



Topics in Sports Medicine

Sport Concussion Knowledge and Clinical Practices: A Survey of Doctors of Chiropractic With Sports Certification



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Abstract

Objective: The purpose of this study is to describe the knowledge base and clinical practices regarding concussion by sports-certified doctors of chiropractic.

Methods: A 21-item survey was distributed to the 312 attendees of the 2014 American Chiropractic Board of Sports Physicians Sports Sciences Symposium. Results were measured by frequency analysis and descriptive statistics for all surveys completed by sports-certified chiropractors.

Results: Seventy-six surveys were returned by sports-certified doctors of chiropractic. All (N = 76) 100% of respondents believe that the evaluation of concussion should be performed by a health care provider with training in concussion. The respondents actively assess and manage concussion in adults (96%), adolescents (95%), and children (75%). A majority (79%) of respondents believe that the Sideline Concussion Assessment Tool–3 represents a current standard of care for the sideline evaluation of the athlete who possibly has sustained a sport concussion. Most respondents agreed or strongly agreed that manual therapies may be appropriate in certain circumstances in adults (80%) and minors (80%).

Conclusion: This cross section of certified sports chiropractors strongly believes that the evaluation of concussion should be performed by a health care provider with specific training in concussion. A high percentage of the sports-certified chiropractors who responded assess and

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manage sport concussion in their practice, and many of them endorse the use of the Sideline Concussion Assessment Tool–3 as a sideline assessment tool.

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Introduction

The prevention and treatment of injuries and disorders related to sport participation are practiced by many types of health care providers. The current level or standard of training in the detection and management of head injury by each profession is unknown and has yet to be mandated by any government or health-related agencies. In sports, the evaluation and management of concussion in all populations are important because concussion is a common occurrence with the potential for serious adverse effects if managed incorrectly both acutely and over the course of an individual's life span.¹ The 2009 incidence of sports and recreational concussive injuries in children (under the age of 19) that were treated in US emergency departments is estimated by the Centers for Disease Control and Prevention (CDC) to represent almost 250,000 concussions or traumatic brain injury.² Many sports-related concussions are known to be managed outside the emergency department setting, making the actual incidence difficult to estimate.² As a result, the total number of injuries should be expected to be much higher than the reported incidence from the CDC reports.³

There are several variables that support that the actual number of concussive injuries is much higher than currently reported.³ Some of the variables include the following:

1. The culture of placing the team's needs before the individual athlete's needs. Individual athletes may misinterpret the importance of sport to the point of playing with a head injury to avoid letting their team and teammates down. It is well recognized that athletes may cover their injury as well as the injury of their teammates.^{4,5}
2. Many sporting activities take place without the presence of a trained health care provider to assess and manage head injuries. Reported concussion incidence has been shown to increase with greater education of the sporting community.⁶
3. Nationwide reporting systems for sports medicine personnel to record concussive injury, regardless of the level of sports participation, do not capture all incidences of concussion.⁷

4. The current definition and methodologies of detecting concussion may miss subclinical head injury.⁸

The importance of detecting concussive injury is an essential competency for sports medicine providers. Cumulative detrimental effects of concussion have been well researched.^{9,10} Recognized key variables affecting management decisions for individuals who have sustained concussion include consideration of the temporal relationship of the concussive injury, the number of concussive injuries, and the time to recovery from a concussive injury.^{11,12} Health care providers who are not aware of the many clinical presentations of concussion and the clinical cornerstone of removing the head-injured athlete from play until he or she is fully recovered would likely result in missing some concussive injuries and placing concussed athletes at increased peril. The missed diagnosis of concussion with subsequent continued sport participation may lead to additional and potentially more serious concussive injury because of the cumulative effects of concussion and the lowered threshold of an unresolved head-injured athlete sustaining a subsequent concussion or other injury.^{1,13}

Best practices in concussion evaluation and management continue to evolve. This is demonstrated by the recent surge in position statements and practice guidelines for sports concussion across a broad spectrum of medical specialties and sport organizations. The American Academy of Neurology, American Chiropractic Board of Sports Physicians (ACBSP), American College of Sports Medicine, American Medical Society for Sports Medicine, National Athletic Trainers Association, and National Association of School Nurses each have recently released position statements on concussion management.^{14–19} Review of these consensus-based position statements suggests that there are common themes of identified best practices in concussion management. However, little is known in regard to how well the knowledge of best practices is translated from the statement to the field of clinical setting.

