13/02 “Grading Scale for Concussion in Sports”
American Academy of Neurology
Denver, Colorado

2/16/02 “Overview of Concussion”
2nd Annual Neurotrauma and Sports Medicine Review
Alleghany Hospital, Pittsburgh, PA
Caribe Royale Resort Suites and Villas
Orlando, Florida

2/16/02 “Head Injury in Recreational Sports”
2nd Annual Neurotrauma and Sports Medicine Review
Alleghany Hospital, Pittsburgh, PA
Caribe Royale Resort Suites and Villas
Orlando, Florida

2/16/02 “Guidelines for Return to Competition after a Mild Head Injury”
2nd Annual Neurotrauma and Sports Medicine Review
Alleghany Hospital, Pittsburgh, PA
Caribe Royale Resort Suites and Villas
Orlando, Florida

11/3/01 “Panel Discussion: When to retire from sports”
European Sports Medicine Conference
Vienna, Austria

European Sports Medicine Conference
Vienna, Austria

10/1/01 “Neurosurgical Management of Athletic Injuries”
Congress of Neurological Surgeons 51st Annual Meeting
San Diego, California

10/1/01 “On-the-Field Management of Head and Neck Injuries”
Kerlin Jobe Clinic
Los Angeles, California

7/28/01 New Developments in Sports Related Concussion
“Models of Concussion Management: Current Models of Concussion Management: Where Are We Headed?”
University of Pittsburgh School of Medicine Center for Continuing Education
Education in the Health Sciences, Department of Orthopedic Surgery, UPMC Health System Center for Sports Medicine, Western Psychiatric Institute and Clinic
Hilton Hotel, Pittsburgh, PA

6/8/01 “Second Impact Syndrome”
Manitoba Public Insurance and the Workers Compensation Board of Manitoba Continuing Medical Education Guest Speakers Series
Winnipeg, Canada

6/8/01 “Return to Play After Concussion”
Manitoba Public Insurance and the Workers Compensation Board of Manitoba Continuing Medical Education Guest Speakers Series
Winnipeg, Canada

6/8/01 “Concussion Grading Systems”
Manitoba Public Insurance and the Workers Compensation Board of Manitoba Continuing Medical Education Guest Speakers Series
Winnipeg, Canada

6/8/01 “Biomechanical and Pathophysiology of Head Injury”
Manitoba Public Insurance and the Workers Compensation Board of Manitoba Continuing Medical Education Guest Speakers Series
Winnipeg, Canada

6/8/01 “Overview of Concussion”
Manitoba Public Insurance and the Workers Compensation Board of Manitoba Continuing Medical Education Guest Speakers Series
Winnipeg, Canada

Manitoba Public Insurance and the Workers Compensation Board of Manitoba Continuing Medical Education Guest Speakers Series
Winnipeg, Canada

5/31/01 “On-the-Field Evaluation of Head and Neck Injuries”
American College of Sports Medicine Annual Meeting
Baltimore Convention Center
Baltimore, Maryland

5/31/01 “Return to Play Decisions Following Concussion: Controversies and Dilemmas”
American College of Sports Medicine Annual Meeting
Baltimore Convention Center
Baltimore, Maryland

5/30/01 “NASCAR Deaths: Were they preventable”
American College of Sports Medicine Annual Meeting
Baltimore Convention Center
Baltimore, Maryland
5/19/01  “Concussion: It’s Effect Upon the Brain”
Salem Sports Medicine Conference Head and Neck Injuries in Athletes
Colonial Sheraton
Lynnfield, Massachusetts

5/7/01  “On-the-Field Evaluation of Athletic Head and Spine Injury”
New York State Public High School Athletic Association
Carrier Circle Holiday Inn
Syracuse, New York

5/7/01  “Evaluation, Treatment and Return to Play Decisions Regarding Athletic Head and Spine Injury”
New York State Public High School Athletic Association
Carrier Circle Holiday Inn
Syracuse, New York

5/5/01  “Athletic Cervical Spine Injuries”
American Academy of Neurology 53rd Annual Meeting
Pennsylvania Convention Center
Philadelphia, PA

3/19/01  “NASCAR Deaths: Were they preventable”
Neurotrauma and Sports Medicine for the New Millennium
Department of Neurosurgery, Allegheny General Hospital
The Shadow Ridge Hotel and Conference Center
Park City, Utah

3/19/01  “Adult vs. Pediatric Athletic Spine Injuries: Management Issues”
Neurotrauma and Sports Medicine for the New Millennium
Department of Neurosurgery, Allegheny General Hospital
The Shadow Ridge Hotel and Conference Center
Park City, Utah

3/19/01  “Athletic Head and Spinal Cord Injuries”
Neurotrauma and Sports Medicine for the New Millennium
Department of Neurosurgery, Allegheny General Hospital
Park City, Utah

3/19/01  “On-the-Field Management of Athletic Head Injuries”
Neurotrauma and Sports Medicine for the New Millennium
Department of Neurosurgery, Allegheny General Hospital
The Shadow Ridge Hotel and Conference Center
Park City, Utah

3/19/01  “Overview of Concussion”
Neurotrauma and Sports Medicine for the New Millennium
Department of Neurosurgery, Allegheny General Hospital
The Shadow Ridge Hotel and Conference Center
Park City, Utah

12/2/00  “Second Impact Syndrome”
Sports Neurology Injuries of the Head and Spine
Hospital for Special Surgery, Burke Rehabilitation Hospital and the Weill Medical College of Cornell University
Uris Auditorium
New York, New York

11/18/00  “Catastrophic Football Head Injuries”
Southwest Chapter American College Sports Medicine 2000 Annual Meeting
Bahia Hotel
San Diego, CA

11/3/00  “Practical Management of Head Injuries and Concussion in Sport”
British Association of Sports and Exercise Medicine
Hilton Puckrup Hall
Tewkesbury, Gloucestershire England

9/16/00  “Diagnosis and Nonsurgical Treatment and Rehabilitation of Degenerative Cervical Conditions”
7th Annual Symposium New Hampshire Musculoskeletal Institute
Saint Anselm College, Manchester, NH

06/04/99  “On-The-Field Evaluation of Head and Neck Injuries”
American College of Sports Medicine: Annual Meeting
Washington State Convention and Trade Center
Seattle, Washington

06/03/99  “Concussion Symposium”
American College of Sports Medicine: Annual Meeting
Washington State Convention and Trade Center
Seattle, Washington

05/28/99  “Concussion: Mechanisms and Classifications”
Sports Related Concussions and Nervous System Injury Conference
Orlando Regional Healthcare System
Hotel Royal Plaza
Orlando, Florida

12/10/98  “Headaches”
Middlesex Community College Community Lecture
Bedford, Massachusetts

11/08/98  “Sports Related Concussion Controversies: Neuropsychological Aspects and Return to Play Issues:
Traumatic Brain Injury and Stroke Conference
Healthsouth Braintree Rehabilitation Hospital
Royal Sonesta Hotel
Boston, Massachusetts

06/06/98  “Examination of the Spine”
American College of Sports Medicine: Annual Meeting
Orange County Convention Center
Orlando, Florida
06/05/98  “Age, Ethical, Sociological, and Safety Issues in Boxing Especially as Regards Head Injury”
American College of Sports Medicine: Annual Meeting
Orange County Convention Center
Orlando, Florida

06/02/98  “Age in Boxing: Should there be an age limit”
XXVI FIMS World Congress of Sports Medicine
Orange County Convention Center
Orlando, Florida

05/15/98  “Return to Sports Criteria Following Concussion”
Innovative Symposia/Sports Related Concussion
Smithtown Sheraton
Long Island, New York

05/15/98  “Concussion Classification and Implementation”
Innovative Symposia/Sports Related Concussion
Smithtown Sheraton
Long Island, New York

05/08/98  “Fitness Over Forty and Fifty”
Lincoln-Sudbury Auxiliary Board Meeting
Pierce House, Lincoln

