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The Importance of Cervical Spine Evaluations for Concussions and Traumatic Brain Injuries

The Role of Chiropractic Care in Treating Brain Injuries

Mark Knoll, DC
Director of Educational Outreach & Public Advocacy

Nebraska Chiropractic Physicians Association

Presentation Overview

- Introduction
- Nebraska Chiropractic Scope of Practice
- Advances in the Chiropractic Profession
- Concussion in Sport Group
- The role of the cervical spine in concussion management
- Evidence that supports chiropractic treatment of neck pain
- Safety of chiropractic care
- Chiropractic Care as part of the interprofessional treatment for concussion/mTBI management
- Interprofessional Collaboration
- Bibliography

Professional Experience

Nebraska Chiropractic Physicians Association

- **Nebraska Chiropractic Physicians Association**
  - Director of Educational Outreach & Public Advocacy: 2024-present
- **SecureCare (Independent Physician Association)**
  - Board Member: 1999-2016
  - Part-time Medical Director: 2005-2016
  - Chief Medical Officer: 2016-2024
  - Credentialing Committee Member
    - Blue Cross Blue Shield of Nebraska: 2001-2024
    - Nebraska Total Care: 2019-2024
- **Solo Practice: Omaha, NE: 1986-2016**
- **Graduate: Logan College of Chiropractic: 1983**
  - Internship & Associate Doctor: 1984-85

Mark Knoll, DC

Nebraska Chiropractic Scope of Practice

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Includes:

- Evaluation & Management Services
- Diagnosis
- Use of Diagnostic X-rays
- Routine Lab Procedures
- Treatments:
  - Spinal Manipulation
  - Passive & Active Therapies
  - Nutrition & Dietary Guidance

Does Not Include:

- Use of Drugs or Surgery

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Advances in the Chiropractic Profession

Chiropractic in the Veterans Health Administration

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- Onsite chiropractic care began in 2004 at Veteran's Affairs (VA) facilities.
- Primary conditions treated are low back pain, neck pain, headaches.
- Currently, there are 500 treating doctors of chiropractic (DCs) at 221 sites.
- DCs are located in Nebraska VA hospitals in Omaha, Lincoln, Grand

Chiropractic in the Veterans Health Administration

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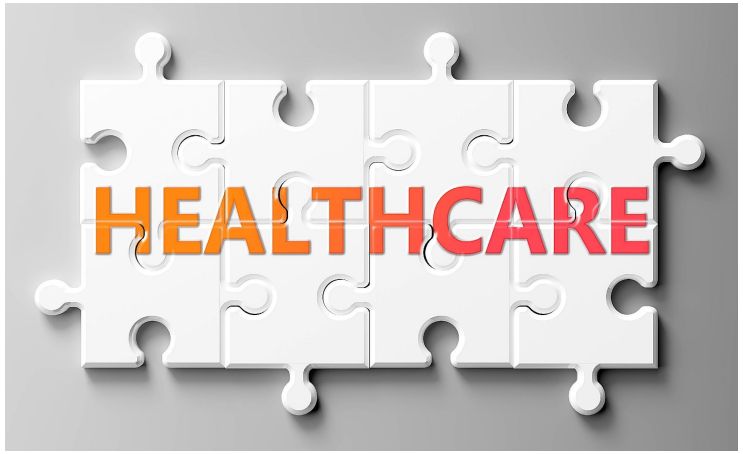

The VA is an interdisciplinary healthcare system where chiropractic care is a valued part of patient care plans.

- Chiropractic residency program available in VA.
- 70% of medical physicians rotate through the VA during their careers.
- Chiropractic use projected to double between 2022-2027.

Chiropractic Research at Universities & Academic Institutions

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- Duke University
- Yale University
- Osher Center for Integrative health at Harvard Medical School
- **University of Pittsburgh**
  - **First university-based chiropractic program**
  - **https://www.shrs.pitt.edu/academics/chsrs/chiropractic/**
- **Troy University**
  - **Second university-based chiropractic program**
- Miami of Ohio University
- Dartmouth College
- Medical College of Wisconsin
- Palmer Center for Chiropractic Research

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Concussion in Sport Group

Concussion Research

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- **Background**
  - The concussion in Sport Group (CISG) focus is on Sports related concussion (SRC)
    - Driven by sporting bodies needing to have clear and practical guidelines for recovery and safe return to play for athletes
  - Lessons learned from research for non-sporting mild Traumatic Brain Injury should inform the understanding of SRC and vice-versa
  - Arbitrary separation of sporting versus non-sporting TBI should not be viewed as opposing views of TBI