Current best practices in concussion management have been described to rely on full physical and cognitive rest.^{20,21} There has been a call for more investigation into physical rest and adjunctive therapies targeted at specific concussion symptoms.²² Recent investigations have

studied the use of low-grade exercise, balance and vestibular retraining, and manual therapy in the concussed patient.^{22–24} Many of the symptoms associated with concussion have known positive response to manual therapy, for example, headache, dizziness, and neck pain.^{22,25–28} Understanding current trends in clinical care with regard to these therapies may help researchers identify techniques with the potential to be tested for efficacy in future clinical trials.

The purpose of this study was to describe the knowledge base and clinical practices regarding concussion by sports-certified doctors of chiropractic.

Methods

A 21-item survey was developed with the purpose of identifying trends regarding concussion management including manual care by sports-certified doctors of chiropractic. The questions were developed by the first author (WJM) who has 30 years of experience as a clinician and educator on the topic of sports concussion experience in sports medicine as a clinician and educator. The questions were reviewed for face validity by the second author.

The first question was about demographics and determined the type of sports chiropractic certification held by the respondent. One question measured self-perceived competency in concussion management. Two questions were dedicated to the topic of best practices in concussion management. Three questions were dedicated to the frequency of evaluation of concussion by the respondent in the adult, child, and adolescent patient populations. Thirteen questions investigated beliefs and practice patterns in regard to the use of manual medicine in the concussed patient.

A pen-and-paper version of the questionnaire was distributed to the 312 attendees of the 2014 ACBSP Sports Sciences Symposium in the main lecture hall during the Symposium. An oral presentation inviting voluntary participation was provided at the time of survey distribution. Participation was voluntary; therefore, participation implied consent. Completed questionnaires were collected at the event registration booth. Results were entered into Microsoft Excel and then analyzed in JMP Statistical Discovery Software (SAS). Statistical methods included simple frequency analysis and descriptive statistics for all surveys completed by sports-certified chiropractors.

This project was approved by the Southern California University of Health Sciences Institutional Review Board. All participants provided consent to participate.

Results

Eighty-three completed surveys were returned out of 312 distributed, for a response rate of 26%. Seven were completed by individuals who were not sports-certified doctors of chiropractic and were excluded. Of the 76 surveys returned by sports-certified doctors of chiropractic, 48 were Certified Chiropractic Sports Physicians (CCSP) and 28 were Diplomates of the American Chiropractic Board of Sports Physicians (DACBSP). At the date of the survey, the ACBSP had 1567 active certificants including 1387 CCSPs and 180 DACBSPs.

All (N = 76) of the respondents agreed or strongly agreed that the medical evaluation of concussion should be performed by a health care provider with training in concussion. An overwhelming majority (95%) of the respondents agreed or strongly agreed that their level of competency in the evaluation and management of concussed individuals meets or exceeds the standard of care for their area. Most of the respondents (79%) believe that the Sideline Concussion Assessment Tool–3 (SCAT3) represents a current standard of care for the sideline evaluation of the athlete who possibly has sustained a sport concussion. The respondents reported that they actively assess and manage concussion in adults (96%), adolescents (95%), and children (75%).