04/24/98  “The Concussion Controversy/Grading and Return to Play”
Sports Medicine Update ‘98 and NEACSM Spring Meeting
Sunrise/Mediplex, Concord, MA
Program Co-chair

04/07/98  “Living With Low Back Pain”
Emerson Hospital Community Lecture Series
Emerson Hospital
Concord, Massachusetts

03/17/98  “Head Injury in Sports”
Boston Medical Center
Department of Rehabilitation Medicine
Boston, Massachusetts

03/07/98  “Safety Issues In Boxing Regarding Head Injury”
Sports Related Concussion and Nervous System Injuries
Orlando Regional Healthcare System
Caribe Royale Resort
Lake Buena Vista, Florida

02/06/98  “Neurologic and Vascular Causes of Upper Extremity Problems
(Cervical Spine Stingers, Peripheral Nerve, Brachial Plexus, Thoracic Outlet)
American College of Sports Medicine’s Team Physician Course
San Diego Princess Resort
San Diego, California

02/06/98  “Cervical Spine Injury, Extra Axial Facet, Disk, Radicular Symptoms, and Transient Quadriparesis”
American College of Sports Medicine’s Team Physician Course
San Diego Princess Resort
San Diego, California
02/06/98  “Epilepsy and Sports Participation”
American College of Sports Medicine’s Team Physician Course
San Diego Princess Resort
San Diego, California

02/06/98  “Concussion: Definition, Classification, and Return to Play”
American College of Sports Medicine’s Team Physician Course
San Diego Princess Resort
San Diego, California

02/06/98  “Problems and Perils in On-field Management of Head and Neck Injury”
Hands-on Exam Workshop
American College of Sports Medicine’s Team Physician Course
San Diego Princess Resort
San Diego, California

02/06/98  “Physical Examination of the Cervical Spine”
Hands-on Exam Workshop
American College of Sports Medicine’s Team Physician Course
San Diego Princess Resort
San Diego, California

01/31/98  “Concussion/Closed Head Trauma/Convulsions”
Panel Discussion
The Jockey Club/Concussion and Head in Sport
The Gloucester Hotel
Harrington Gardens
London, England

01/30/98  “Concussion in Sport and the Second Impact Syndrome”
The Jockey Club/Concussion and Head in Sport
The Gloucester Hotel
Harrington Gardens
London, England

10/18/97  “The On-Field Management of Athletic Head and Spine Injuries”
ACC Keynote Address
New Zealand Sports Medicine Partners In Performance Conference
Millennium Hotel
Christchurch, New Zealand

10/18/97  “Second Impact Syndrome:”
ACC Keynote Address
New Zealand Sports Medicine Partners in Performance Conference
Millennium Hotel
Christchurch, New Zealand

10/17/97  “When To Return to Collision Sports After Concussion”
ACC Keynote Address: Tom Anderson Trust Lecture
New Zealand Sports Medicine Partners in Performance Conference
Millennium Hotel  
Christchurch, New Zealand

10/16/97  
“The Return to Sport After Cervical Spine Injury”  
Sports Physician Day  
New Zealand Sports Medicine Partners in Performance Conference  
Millennium Hotel  
Christchurch, New Zealand

10/14/97  
“Catastrophic Sports Injuries”  
New Zealand Sports Medicine Conference  
Hawkes Bay Chapter  
Hawkes Bay, New Zealand

10/14/97  
“Second Impact Syndrome”  
Grand Rounds Presentation  
Napier Hospital  
Napier, New Zealand

10/13/97  
“When to Return to Competition After Head and Spine Injury”  
New Zealand Sports Medicine Conference  
Whangarei, New Zealand

09/25/97  
“Athletic Head Injury Guidelines”  
New England American College of Sports Medicine: Fall Meeting  
Rhode Island Convention Center  
Providence, R.I.

05/22/97  
“Head Injury In Football”  
American College of Sports Medicine: Annual Meeting  
Denver, Colorado

05/01/97  
“Should There Be An Age Limit in Boxing”  
WBC: First Medical Conference on Boxing Safety  
Aruba

03/14/97  
“Head Injury in Boxing”  
Ringside Physician Course  
Colorado Springs, Colorado

02/10/97  
“Concussion Guidelines: Controversies and Implementation”  
Allegheny General Hospital Sports Medicine Meeting  
Caribe Royale Resort  
Lake Buena Vista, Florida

01/12/97  
“Neurological Injuries and the Athlete”  
Breakfast Seminar  
AANS 65th Annual Meeting  
Colorado Convention Center  
Denver, Colorado

11/22/96  
“Catastrophic Head Injury”  
Oklahoma Spine Institute  
Oklahoma City, Oklahoma
11/08/96  “Head and Face Protection for the Athlete”
New England American College of Sports Medicine: Fall Meeting
Boxboro, MA

10/26/96  “Ask the Experts”
Fitness and Beauty Cruise
Norwegian Cruise Line

10/23/96  “Weekend Warrior Woes”
Fitness and Beauty Cruise
Norwegian Cruise Line

10/22/96  “Exercise for Health versus Fitness”
Fitness and Beauty Cruise
Norwegian Cruise Line

10/02/96  “Head Injury and the Athlete”
Pediatric Day Conference
Waterbury, CT

06/01/96  “Boxing and Medicine”
American College of Sports Medicine: Annual Meeting
Cincinnati, OH

05/31/96  “On-the-Field Evaluation of Head and Neck Injuries”
Clinical Workshop
American College of Sports Medicine: Annual Meeting
Cincinnati, OH

05/31/96  “Positive and Negative Effects of Head Protection”
NCAA Colloquium
American College of Sports Medicine: Annual Meeting
Cincinnati, OH

05/29/96  “Management of Head and Neck Injuries”
American College of Sports Medicine: Annual Meeting
Cincinnati, OH

5/18/96  “Head and Neck Injuries in Sports:
Assessment in On-The-Field Management”
Sports Medicine For The Rheumatologist
American College of Rheumatology
Phoenix, AX

4/27/96  “Diffuse Brain Injuries”;
“Spinal Stenosis, Cord Neuropraxia, Transient Quadriplegia”;
“Athletic Injuries of the Head and Neck”
The William W. Backus Hospital Trauma Department Program
Foxwoods Resort Casino, CT

03/14/96  “Boxing Injuries”
Emory University School of Medicine
Summer Games: Sports Medicine Review
Atlanta, GA

02/09/96  “Concussion: Definition, Classification, and Return to Play”;
          “Epilepsy and Sports Participation”;
          “Cervical Spine Injury, Extra Axial Facet, Disk, Radicular
          Symptoms, and Transient Quadriplegia”;
          “Neurologic and Vascular Causes of Upper Extremity Problems
          (Cervical Spine, Stringers, Peripheral Nerve, Brachial Plexus, Thoracic Outlet)”;
          “Hands-on Workshop - Physical Examination of the Spine”
  American College of Sports Medicine: Team Physician Course - Part I
          San Diego, CA

01/27/96  “Strength Aerobics - The Next Stage in Personal Fitness”
          McKenzie Speaker
          Sports Injuries Update
          Lake Placid Sports Medicine Society Conference
          Lake Placid, NY

01/26/96  “Epidemiology and Pathophysiology of Athletic Head Injury”
          “Acute Assessment of Athletic Head and Neck Injuries”
          “Surgical Treatment of Athletic Head and Spine Injuries:
          Who can Safely Return to Competition”
          Sports Injuries Update
          Lake Placid Sports Medicine Society Conference
          Lake Placid, NY

01/25/96  “Athletic Neck and Cervical Spine Trauma”
          Albany Medical College
          Albany, NY

01/07/96  “Second Impact Syndrome”
          Eastern Athletic Trainers Association Annual Meeting
          Boston, MA