Source: British Journal of Sports Medicine (2018) Consensus statement on concussion in sport-the 5th international conference on concussion in sport held in Berlin, October 2016

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- **11 R's of Sport related concussion management:**
  - Recognize
  - Remove
  - Re-evaluate
  - Rest
  - **Rehabilitation**
  - **Refer**
  - Recovery
  - Return to sport(RTS)
  - Reconsider
  - Residual effect and Sequelae
  - Risk Reduction

Source: British Journal of Sports Medicine (2018) Consensus statement on concussion in sport-the 5th international conference on concussion in sport held in Berlin, October 2016

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- **Rehabilitation**
  - Historically, no focus on early concussion interventions because most patients with SRC **seem** to clinically recover in a short period
  - For individuals with persistent symptoms or ongoing impairments after 10-14 days, Concussion in Sport Group (CISG) now opines that the data supports interventions including:
    - Psychological rehabilitation
    - **Cervical Rehabilitation**
    - Vestibular Rehabilitation

Source: American College of Sports Medicine (2018) Zurich to Berlin-Where are we now with the concussion in Sport Group?

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- **Refer**
  - Persistent Postconcussive Symptoms (Definition):
    - Failure of normal clinical recovery, that is symptoms that persist beyond expected timeframes:
      - **10-14 days in adults**
      - **Over 4 weeks in children**
  - Treatment of individuals who have ongoing impairments exceeding the above timeframes should include a **multidisciplinary team** of healthcare providers with experience in treating SRC
    - Targeted physical therapy in patients with cervical spine or vestibular dysfunction

Source: American College of Sports Medicine (2018) Zurich to Berlin-Where are we now with the concussion in Sport Group?

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- **Overview**
  - This 6th statement summarizes the process and outcomes of the 6th international conference on concussion
  - The 11 R's were developed by the 5th conference in Berlin
  - 2 additional R's were developed during the 6th conference
    - Retire: to address issues related to potential career-ending decisions
    - Refine: to highlight the need to embrace ongoing strategies to advance the field
  - Rehab and Refer are expounded upon for this 6th conference

Source: British Journal of Sports Medicine (2023) Consensus statement on concussion in sport: the 6th International Conference on Concussion in Sport-Amsterdam, October 2022

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- **13 R's of Sport related concussion management:**
  - Recognize
  - Reduce: prevention
  - Remove
  - **Refer**
  - Re-evaluate
  - Rest & exercise
  - **Rehabilitation**
  - Recovery
  - Return to learn/return to sport
  - Reconsider
  - Residual effects
  - Retire
  - Refine

Source: British Journal of Sports Medicine (2023) Consensus statement on concussion in sport: the 6th International Conference on Concussion in Sport-Amsterdam, October 2022

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- **Refer**
  - Key Point
    - The SRC clinician network may include:

Sports Medicine Physicians
- Athletic trainers/therapists
- Physiotherapists
- Occupational therapists
- **Sports Chiropractors**
- Neurologists
- Neurosurgeons
- Neuropsychologists
- Ophthalmologists
- Optometrists

Physiatrists

Psychologists

Psychiatrists

Source: British Journal of Sports Medicine (2023) Consensus statement on concussion in sport: the 6th International Conference on Concussion in Sport-Amsterdam, October 2022

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- **Rehabilitation**
  - Key Points
    - **Cervicovestibular rehabilitation is indicated for symptoms that persist in adults more than 10 days:**
      - Neck pain
      - Dizziness
      - Balance Problems
    - If symptoms persist beyond 4 weeks in children and adolescents, active rehabilitation and collaborative care may be of benefit

Source: British Journal of Sports Medicine (2023) Consensus statement in sport: the 6th International Conference on Concussion in Sport-Amsterdam, October 2022

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The Role of the Cervical Spine in Concussion Management

Concussion Research

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- **Objective**
  - To examine the prevalence of cervical spine injuries among children and adolescents referred with suspected and diagnosed sports-related concussion (SRC) and evaluate the effect of cervical spine dysfunction (CSD) on physician documented clinical recovery following SRC
- **Results**
  - **33%** had CSD
  - Patients with CSD post SRC took longer to achieve physician-documented clinical recovery
    - 28.5 days vs. 17 days
    - 4 times more likely to experience delayed clinical recovery
- **Conclusion**
  - CSD may be a risk factor for delayed clinical recovery in SRC

Source: Journal of Head Trauma (2019) Cervical spine dysfunction following pediatric sports-related head trauma.