Manual medicine was considered either somewhat or very important by (91%) of the respondents. In the adult (80%) and minor populations (80%), most respondents agreed or strongly agreed that manual medicine may be appropriate in certain circumstances at the time of injury. There was near consensus, as 92% agreed or strongly agreed in the opinion that informed consent is a best practice before performing manual therapy regardless of patient age and 93% agreed or strongly agreed that a written release should be obtained before performing manual medicine on a minor. There was less agreement on the timing of manual therapy after the injury, with 74% agreeing that a focal neurologic deficit at the time of injury is a contraindication of manual therapy, 87% agreeing or strongly agreeing that the serial examinations should be static before proceeding with manual medicine, 82% agreeing or strongly agreeing that vital signs should be within normal limits and stable before manual medicine, and only 38% agreeing or strongly agreeing that a 2-hour waiting period should be implemented before manual therapies. There was relatively strong agreement that the lowest force types of manual therapies should be tried first, with 74% agreeing or strongly agreeing to this statement. Many of the respondents felt that manual medicine should be

performed in a private setting, with 68% of respondents indicating that they agreed or strongly agreed. The respondents favorably scored manual therapies in the stable concussed patient in terms of efficiency (77%), usefulness (80%), and safety (77%).

Discussion

As awareness of sport concussion improves in the general public and medical communities, the number of sports concussions reported in the United States has grown significantly.³ The CDC recently reported that more than 3.8 million concussions occur in sports and recreational activities per year in the United States.³ As the incidence of concussion increases, it is imperative that the health care providers who work with concussed individuals, including athletes, are appropriately trained to evaluate and manage concussion.³

Clinical Practices of Health Care Providers Who Manage Concussion

The first step toward determining gaps in education on the topic of education among clinicians is to determine current practice patterns by health care providers who manage concussion. In this study, the population of sports medicine–certified doctors of chiropractic surveyed reported that they evaluate and manage concussion in adult (96%), adolescent (95%), and children (75%) populations as part of their clinical practice. The majority of the respondents to this survey recognized the SCAT3 as the standard of care sideline evaluation tool for managing concussion. Similar surveys have been performed in other health professions. The concussion-related practice patterns of other health care providers have also been studied. Pediatricians, a group in which 31% to 38.6% of providers see at least 1 concussion a month, largely do not follow any concussion guidelines.^{29,30} A survey of Illinois pediatricians published in 2014 showed that only 14.6% of respondents are “very familiar” with the “Consensus Statement on Concussion in Sport.”³⁰ A survey of Canadian pediatricians showed that whereas only 18% use the “Consensus Statement of Concussion in Sport” guidelines, 69% follow guidelines by the Canadian Pediatric Society. In a study of 73 emergency medicine physicians, only 23% use recognized concussion management guidelines.³¹ A study of fourth-year medical students revealed that concussion management is frequently left out of the medical school curriculum, with 32% of respondents answering that they either “could not remember if they learned

about concussions” or “never learned about concussion” during their undergraduate medical education.³² Neurologists are a medical specialty frequently relied on to manage concussion. A recent survey showed that more than half of neurologists surveyed (63%) have not received any informal or formal training on sports neurology.³³ Athletic trainers, who have been estimated to manage 10 concussions per provider each year, have been studied extensively for their practice patterns.³⁴ Athletic trainer practice patterns have demonstrated a progression in management strategies, as a 2013 study showed that, since 1999, the use of multimodal concussion management strategies has increased significantly.^{34,35} In this population, the 2004 National Athletic Trainers Association Position Statement on Concussion in Sport (69.3%) was the concussion management document that most athletic trainers were familiar with, followed by the Consensus Statement on Concussion in Sport (48.6%) and the National Collegiate Athletic Association Concussion Management Plan Legislation (45.1%).³⁴

The results mentioned above demonstrate a trend toward greater impact in clinical practices by recognized guidelines in health care providers with training in sports medicine than in many medical specialties. Legislators with interest in concussion legislation have identified barriers to access for appropriate concussion examination in some regions.³⁶ Athletic trainers, the health care providers traditionally on the field at organized sporting events, are only available as full-time staff at 37% of US high schools.³⁷