12/14/95  “Catastrophic Head and Neck Injury in Sports”
          “Evaluation of Current Guidelines for Head Injury in Sports”
          “General Spinal Stenosis in Contact Sports”
          The Rehabilitation Institute of Chicago
          Chicago, IL

11/09/95  “Strength Aerobics”
          Walden Rehabilitation & Nursing Center
          Concord, MA

10/23/95  “Weekend Warrior Woes: How to Avoid Exercise Injuries”
          Fitness and Beauty Cruise
          Norwegian Cruise Line

10/22/95  “Exercise for Health vs Fitness (How Much is Enough?)”
          Fitness and Beauty Cruise
          Norwegian Cruise Line
10/13/95
“Closed Head Injury”
“Transient Quadriplegia in Sports”
Together in College Health: Surviving and Thriving
Combined Annual Meeting: New York State Health Association and New England College Health Association
Tarrytown, NY

10/11/95
“Catastrophic Sports Injuries: Functional Spinal Stenosis”
“Sudden Death Syndrome”
Emerson Hospital Neurology Conference
Concord, MA

08/24/95
“Torso and Genitourinary Tract Injuries”
Medicine in the Last Frontier/Medical World Conference
Alaska

08/24/95
“A Team Physician’s Sports Medicine Bag”
Medicine in the Last Frontier/Medical World Conference
Alaska

08/21/95
“Sports Injuries in Young Athletes”
Medicine in the Last Frontier/Medical World Conference
Alaska

08/21/95
“How to Write a Precise Aerobic Exercise Prescription”
Medicine in the Last Frontier/Medical World Conference
Alaska

08/20/95
“Conditioning of Cardiovascular System: A Machiavellian Approach to Health”
Medicine in the Last Frontier/Medical World Conference
Alaska

06/14/95
“Guidelines for Return to Competition After Mild Brain Injury in Sports”
National Athletic Trainers’ Association
Indianapolis, IN

06/02/95
“On-The-Field Evaluation of Head and Neck Injuries”
Clinical Workshop
American College of Sports Medicine: Annual Meeting
Minneapolis, MN

05/23/95
“Trauma to the Head and Spine”
Connecticut Athletic Trainers’ Association
New Britain, CT

05/13/95
“Cervical Radiculopathy - Painless vs. Painful: A Conceptual Model and Management Approach”
1st Annual Combined Meeting - Puget Sound & Portland Spine Interest Groups
Seattle, WA

05/07/95
“Current Treatment Recommendations for Concussions and the Burner Syndromes”
Prevention and Management of High School Football Injuries
Salem Orthopedic Surgeons, Inc.
Waltham, MA

04/28/95
“Management of Sports-Related Spine Injuries”
Keynote Address
*Contemporary Management of Lumbar Spine Disorders*
The NeuroScience Institute at Mercy
Oklahoma City, OK

04/23/95
“Assessment of Acute and Repetitive Head Injuries”;
“Management of Cervical Injuries”
*Clinical Congress: Decision Making and Sports Injuries*
Braintree Hospital Rehabilitation Network
Randolph, MA

04/21/95
“Return to Play Criteria After Cervical Spine Injury”
“Cervical Spine Injuries Workshop: Case Studies and Discussion”
*Controversies in Decision Making: Neurological Sports Injuries*
University of Miami School of Medicine
Lake Buena Vista, FL

04/01/95
“Exercise for Health vs Fitness”
Mens Health Day
Emerson Hospital
Concord, MA

03/03/95
“Catastrophic Injury of the Brain and Spinal Cord”
*Ninth Annual Neurologically Impaired Individual Symposium*
St. Mary’s Hospital
Richmond, VA

02/21/95
“Head Injuries”
Department of Physical Medicine & Rehabilitation
*Resident Didactic Seminars*
Tufts University School of Medicine
Newton Wellesley Hospital
Natick, MA

02/15/95
“Chest and Abdominal Injuries”
*Sports Medicine: An In-Depth Review*
American Academy of Family Physicians
Dallas, TX

02/14/95
“Closed Head Injuries”
“Entrapment Neuropathies”
“Spine: History and Exam Skills Workshop”
*Sports Medicine: An In-Depth Review*
American Academy of Family Physicians
Dallas, TX

01/25/95
“Athletic Head and Spine Injuries: Recognition of
On-The-Field Care and Return to Play Guidelines”
Sports Medicine Symposium 1995
North Broward Medical Center
Pompano Beach, FL

“Guidelines for Return to American Football After an Episode of Transient Quadriplegia”
American Society for Testing and Materials Symposium on Safety in American Football
Phoenix, AZ

11/19/94  “Prevention, Treatment, and Return to Play Criteria for Head & Neck Injuries in Sports”
“ACSM and the Sports Medicine Professional”
Greater New York Regional Chapter American College-of-Sports Medicine
New York, NY

11/04/94  “When to Return to Contact Collision Sports After an Episode of Transient Quadriplegia”
New England Chapter American College of Sports Medicine
Boxborough, MA

09/14/94  “Spinal Stenosis”
Emergency Department Medical Staff Conference
Emerson Hospital
Concord, MA

06/11/94  “Assessment and Treatment of Traumatic Cervical Spine/Cord Injury”
“Guidelines for Return to Contact Collision Sports After Traumatic Cervical Spine/Cord Injury”
National Athletic Trainers Association Annual Meeting and Clinical Symposium
Dallas, TX

06/04/94  “On-the-Field Evaluation and Management of Head and Spinal Cord Injury”
American College of Sports Medicine: Annual Meeting
Indianapolis, IN

06/03/94  “Concussion: Management and Return to Competition”
American College of Sports Medicine: Annual Meeting
Indianapolis, IN

06/02/94  “Traumatic Fatal and Non-Fatal Catastrophic Sports Injuries”
American College of Sports Medicine: Annual Meeting
Indianapolis, IN

06/02/94  “Cervical Spinal Stenosis and Contact Sports”
American College of Sports Medicine: Annual Meeting
Indianapolis, IN

05/20/94  “Return to Sport After Head Injury”
“Head and Neck Injuries”
“The Preparticipation Examination”
Caribbean Sports Medicine Congress
Bridgetown, Barbados, WI
04/17/94  “Cerebral Concussion in Sport: Prevention and Management”
          Mild Brain Injury Summit National Athletic Trainers Association
          Washington, D.C.

03/23/94  “Neck Injuries: The Great Debate: Personal Experience and Perspectives of Our Experts”
          Panelist: Neck Injuries Workshop Case Studies and Discussion
          Controversies in Decision Making: Neurological Sports Injuries
          University of Miami School of Medicine and the Miami Project to Cure Paralysis
          Lake Buena Vista, FL

03/22/94  “Catastrophic Sports Injuries: Which Sports Are at Greatest Risk and Why”
          “When to Return to Contact/ Collision Sports After Head and Spine Injury”
          16th Annual Family Practice Review
          Bayfront Medical Center
          St. Petersburg Beach, FL

03/21/94  “When is it Safe to Return to Contact Sports?”
          Panelist: Head Injury Workshop - Case Studies and Discussion
          Controversies in Decision Making: Neurological Sports Injuries
          University of Miami School of Medicine and the Miami Project to Cure Paralysis
          Lake Buena Vista, FL

03/20/94  “Prevention of Sports-Related Neurological Injuries: Rules, Equipment, and Surfaces,“
          Moderator: Peripheral Nerve Injuries Workshop - Case Studies and Discussion
          Controversies in Decision Making: Neurological Sports Injuries
          University of Miami School of Medicine and the Miami Project to Cure Paralysis
          Lake Buena Vista, FL

03/12/94  “Acute and Second Impact Syndrome Head Injury”
          First Annual Ringside Physicians Course
          United States Amateur Boxing, Inc.
          Colorado Springs, CO

03/08/94  “Health Benefits of Physical Fitness,”
          Second Annual New Dimensions in Research Conference
          Mabon Securities Corporation
          Beaver Creek, CO

03/05/94  “Managing Head and Neck Injuries”
          Back Pain Society
          Danvers, MA

01/21/94  “Neck Injuries”
          Sport Med 94
          Toronto, Canada

01/21/94  “Head Injuries in Sport”
          The Tom Pashby Sport Safety Fund Lecture
          Sport Med 94
          Toronto, Canada
11/19/93  “When is it Safe to Return to Contact Sports After a Head Injury”
American Medical Tennis Association Omni Specialty Sports Medicine Update
Palm Springs, CA

11/18/93  “When is it Safe to Return to Contact Sports After a Cervical Spine Injury?”
American Medical Tennis Association Omni Specialty Sports Medicine Update
Palm Springs, CA

11/09/93  “The Female Triad: Disordered Eating, Amenorrhea, and Osteoporosis”
Community Health Education Program
Emerson Hospital
Concord, MA

09/06/93  “Head and Neck Injury”
XVth World Congress of Neurology
Vancouver, B.C., Canada
08/14/93  “Epidemiology, Recognition and Acute Management of Closed Head Injury/ Concussion”
   “Return to Competition After Head Injury”
   “Fractures and Dislocations of Cervical Spine”
   “Epidemiology, Evaluation and Treatment of Traumatic Spinal Cord Injury: Return to Competition”
   “Case Presentations: Transient Quadriplegia”

ACSМ CAQ Board Review Course for the Certification Examination
in Sports Medicine
San Francisco, CA

08/13/93  “Functional Anatomy & Biomechanics:
Examination of the Patient with Low Back Pain”
   “Lumbar Spinal Stenosis: Dx and Management”
   “Indications for Surgery and Return to Competition After Lumbar Spine Injury”
   “Legal Aspects of Sports Medicine and Role of the Team Physician”
   “On-field Management and Evaluation of Acute Spinal Cord Trauma”

ACSМ CAQ Board Review Course for the Certification Examination
in Sports Medicine
San Francisco, CA

06/11/93  “Case Studies: Epidemiology, Assessment, and Return to Play Criteria for Head Injuries in Sports”

National Athletic Trainers Association Annual Meeting and Clinical Symposium
Kansas City, MO

06/05/93  “Spinal Stenosis: Transient Quadriplegia and Football”

40th Annual Meeting American College of Sports Medicine
Seattle, WA

06/03/93  “Physician Continuing Medical Education and Opportunities”

Symposium: 40th Annual Meeting American College of Sports Medicine
Seattle, WA

05/20/93  “Where is Boxing in This Process?”

International Symposium on Head and Neck Injuries in Sports American Society for Testing and Materials
Atlanta, GA

05/14/93  “Sports Medicine in Primary Care”
   “Medical Coverage of Games and Events”
   “Legal Liabilities of the Team Physician”
   “How to Live Painlessly With Your Low Back Disorder”

Fourth Annual Sports Medicine Conference on the Beach Halifax Medical Center Family Practice Residency Program
Daytona Beach, FL

05/07/93  “Women’s Triad”
Conference Chairman
Eighth Annual Sports Medicine Update 93
Westford, MA
05/06/93  “Returning to Contact Sports After a Head Injury: Relative and Definite Contraindications”
Department of Pediatrics, Emerson Hospital
Concord, MA

04/15/93  “The Prevention and Treatment of Athletic Spine Injuries”
Grand Rounds
Nashua Memorial Hospital, NH

03/06/93  “Specific Problems and Pearls in Boxing”
“Indications for Surgery and Return to Competition After Lumbar Spine Injury”
Team Physician Course Parts II and III: American College of Sports Medicine
Orlando, FL

03/05/93  “Transient Quadriparesis (Symptoms, Pathomechanics, Work-up, Return to Play, Controversies, Case Presentations and Discussion)
(With Stanley A. Herring, M.D.)
Team Physician Course Part III: American College of Sports Medicine
Orlando, FL

03/04/93  “Brachial Plexus Injuries”
“Epidemiology, Recognition, and Acute Management of Head Injuries”
“Return to Play Criteria After Head Injury”
“Epilepsy and the Athlete”
Team Physician Course Part II and III: American College of Sports Medicine
Orlando, FL

03/02/93  “Toward a Lifetime of Family Fitness”
Health and Fitness in the 90’s
The Thoreau Club of Concord
Concord, MA

02/23/93  “Legal Liabilities of the Team Physician”
Omni Specialty Sports Medicine Update American Medical Tennis Association
Scottsdale, AZ

02/22/93  “Epilepsy and the Athlete”
Omni Specialty Sports Medicine Update American Medical Tennis Association
Scottsdale, AZ

01/29/93  “Catastrophic Sports Injuries: Which Sports are at Greatest Risk and Why?”
Southeast Regional Chapter: American College of Sports Medicine
Norfolk, VA

01/29/93  “Medical Risks of Boxing/Is Boxing a Sport?”
Southeast Regional Chapter: American College of Sports Medicine
Norfolk, VA

01/25/93  “Head and Spine Injuries in Athletes”
Chelmsford High School
Chelmsford, MA
01/23/93  “Head and Neck Injuries in Athletes”
Comprehensive Review Course in Sports Medicine
The College of Physicians and Surgeons
Department of Orthopaedic Surgery
Columbia University, New York
Barbados, West Indies

01/12/93  “Women’s Health Issues: Ask the Doctor”
Health and Fitness in the 90’s
The Thoreau Club of Concord
Concord, MA

12/23/92  “Overview of Head Injuries in the Athlete,”
St. Vincent Hospital Grand Rounds
Worcester, MA

11/18/92  “Head and Neck Injury Reduction in Football: A Sixty-Year Effort”
American Medical Tennis Association
Palm Springs, CA

11/13/92  “Low Back Pain: Etiology, Diagnosis, and Treatment”
“Spinal Cord Injuries”
American Academy of Family Physicians 6th Annual Family Practice Weekend & Sports Medicine Conference
Huntington, WV

11/10/92  “Exercise: What’s the Right Dosage for You?”
Health and Fitness in the 90’s
The Thoreau Club of Concord
Concord, MA

10/14/92  “Cervical Spine Injuries”
Australian College of Sports Physicians: National Annual Scientific Conference in Sports Medicine
Perth, Western Australia

10/13/92  “The Team Physician”
Australian College of Sports Physicians: National Annual Scientific Conference in Sports Medicine
Perth, Western Australia

10/12/92  “Catastrophic Sports Injuries”
Keynote Address
Australian College of Sports Physicians: National Annual Scientific Conference in Sports Medicine
Perth, Western Australia

10/06/92  “Signs and Symptoms of Anabolic Steroid Abuse”
Commonwealth of Massachusetts
Project Alliance Training Program
Burlington, MA
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<th>Date</th>
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<tbody>
<tr>
<td>08/22/92</td>
<td>“Back Injuries in Tennis Players”</td>
<td>Society of Tennis Medicine and Science</td>
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<td>Yale University</td>
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<td>New Haven, CT</td>
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<td>07/23/92</td>
<td>“Fitness for Good Health”</td>
<td>Concord Prison Outreach</td>
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<tr>
<td>06/05/92</td>
<td>“Serious Head and Neck Injury Reduction in Football - A 60-Year Effort”</td>
<td>New England Neurosurgical Society,</td>
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<tr>
<td>05/29/92</td>
<td>“Head Injury in Sports”</td>
<td>39th Annual Meeting American College of Sports Medicine</td>
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<td>05/28/92</td>
<td>“Team Physician Certification,”</td>
<td>39th Annual Meeting American College of Sports Medicine</td>
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<td>05/13/92</td>
<td>“Steroid Abuse in the Athlete”</td>
<td>Spring Symposium on Sports Medicine</td>
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<td>Milford Whitinsville Regional Hospital</td>
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<td>05/01/92</td>
<td>“The Anabolic Steroid Epidemic”</td>
<td>7th Annual Sports Medicine Update 92</td>
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<td>04/14/92</td>
<td>“Disc Herniation in the Athlete: When to Operate?”;</td>
<td>The National Sportsmedicine Conference 92</td>
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<td>“On-field Emergencies to the Spine and Neck”</td>
<td>Orlando, FL</td>
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<td>03/11/92</td>
<td>“Steroids - The Threat and Dangers,”</td>
<td>Assabet Valley Regional Vocational School</td>
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<td>Marlborough, MA</td>
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<td>02/26/92</td>
<td>“Lumbar Spinal Stenosis: Evaluation and Treatment”</td>
<td>Leominster Hospital Grand Rounds</td>
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<td>02/24/92</td>
<td>“Head Trauma in Adolescents”</td>
<td>Medical Student Education</td>
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02/02/92  “Sports Medicine-Sports Science: Bridging the Gap”;  
“Head, Neck, and Extraspinal Nerve Injury in Contact Sports”;
“Acute and Chronic Brain Injuries in Boxing and Other Collision Sports”;
“Return to Collision Sports After Athletic Cervical and Lumbar Spine Injury”
Third National Kaiser Permanente Sports Medical Conference
Snowbird, UT