Policy makers and legislators interested in assisting with protecting concussed athletes may wish to specify that the management the concussed athlete should be performed by health care providers with specific training in sport concussion. The recognized concussion management training and skills vary between individuals within any profession. It is evident that terminal degree alone does not necessarily indicate training or familiarity with current best practices in concussion management. This concept has been reinforced by the diverse wording of recent position statements.^{15,16}

The ACBSP is the credentialing body for 2 postgraduate certificates of additional qualification (CAQs) in sports medicine in the United States. The 2 ACBSP CAQs are the entry-level sports chiropractic certificate CCSP and a higher-level Diplomate program, the DACBSP. The CCSP program requires successful completion of 100 hours of postgraduate course work which includes concussion and emergency procedures training from a Council on Chiropractic Education–accredited chiropractic college or university and

successful completion of a written examination. There are alternative pathways to challenge the CCSP examination; for example, a licensed chiropractor currently certified as an athletic trainer can challenge the CCSP test. The DACBSP CAQ requires an additional 200 hours in course work, 100 hours of on field experience in a sports medicine setting, completion of another written examination, and completion of a practical examination, which includes a practical assessment of concussion management and return-to-play decision making, as well as authorship of a scientific publication. Individuals with ACBSP CAQs must meet competency standards that are built from task analysis of each of the separate specialties. The examinations are built upon standard psychometric processes to derive cut scores. Doctors demonstrate competency by meeting the ACBSP certification standards and maintain the CAQ by meeting mandated annual continuing education related to sports medicine.

The ACBSP defines DACBSP and CCSP educational outlines and recommended references including position stands and reference materials. The ACBSP provides position statements on sports medicine–related topics such as sports concussion, blood-borne pathogens, and the preparticipation examination. Specific ACBSP-recommended resources for concussion are inclusive of the Fourth Zurich Statement on Concussion, the ACBSP Position Statement on Concussion in Athletics, the CDC “Head’s Up” online training portal, and the American Medical Society for Sports Medicine Position Statement on Concussion.^{15,16,21,38}

To the authors’ knowledge, the DACBSP is the only sports medicine certification in the United States that requires successful completion of an evidence-based practical examination which demonstrates clinical competency regarding emergency procedures and the evaluation, management, and return-to-play decision process of sports-related head injury as a requisite for certification. The ACBSP has implemented and reviewed these standards since 1997.

Manual Therapy Practices in Management of the Concussed Athlete

In the population of sports chiropractors surveyed, many to most respondents reported agreement that manual therapy may be appropriate in the management of concussion symptoms. This is a novel topic in concussion management research, with little precedence in terms of efficacy, safety, or even expert opinion–based clinical guidelines. The respondents

had good agreement on the role of manual therapy in concussion management, including the informed consent process, most indications and contraindications for manual therapy, and the concept that low-force techniques should be used before high-force techniques. There was moderate agreement as to the efficiency, usefulness, and safety of manual therapies in the management of concussion. The authors were not able to find any previous studies on this topic for comparison. In the absence of high-level evidence, these findings introduce novel concepts for development of expert opinion documents and theories for development of future clinical trials. Additional research is needed to better identify the parameters defining manual therapy in the management of concussion.

Limitations

This study has several limitations. The population that responded represents a relatively small portion of practicing sports chiropractors. Chiropractors were the only health care professionals studied, so comparison of professions was not possible. The questions used in the survey were closed ended, which creates bias in the available responses.

Further research in this area should be performed to determine if there are measureable differences in clinical practices of concussion management in sports-certified chiropractors as compared with chiropractors without sports medicine certification and other health professionals with and without sports medicine training. Future surveys in this topic should consider including multiple-choice questions in addition to scaled questions and a larger sample pool.