01/13/92  “Steroids - The Threat and Dangers”
Marlborough High School Athletic Department
Marlborough, MA

12/14/91  “Epidemiology, Assessment, and Criteria for Return to Play in Cervical Spine Injuries”;  
“Epidemiology, Assessment, and Return to Play Criteria for Head Injuries in Sports”
Rehabilitation Sports Medicine IV: Injuries to the Head and Neck in Sports
Rehabilitation Institute of Chicago
Chicago, IL

12/04/91  “Steroids - The Threat and Dangers”
Sports Injury Symposium: The Massachusetts Interscholastic Athletic Association
Waltham, MA

11/22/91  “Anabolic Steroid Abuse in Athletics”
American Medical Tennis Association
Palm Springs, CA

11/21/91  “Catastrophic Sports Injuries in High School and College Sports”
American Medical Tennis Association
Palm Springs, CA

10/22/91  “Catastrophic Sports Injuries: Which Sports Are at Greatest Risk and What is Being Done to Reduce Injury”
Harvard Community Health Plan
Wellesley, MA

10/19/91  “Etiology, Biomechanics, Diagnosis, and Treatment of Athletic Low Back Pain”
University of Texas Health Center
Tyler, TX

10/18/91  “Etiology, Biomechanics, Diagnosis, and Treatment of Athletic Low Back Pain”
Tom Landry Sports Medicine Center
Dallas, TX

10/18/91  “Catastrophic Sports Injuries: Which Sports Are at Greatest Risk and What is Being Done to Reduce Injury”
Texas College of Osteopathic Medicine
Fort Worth, TX

10/17/91  “Catastrophic Sports Injuries: Which Sports Are at Greatest Risk and What is Being Done to Reduce Injury”
Texas A&M University
College Station, TX
10/17/91  “Etiology, Biomechanics, Diagnosis, and Treatment of Athletic Low Back Pain”
Texas Woman’s University
Houston Center, TX

10/10/91  “Head and Spine Injuries in Athletes’“
Maine Medical Center
Portland, ME

09/27/91  “Catastrophic Sports Injuries: Sports at Risk?”
Medical Staff Clinical Meeting
Emerson Hospital
Concord, MA

09/08/91  “Catastrophic Spinal Injuries in Scholastic Sports”
American Academy of Neurological and Orthopaedic Surgeons Fifteenth Annual Scientific Convention
Las Vegas, NV

09/07/91  “The Boxing Controversy: A Neurosurgeon’s Perspective”
American Academy of Neurological and Orthopaedic Surgeons Fifteenth Annual Scientific Convention
Las Vegas, NV

09/07/91  “When To Return to Collision Sports After Athletic Head and/or Cervical Spine Injury”
American Academy of Neurological and Orthopaedic Surgeons Fifteenth Annual Scientific Convention
Las Vegas, NV

09/06/91  “Catastrophic Spine Injuries in Scholastic Sports: Which Are at Greatest Risk and What is Being Done to Reduce Injury”
1991 Presidential Guest Lecturer
American Academy of Neurological and Orthopaedic Surgeons Fifteenth Annual Scientific Convention
Las Vegas, NV

07/27/91  “Low Back Pain: Etiology, Diagnosis, and Treatment”
The Burdenko Water and Sports Therapy Institute
Boston, MA

07/27/91  “Catastrophic Spine Injuries in All School Sports”
American Academy of Sports Physicians
Boston, MA

06/12/91  “Health Effects of Regular Exercise”
Concord Prison Outreach
Concord, MA

06/07/91  “Acute and Chronic Brain Injury in Contact Sports”; “Evaluation of the Athlete for Return to Sports After Concussion
Snake River Medical Forum
Lewiston, ID
06/01/91  “Boxing - A Historical Perspective”;
          “Professional Boxing - One Neurosurgeon’s Viewpoint”
          American College of Sports Medicine Annual Meeting
          Orlando, FL

05/31/91  “Criteria For Return to Play Following Cervical Injuries”
          American College of Sports Medicine Annual Meeting
          Orlando, FL

05/17/91  “Carotid Artery Stenosis”
          Medical Staff Clinical Scientific Meeting
          Emerson Hospital
          Concord, MA

05/07/91  “Sports Injuries”
          Milford Regional Hospital Grand Rounds
          Milford, MA

05/03/91  “When to Return to Competition after Head and Cervical Spine Injury”;
          “Anatomy, Biomechanics, Diagnosis, and Management of Athletic Low Back Pain
          Sixth Annual Sports Medicine Update 91
          Westford, MA

05/02/91  “Life-threatening Injuries to the Head and Neck”
          Minnesota Academy of Family Physicians
          Minneapolis, MN

          American Association of Neurological Surgeons
          New Orleans, LA

04/12/91  “Low Back Pain: Etiology, Diagnosis, and Treatment”
          National Sports Medicine Conference On The Beach
          Halifax Medical Center
          Family Practice Residency Program
          Daytona Beach, FL

03/26/91  “Recognition and Management of Head Injuries”;
          “Peripheral Nerve Entrapment”
          American College of Sports Medicine Team Physician Course
          Orlando, FL

03/24/91  “Cord and Peripheral Nerve”;
          “Spinal Stenosis: How to Evaluate”;
          “On-the-Field Management of Acute Spinal Cord Injury”
          American College of Sports Medicine Team Physician Course
          Orlando, FL

03/14/91  “Catastrophic Sports Injuries in High School and College Sports”
          Massachusetts Association for Health, Physical Education, Recreation and Dance,
          1991 Annual Convention
          Randolph, MA
02/11/91  “Anatomy and Biomechanics of Athletic Cervical Spine & Head Injury”;  
“Intraspinal and Extraspinal. Cervical Spine Injuries - Diagnosis and Management”  
Second National Kaiser Permanent Sports Medicine Conference  
Snowbird, UT

02/10/91  “Anatomy, Biomechanics, Diagnosis and Management of Low Back Pain”  
Second National Kaiser Permanent Sports Medicine Conference  
Snowbird, UT

02/01/91  “Spinal Stenosis: Identification and Therapy,”  
Medical Staff Scientific Meeting  
Emerson Hospital  
Concord, MA

01/10/91  “Lumbar Spinal Stenosis: Evaluation and Treatment/ Surgical Indications”  
Buffalo General Hospital Grand Rounds  
Buffalo, NY

01/10/91  “Diabetes and Exercise”  
Mercy Hospital Grand Rounds  
Buffalo, NY

01/09/91  “How to Live Painlessy With Your Low Back Disorder”  
South Town Physicians  
Blasdell, NY

12/04/90  “Feeling Fit for Life”  
Community Health Lecture Series  
Emerson Hospital  
Concord, MA

11/30/90  “Catastrophic Sports Injuries in High School and College Athletes”  
American Medical Tennis Association  
Palm Springs, CA

11/29/90  “Sports Medicine in Primary Care”  
American Medical Tennis Association  
Palm Springs, CA

11/26/90  “Neurologic Injuries: Assessment/Care at Scene of Injury”  
Littleton Fire Department - EMT  
Littleton, MA

11/17/90  “Epidemiology of Head Injuries in Sports and Return to Play Decision Making”  
Swedish Hospital Medical Center  
Spine Institute Fall Symposium  
Seattle, WA

11/16/90  “Epidemiology of Spinal Cord Injuries and Assessment of Intraspinal Injuries in Sports”  
Swedish Hospital Medical Center  
Spine Institute Fall Symposium  
Seattle, WA
11/07/90  “Steroid Abuse in the Athlete”;  
“Cranial and Cervical Injuries in Sports”  
Hahnemann. University School of Medicine  
Philadelphia, PA

11/03/90  “Sports Injuries to the Lower Extremities”  
Nurse Practitioner Associates for Continuing Education National Primary Care Conference  
Boston, MA

10/22/90  “Neurosurgical Athletic Injuries”  
Congress of Neurological Surgeons  
Los Angeles, CA

10/16/90  “Osteoarthritis Due to Sports-related Injuries”  
Framingham Union Hospital Grand Rounds  
Framingham, MA

10/12/90  “Sports Injuries and Low Back Pain”  
Bethany Medical Conference  
Bethany Medical Center  
Kansas City, KS

10/12/90  “Sports Injuries”  
Trinity Lutheran Hospital  
Kansas City, MO

10/11/90  “Prevention and Treatment of Catastrophic Sports Injuries”  
Kansas University Medical Center;  
Kansas City, MO

10/11/90  “Arthritic Low Back Pain”  
Topeka Veterans Administration Hospital  
Topeka, KS

10/11/90  “Low Back Pain - Management and Exercise of Diabetic Patients”  
Providence - St. Margaret’s Hospital  
Kansas City, KS

10/11/90  “How to Live Painlessly with Arthritic Low Back Pain”  
Shawnee Mission Medical Center  
Overland Park, KS

07/25/90  “Sports Medicine and Primary Care”  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH

07/24/90  “Anabolic Steroid Abuse in Athletics”  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH
07/23/90  “Catastrophic Sports Injuries in High School and College Sports”
Omni Specialty Sports Medicine Update American Medical Tennis Association
Waterville Valley, NH

07/14/90  “Management of Osteoarthritic Sports Injuries”
Health-in-Action Day
Stratton Mountain, VT

07/11/90  “Health Benefits of Exercise”
New England Correctional Center
Concord, MA

05/24/90  “Intracranial Athletic Cervical Spine Injury”
Symposium Co-chairman: Athletic Cervical Spine Injury
American College of Sports Medicine Annual Meeting
Salt Lake City, UT

05/24/90  “On-the-Field Evaluation of Head and Spine Injuries”
Clinical Workshop
American College of Sports Medicine Annual Meeting
Salt Lake City, UT

05/23/90  “Neck Pain - Soccer”
American College of Sports Medicine Annual Meeting
Salt Lake City, UT

05/23/90  “On-the-Field Evaluation of Head and Spine Injuries”
Clinical Workshop
American College of Sports Medicine Annual Meeting
Salt Lake City, UT

05/22/90  “Head Injuries in Sports: Biomechanics, Prevention, and Treatment”
Clinical Lecture
American College of Sports Medicine Annual Meeting
Salt Lake City, UT

05/07/90  Medical Resource for Breakout Medical Session
National Catastrophic Head/Spinal Cord Sports Injury Consensus Meeting
National Federation of State High School Associations
Kansas City, MO

05/04/90  “Catastrophic Sports Injuries”
Conference Chairman
Sports Medicine Update 90
Westford, MA

04/30/90  “The Athlete and the Neurosurgeon”
Breakfast Seminar Panel Chairman
American Association of Neurological Surgeons
Nashville, TN

04/23/90  “Diagnosis, Prevention, and Treatment of Athletic Spine Injuries”
Kaiser Permanente HMO
Holyoke, MA
04/18/90 “Burners/ Stingers /Cervical Spine Injuries”; “Concussions”
First Annual Sports Medicine Conference on the Beach
Haliifax Medical Center
Family Practice Residency Program
Daytona Beach, FL

04/06/90 “Sports Medicine: Bridging the Gap”
Penobscot Bay Medical Center
Rockland, ME

04/05/90 “Low Back Pain: Etiology, Diagnosis, and Treatment”
Eastern Maine Medical Center
Bangor, ME

03/30/90 “Cervical and Low Back Pain: Diagnosis and Treatment”
St. Vincent Hospital Family Practice Residency Program
Erie, PA

03/30/90 “Catastrophic Sports Injuries”
Hamot Family Practice
Erie, PA

03/30/90 “Low Back Pain: Etiology, Diagnosis, and Treatment”
Millcreek Community Hospital
Erie, PA

03/29/90 “Low Back Pain: Etiology, Diagnosis, and Treatment”
Aviation Country Club
Erie, PA

03/23/90 “Low Back Pain: Etiology, Diagnosis, and Treatment”
Hanscom Clinic - Hanscom Field Air Force Base
Bedford, MA

02/09/90 “Catastrophic Football Spine Injuries; 1977-1988”
Joint Section on Disorders of the Spine and Peripheral Nerves
American Association of Neurological Surgeons
Captiva Island, FL

02/03/90 “The Neurosurgeon and the Amateur Athlete”
Downeast Association of Physician Assistants Winter Conference
Bethel, ME

01/12/90 “Exercise for Health vs Fitness: How much is enough?”
Community Health Lecture Series
Emerson Hospital
Concord, MA

10/24/89 “Adolescents and Anabolic Steroids”
Pediatric Grand Rounds
Baystate Medical Center
Springfield, MA
10/17/89  “Prevention and Treatment of Spinal Injuries in Athletes”  
St. Francis Health Care Foundation Endowed Lecture Series  
St. Francis Hospital  
Poughkeepsie, NY  

10/04/89  “Steroids - The Threat and Dangers”  
Massachusetts Interscholastic Athletic Association, Inc Annual Sports Injury Conference  
Milford, MA  

09/23/89  “Indications/ Contra-Indications For Surgery in the Arthritic Patient”  
Health-in-Action Day  
Nova Scotia, Canada  

09/16/89  “Rehabilitation at Fitness Centers”  
Sponsored by Nautilus Sports Medical Industries, Inc.  
Vista International Hotel  
Elizabeth, NJ  

07/25/89  “Anabolic Steroid Abuse in Athletics”  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH  

07/24/89  “Catastrophic Sports Injuries in High School and College Sports”  
Omni Specialty Sports Medicine Update American Medical Tennis Association  
Waterville Valley, NH  

06/13/89  “Case Presentations”  
Monroe County Highland Hospital Grand Rounds  
Rochester, NY  

06/13/89  “Cervical and Low Back Spine”  
Monroe County Highland Hospital Grand Rounds  
Rochester, NY  

06/12/89  “Cervical and Low Back Spine”  
Sponsored by Monroe County Highland Hospital Physicians Assistants  
Pittsford, NY  

06/10/89  “Low Back Pain: Etiology, Diagnosis, and Treatment”  
Sheehan Memorial Hospital  
Buffalo, NY  

06/10/89  “Low Back Pain: Etiology, Diagnosis, and Treatment”  
Our Lady of Victory Hospital Grand Rounds  
Lackawanna, NY  

06/05/89  “Sports Medicine in Primary Care”  
Williamsville, NY  

06/05/89  “Sports Medicine in Primary Care”  
Niagara Falls Memorial Hospital  
Niagara Falls, NY
05/05/89  “Steroid Abuse in Athletics”
Sports Medicine Update 89
Westford, MA

04/28/89  “Cervical and Lumbar Osteoarthritis,”
St. Anne’s Hospital Grand Rounds
Fall River, MA