Conclusion

This cross section of certified sports chiropractors strongly believes that the evaluation of concussion should be performed by a health care provider with specific training in concussion. A high percentage of the sports-certified chiropractors who responded assess and manage sport concussion in their practice, and many of them endorse the use of the SCAT3 as a sideline assessment tool. Manual therapy is considered by many chiropractors to be an appropriate treatment for concussion patients. Future research on concussion management is needed to understand the efficacy of manual therapies as components of multidisciplinary concussion management strategies.

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No funding sources or conflicts of interest were reported for this study

References

- Weinstein E, Turner M, Kuzma BB, Feuer H. Second impact syndrome in football: new imaging and insights into a rare and devastating condition. *J Neurosurg Pediatr* 2013;11(3):331–4.
- Nonfatal traumatic brain injuries related to sports and recreation activities among persons aged ≤ 19 years—United States, 2001–2009. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6039a1.htm> [Accessed March 24, 2015].
- Daneshvar DH, Nowinski CJ, McKee A, Cantu RC. The epidemiology of sport-related concussion. *Clin Sports Med* 2011;30(1):1–17.
- McCrea M, Hammeke T, Olsen G, Leo P, Guskiewicz K. Unreported concussion in high school football players: implications for prevention. *Clin J Sport Med* 2004;14(1):13–7.
- Moreau W. Reporting frequency of concussion in high school football. 2005 ACBSP Sports Sciences Symposium abstract presentation; 2005.
- Bompadre V, Jinguji TM, Yanez ND, et al. Washington State's Lystedt Law in concussion documentation in Seattle public high schools. *J Athl Train* 2014;49(4):486–92.
- Concussion in high school sports: overall estimate of occurrence is not available, but key state laws and nationwide guidelines address injury management. Available at: <http://www.gao.gov/products/GAO-10-569T> [Accessed March 24, 2015].
- Herzog MM. Prevalence of undiagnosed concussion in adolescent athletes based on neuropsychological declines. Proceedings of the American Academy of Pediatrics National Conference and Exhibition Oct 11–14, 2014, San Diego, CA; 2014. [Available from: <https://aap.confex.com/aap/2014/webprogram/Paper26610.html>].
- Collins MW, Lovell MR, Iverson GL, Cantu RC, Maroon JC, Field M. Cumulative effects of concussion in high school athletes: neurosurgery. *Neurosurgery* 2002;51(5):1175–9; discussion 1180–1.
- Iverson GL, Gaetz M, Lovell MR, Collins MW. Cumulative effects of concussion in amateur athletes. *Brain Inj* 2004;18(5):433–43.
- McCrorry P. When to retire after concussion? *Br J Sports Med* 2001;35(6):380–2.
- Concannon LG, Kaufman MS, Herring SA. The million dollar question: when should an athlete retire after concussion? *Curr Sports Med Rep* 2014;13(6):365–9.
- Nordström A, Nordström P, Ekstrand J. Sports-related concussion increases the risk of subsequent injury by about 50% in elite male football players. *Br J Sports Med* 2014;48(19):1447–50.
- Giza CC, Kutcher JS, Ashwal S, et al. Summary of evidence-based guideline update: evaluation and management of concussion in sports. Report of the Guideline Development Subcommittee of the American Academy of Neurology 2013;80(24):2250–7.
- Moreau WJ, Nabhan DC. Development of the 2012 American Chiropractic Board of Sports Physicians position statement on concussion in athletics. *J Chiropr Med* 2013;12(4):269–73.
- Harmon KG, Drezner JA, Gammons M, et al. American Medical Society for Sports Medicine position statement: concussion in sport. *Br J Sports Med* 2013;47(1):15–26.