04/24/89  “Medical Management of Low Back Pain”
Hunt Memorial Hospital
Danvers, MA

04/12/89  “Nutrition and Exercise For the Senior Citizen”
Trinitarian Church
Concord, MA

04/10/89  “Prevention and Treatment of Athletic Spine Injuries”
Sponsored by Cooley Dickinson Hospital
Northampton, MA

03/17/89  “Chronic Low Back Pain”
St. John’s Hospital Grand Rounds
Lowell, MA

03/16/89  “Low Back Pain: Etiology, Diagnosis, and Treatment”
Mercy Hospital
Buffalo, NY

03/16/89  “Prevention and Treatment of Athletic Spine Injuries”
Millard Fillmore Hospital Grand Rounds
Buffalo, NY

03/15/89  “Low Back Pain: Etiology, Diagnosis, and Treatment”
Blasdell, NY

03/02/89  “Common Sports Injuries”
Youville Hospital
Cambridge, MA

02/24/89  “Catastrophic Sports Injuries”
6th Annual Office-Based Sports Medicine Conference
Sun Valley, ID
Sponsored by University of California School of Medicine at San Francisco

02/24/89  “When to Return to Contact Sports After a Concussion”
6th Annual Office-Based Sports Medicine Conference
Sun Valley, ID
Sponsored by University of California School of Medicine at San Francisco

02/24/89  “Athletic Low Back Pain”
6th Annual Office-Based Sports Medicine Conference
Sun Valley, ID
Sponsored by University of California School of Medicine at San Francisco
02/22/89  “Acute and Chronic Brain Injuries in Boxing and Other Collision Sports”
6th Annual Office-Based Sports Medicine Conference
Sun Valley, ID
Sponsored by University of California School of Medicine at San Francisco

02/22/89  “On-the-Field-Management of Athletic Head and Spine Injuries”
6th Annual Office-Based Sports Medicine Conference
Sun Valley, ID
Sponsored by University of California School of Medicine at San Francisco

02/08/89  “Osteoarthritis of the Lumbar Spine”
New Britain Hospital Grand Rounds
New Britain, CT

02/08/89  “Sports Medicine In Primary Care”
Stamford Hospital Grand Rounds
Stamford, CT

02/07/89  “Feeling Fit After Forty”
Community Health Lecture Series
Emerson Hospital
Concord, MA

02/03/89  “Osteoarthritis of the Lumbar Spine”
Harvard Community Health Plan
Braintree, MA

01/20/89  “Catastrophic Injuries in High School and College Athletes”
The Second International Symposium on the Prevention of Catastrophic Sports and Recreational Injuries to the Spine and Head
Toronto, Canada

01/19/89  “Head Injuries: The Experience in the United States”
The Second International Symposium on the Prevention of Catastrophic Sports and Recreational Injuries to the Spine and Head
Toronto, Canada

01/18/89  “Steroid Abuse in Athletics”
Sports Medicine Symposium Connecticut State Medical Society
Choate School
Wallingford, CT

01/17/89  “Catastrophic Sports Injuries”
Connecticut State Medical Society
Cheshire, CT

01/11/89  “Diagnosis and Treatment of Degenerative Cervical and Lumbar Spine Disease”
Henry Heywood Hospital Grand Rounds
Gardner, MA

01/11/89  “Athletic Low Back Pain”
Sports Medicine Systems
Newton, MA
12/20/88  “Low Back Pain”
         Milford-Whitinsville Regional Hospital Grand Rounds
         Milford, MA

12/10/88  “Head and Neck Injuries in Sports”;
         “On-the-Field Management of Head and Neck Injuries”
         American Physical Therapy Association
         Hilton Head Island, SC

11/21/88  “Women and Sports - Special Concerns”
         The Daisy Flour Mill
         Rochester, NY

11/21/88  “Sports Medicine In Primary Care”
         Genesee Memorial Hospital Grand Rounds
         Batavia, NY

         “Sports Medicine-Sports Science: Bridging the Gap”
         Kent County Hospital Grand Rounds
         Warwick, RI

10/28/88  “Osteoarthritis Due To Spinal Injuries”
         Cutler Army Hospital Grand Rounds
         Fort Devens, MA

10/07/88  “Health Enhancement Through Physical Conditioning”
         Concord Fitness Club
         Concord, MA

10/05/88  “Head and Neck Injuries”
         Sports Medicine Workshop
         Boxborough, MA

09/29/88  “Arthritic Low Back Pain”
         Health-In-Action Day
         Boston, MA

09/22/88  “Prevention and Recognition of Athletic Head and Spine Injuries”
         Sports Medicine Update: Prevention and Treatment of Fall Sports Injuries
         Albany Medical College
         Albany, NY

09/13/88  “Emergency Care of the Injured Athlete”
         Littleton Junior-Senior High School
         Littleton, MA

08/12/88  “Osteoarthritis and Sports Injuries”
         Brockton Hospital Grand Rounds
         Brockton, MA
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<tr>
<td>07/27/88</td>
<td>“Catastrophic Sports Injuries”</td>
<td>Omni Specialty Sports Medicine Update American Medical Tennis Association</td>
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<td>“When To Return To Contact Sports After A Head Injury”</td>
<td>Omni Specialty Sports Medicine Update American Medical Tennis Association</td>
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<td>“The Diagnosis and Treatment of Degenerative Cervical and Lumbar Spine Disease”</td>
<td>Binghamton General Hospital Grand Rounds</td>
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<td>“Low Back Pain: Etiology, Diagnosis, and Treatment”</td>
<td>Binghamton, NY</td>
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<td>06/17/88</td>
<td>“Osteoarthritis - As It Relates To Sports Injuries”</td>
<td>St. John’s Hospital Grand Rounds</td>
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<td>05/31/88</td>
<td>“Head and Neck Injuries in Rugby”</td>
<td>International Conference on Rugby Injuries</td>
<td>Boston, MA</td>
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<td>“Sudden Death - Ice Hockey”</td>
<td>American College of Sports Medicine Annual Meeting</td>
<td>Dallas, TX</td>
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<td>“Catastrophic Sports Injuries: Which Sports Are At Greatest Risk and What Is Being Done To Reduce Injury”</td>
<td>American College of Sports Medicine Annual Meeting</td>
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<td>American College of Sports Medicine Annual Meeting</td>
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<td>“Cervical Spine Evaluation”</td>
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<td>American College of Sports Medicine Annual Meeting</td>
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05/26/88  “Headache and Convulsion - Aerobic Exercise”
Clinical Lecture
American College of Sports Medicine Annual Meeting
Dallas, TX

05/25/88  “When to Return to Contact Sports After a Cerebral Concussion”
Tutorial Lecture
American College of Sports Medicine Annual Meeting
Dallas, TX

04/28/88  “Football Catastrophic Sports Injury Experience 1987”
Sports Medicine Section
American Association of Neurological Surgeons
Toronto, Canada

04/25/88  “When to Return to Contact Sports After Head Injury”
Panel Chairman: Breakfast Seminar
American Association of Neurological Surgeons
Toronto, Canada

03/24/88  “High School and College Catastrophic Sports Injury Survey:
Which Sports Are At Greatest Risk and What is Being Done To Reduce Injury”
Drake University Sports Medicine Conference
Des Moines, IA

03/24/88  Returning to Action After a Head Injury”
Drake University Sports Medicine Conference
Des Moines, IA

03/10/88  “Catastrophic Injuries in High School and College Athletes”
Writer’s Conference American College of Sports Medicine
New York, NY

03/05/88  “Return to Contact Sports After a Cerebral Concussion”
Fitness in Sports Fourth Annual Conference
Fort Worth, TX

02/09/88  “Feeling Fit After Forty”
Community Health-Lecture Series
Emerson Hospital
Concord, MA

01/31/88  “Update on Field Management of Head and Neck Injury”
1988 Lake Placid Sports Medicine Conference
Lake Placid, NY

01/30/88  “Concussion in Athletes”
1988 Lake Placid Sports Medicine Conference
Lake Placid, NY

11/06/87  “Head, Neck, and Back Injuries”
American College of Sports Medicine, New England Chapter
Worcester, MA
11/04/87  “Low Back Pain”  
Nashoba Community Hospital Grand Rounds  
Ayer, MA

09/20/87  “When to Return to Contact Sports After a Head Injury”  
New Hampshire Medical Society  
Mt. Washington, NH

08/07/87  “When to Return to Contact Sports After a Cerebral Concussion”  
Community Health Lecture  
Emerson Hospital  
Concord, MA

08/03/87  “Comparison of Exercycle and Monark Bicycles: Maximal Oxygen Uptakes”  
Exercycle Corporation  
Newport, RI

07/28/87  “New Concepts in the Treatment of Spinal Injuries”  
Symmes Hospital Grand Rounds  
Arlington, MA

06/05/87  “When to Return to Contact Sports After a Cerebral Concussion”  
New England Neurosurgical Society  
Cambridge, MA

05/29/87  “On-Site Evaluation of Head and Spine Injuries”  
Clinical Workshop  
American College of Sports Medicine Annual Meeting  
Las Vegas, NV

05/29/87  “Acute and Chronic Brain Injury in Contact Sports: Historical Perspective and Overview”  
American College of Sports Medicine Annual Meeting  
Las Vegas, NV

05/29/87  “Acute and Chronic Brain Injury in Contact Sports”  
Symposium Chairman  
American College of Sports Medicine Annual Meeting  
Las Vegas, NV

05/08/87  “Role of the Neurosurgeon In Sports Medicine”  
Panel Chairman: Breakfast Seminar  
American Association of Neurological Surgeons  
Dallas, TX

05/01/98  When to Return to Contact Sports After a Cerebral Concussion  
Sports Medicine Update ’87  
Westford, MA

04/24/87  “Extracranial Vascular Disease - The Carotid Endarterectomy Controversy”  
Primary Care in Stroke: Putting the Puzzle Together  
Westford, MA
04/06/87  “Brain Injuries In Football and Boxing - Can They be Prevented?”
         *Hot Topics in Sports Medicine and Sports Science ’87*
         New York, NY -

02/27/87  “Medical Aspects of Boxing”
         *American College of Sports Medicine Clinical Conference*
         Keystone, CO

02/26/87  “Discogenic Disease - Surgical and Non-Surgical Approaches”
         *American College of Sports Medicine Clinical Conference*
         Keystone, CO

02/24/87  “Concussion - What Is It?: Guidelines for Returning to Sports”
         *American College of Sports Medicine Clinical Conference*
         Keystone, CO

02/23/87  “Acute and Chronic Brain Injury and Contact Sports”
         *American College of Sports Medicine Clinical Conference*
         Keystone, CO

01/08/87  “Guidelines for Return to Contact Sports After a Cerebral Concussion”
         *International Symposium on the Prevention of Catastrophic Sport, and Recreational Injuries to*
         *the Spine and Head*
         Toronto, Canada

01/07/87  “The Activities Leading to Head Injury”
         *International Symposium on the Prevention of Catastrophic Sports and Recreational Injuries to*
         *the Spine and Head*
         Toronto, Canada
EXHIBIT “2”
<table>
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<td>6.</td>
<td><em>Cox; Brown v. Mount Sinai Hospital</em> (Ill. Cir. Ct., Cook Cnty. 2015)</td>
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<td>18.</td>
<td><em>Leach v. James</em> (Texas Court 7th Court of Appeals 2014)</td>
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<td>21.</td>
<td><em>Mayall v. USA Water Polo Inc.</em> (C.D. Cal. 2015)</td>
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<td>35.</td>
<td><em>Wilgeroth v. Murphy</em> (Fla. 9th Cir. Ct. 2012)</td>
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EXHIBIT “3”
Publications and Documents Reviewed


- B.E. Gavett et al., *Chronic Traumatic Encephalopathy: A Potential Late Effect of Sport-Related Concussive and Subconcussive Head Trauma*, 30 CLINICAL SPORTS MED. 179 (2011).


Committee on Head Injury Nomenclature of the Congress of Neurological Surgeons. Glossary of head injury, including some definitions of injury to the cervical spine, CLIN. NEUROSURG. 12 (1966).

Costanza et al., Review: Contact Sport-Related Chronic Traumatic Encephalopathy in the Elderly: Clinical Expression and Structural Substrates, 37 NEUROPATHOLOGY APPLIED NEUROBIOLOGY 570 (2011).


D.H. Daneshvar et al., The Epidemiology of Sport-Related Concussion, 30 CLINICAL SPORTS MED. 1 (2011).

D.H. Salat et al., Age-related alterations in white matter microstructure measured by diffusion tensor imaging, 26 NEUROBIOLOGAGING 8 (2005).

D.J. Madden et al., Cerebral white matter integrity and cognitive aging: contributions from diffusion tensor imaging, 19 NEUROPSYCHOL REV. 415 (2009).

D.J. Tisserand et al., Regional frontal cortical volumes decrease differentially in aging: an MRI study to compare volumetric approaches and voxel-based morphometry, 17 NEUROIMAGE 2 (2002).


Dickstein, et al., Structural MRI and Molecular PET Imaging (AV45 and AV1451) in the Diagnosis of Chronic Traumatic Encephalopathy In Vivo: Study of a Retired NFL Player, 86 NEUROLOGY 16, SUPPLEMENT P4-046 (2016).


• J.F. Geddes et al., *Neuronal Cytoskeletal Changes are an Early Consequence of Repetitive Head Injury*, 98 ACTA NEUROPATHOLOGY 171 (1999).


• K.M. Guskiewicz et al., *Association between recurrent concussion and late-life cognitive impairment in retired professional football players*, 57 NEUROSURGERY 4 (2005).


• L. Moretti et al., Cognitive decline in older adults with a history of traumatic brain injury, 11 LANCET NEUROL. 12 (2012).

• L.E. Goldstein et al., Chronic Traumatic Encephalopathy in Blast-Exposed Military Veterans and a Blast Neurotrauma Mouse Model, 72 SCI. TRANSLATIONAL MED. 134 (2012).


• M. Critchley, Medical Aspects of Boxing, Particularly from a Neurological Standpoint, BRIT. MED. J. 357 (1957).

• M. Critchley, Punch-drunk syndromes: the chronic traumatic encephalopathy of boxers, HOMMAGE A CLOVIS VINCENT (1949).


• M.H. Chappell et al., Distribution of microstructural damage in the brains of professional boxers: a diffusion MRI study, 24 J. MAGNETIC RESONANCE IMAGING 3 (2006).


• N. Raz et al., Selective aging of the human cerebral cortex observed in vivo: differential vulnerability of the prefrontal gray matter, 7 CEREB CORTEX 3 (1997).

• N.J. Brown et al., Effect of cognitive activity level on duration of post-concussion symptoms, 133 PEDIATRICS 2 (2014).


• R.A. Stern et al., *Longterm Consequences of Repetitive Brain Trauma: Chronic Traumatic Encephalopathy*, 3 PHYSICAL MED. REHABILITATION S460 (2011).


• R.C. Cantu, *Guidelines for return to contact sports after a cerebral concussion*, 14 PHYSICIAN SPORTSMED. 10 (1986).


• Randolph & M.W. Kirkwood, What are the real risks of sport-related concussion, and are they modifiable?, 15 J. INT’L NEUROPSYCHOLOGICAL SOC’Y 4 (2009).

• S. Tremblay et al., Diffuse white matter tract abnormalities in clinically normal ageing retired athletes with a history of sports-related concussions, BRAIN (2014).


• Schwarz et al., N.F.L.’s Flawed Concussion Research and Ties to Tobacco Industry, NEW YORK TIMES (March 24, 2016).


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