- Broglio SP, Cantu RC, Gioia GA, et al. National Athletic Trainers' Association position statement: management of sport concussion. *J Athl Train* 2014;49(2):245–65.
- NASN. Position statement: concussions—the role of the school nurse. *NASN Sch Nurse* 2013;28(2):110–1.
- Herring SA, Cantu RC, Guskiewicz KM, et al. Concussion (mild traumatic brain injury) and the team physician: a consensus statement—2011 update. *Med Sci Sports Exerc* 2011;43(12):2412–22.
- Meehan WP, d'Hemecourt P, Collins CL, Comstock RD. Assessment and management of sport-related concussions in United States high schools. *Am J Sports Med* 2011;39(11):2304–10.
- McCrorry P, Meeuwisse WH, Aubry M, et al. Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012. *Br J Sports Med* 2013;47(5):250–8.
- Reneker JC, Cook CE. Dizziness after sports-related concussion: can physiotherapists offer better treatment than just “physical and cognitive rest”? *Br J Sports Med* 2014.
- Leddy JJ, Kozlowski K, Donnelly JP, Pendergast DR, Epstein LH, Willer B. A preliminary study of subsymptom threshold exercise training for refractory post-concussion syndrome. *Clin J Sport Med* 2010;20(1):21–7.
- Schneider KJ, Meeuwisse WH, Nettel-Aguirre A, Boyd L, Barlow KM, Emery CA. Cervico-vestibular physiotherapy in the treatment of individuals with persistent symptoms following sport related concussion: a randomised controlled trial. *Br J Sports Med* 2013;47(5):e1.
- Alsalaheen BA, Whitney SL, Mucha A, Morris LO, Furman JM, Sparto PJ. Exercise prescription patterns in patients treated with vestibular rehabilitation after concussion. *Physiother Res Int* 2013;18(2):100–8.
- Chaibi A, Russell MB. Manual therapies for cervicogenic headache: a systematic review. *J Headache Pain* 2012;13(5):351–9.
- Chaibi A, Russell MB. Manual therapies for primary chronic headaches: a systematic review of randomized controlled trials. *J Headache Pain* 2014;15(1):67.
- Sensorimotor function and dizziness in neck pain: implications for assessment and management. *J Orthop Sports Phys Ther* 2009;39(5):364–77.
- Gordon KE, Do MT, Thompson W, McFaull S. Concussion management by paediatricians: a national survey of Canadian paediatricians. *Brain Inj* 2013;28(3):311–7.
- Carl RL, Kinsella SB. Pediatricians' knowledge of current sports concussion legislation and guidelines and comfort with sports concussion management: a cross-sectional study. *Clin Pediatr (Phila)* 2014;53(7):689–97.
- Giebel S, Kothari R, Koestner A, Mohny G, Baker R. Factors influencing emergency medicine physicians' management of sports-related concussions: a community-wide study. *J Emerg Med* 2011;41(6):649–54.
- Boggild M, Tator C. Concussion knowledge among medical students and neurology/neurosurgery residents. *Can J Neurol Sci* 2012;39(3):361–8.
- Conidi FX, Drogan O, Giza CC, Kutcher JS, Alessi AG, Crutchfield KE. Sports neurology topics in neurologic practice: a survey of AAN members. *Neurol Clin Pract* 2014;4(2):153–60.

34. Lynall RC, Laudner KG, Mihalik JP, Stanek JM. Concussion-assessment and -management techniques used by athletic trainers. *J Athl Train* 2013;48(6):844–50.
35. Ferrara MS, McCrea M, Peterson CL, Guskiewicz KM. A survey of practice patterns in concussion assessment and management. *J Athl Train* 2001;36(2):145–9.
36. CDC. Implementing return to play: learning from the experiences of early implementation. Available at: http://www.cdc.gov/concussion/pdf/RTP_Implementation-a.pdf 2013 [Accessed January 2, 2015].
37. Pryor RR, Casa DJ, Vandermark LW, et al. Athletic training services in public secondary schools: a benchmark study. *J Athl Train* 2015;50(2):156–62.
38. CDC head's up to youth sports: online training. Available at: <http://www.cdc.gov/headsup/youthsports/training/index.html> [Accessed August 4, 2015].