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- **Objective**
  - To assess people with persistent symptoms post-concussion, determine whether the neck has also been injured and evaluate the potential of the neck to contribute to their symptoms
- **Results**
  - Patients were evaluated 7.5 weeks post-concussion
  - **90%** were considered to have a neck problem by their clinician contributing to their symptoms
- **Conclusion**
  - Multiple findings indicated concurrent neck injury
  - These findings are important to recognize:
    - May contribute to persistent symptoms post-concussion
    - May respond to neck treatment

Source: Journal of Orthopedic Sport Physical Therapy (2019) Can the neck contribute to persistent post-concussion? A prospective descriptive case series.

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- **Objective**
  - Examine the effect of current neck or shoulder pain on concussion outcomes
- **Results**
  - **More than 50%** of patients reported current neck or shoulder pain at initial evaluation
  - Neck or shoulder pain was associated with longer symptom resolution time
- **Conclusion**
  - Experiencing neck or shoulder pain during initial post-injury evaluation was associated with worsened clinical outcomes
  - Clinicians may consider referral to early rehabilitation following concussion with neck or shoulder symptoms

Source: Journal of Child Neurology (2020) Presence of neck or shoulder pain following sports-related concussion negatively influences recovery.

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- **Objective**
  - To characterize the type, frequency and severity of cervical impairments in children and adolescents referred for physical therapy after concussion
- **Results**
  - 90% of patients demonstrated impairments in at least 3/5 assessment categories related to the cervical spine
  - Posture, myofascial impairment and joint mobility demonstrated highest impairment
- **Conclusion**
  - High prevalence of cervical spine impairments were observed in the subjects of this study
  - This study supports the use of a cervical spine evaluation tool on children and adolescents following concussion

Source: International Journal of Sports Physical Therapy (2019) Characterization of cervical spine impairments in children and adolescents' post-concussion.

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- **Objective**
  - Provide a comprehensive report on the clinical prevalence, diagnostic methods and potential treatment options for cervicogenic symptoms during acute and chronic phases following a concussion
- **Results**
  - Prevalence of cervicogenic symptoms in the acute stage ranged from 7-69%
  - Prevalence of cervicogenic symptoms increased to 90% in patients experiencing persistent post-concussion symptoms (PPCS)
  - Treatment using a graded cervical manual therapy reduced time to symptom resolution and medical clearance

Source: Sports Medicine (2021) The role of cervical symptoms in post-concussion management: A systematic review.

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- **Conclusion**
  - Cervicogenic symptoms are prevalent in the acute and chronic stages following concussion
  - If this condition is not diagnosed properly, it increases the likelihood of Persistent Post-Concussion Syndrome (PPCS)
  - More RCTs are necessary to evaluate the effectiveness of cervical specific treatment programs for PPCS

Source: Sports Medicine (2021) The role of cervical symptoms in post-concussion management: A systematic review.

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- **Objective**
  - To describe the cervical spine findings and outcomes of treatment in a series of patients with persistent post-concussion symptoms
  - Describe the clinical characteristics of a cervicogenic component when it is present
- **Results**
  - 32/46 patients reviewed had a cervicogenic component on examination
  - Physiotherapy treatment of the cervicogenic component achieved improvement in function and pain

Source: Musculoskeletal Science and Practice (2017) Clinical characteristics and outcomes of treatment of the cervical spine in patients with persistent post-concussion symptoms: A retrospective analysis.

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- **Conclusion**
  - Clinical characteristics described gave preliminary support to the idea that the cervical spine may contribute to persistent post-concussion symptoms
  - Highlights the value of physiotherapy assessment and treatment of the cervical spine following a concussive injury

Source: Musculoskeletal Science and Practice (2017) Clinical characteristics and outcomes of treatment of the cervical spine in patients with persistent post-concussion symptoms: A retrospective analysis.

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- **Objective**
  - To explore the prevalence of acute neck pain in high school athletes following SRC and to examine the role of acute neck pain in modifying or amplifying concurrent concussive symptoms
- **Participants**
  - High school athletes who suffered a SRC between 2011 and 2019 academic years from the National Athletic Treatment, Injury and Outcome Network Study

Source: Clinical Journal of Sports Medicine (2022) Prevalence of acute neck pain following sports-related concussion in high school athletes.

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- **Results**
  - 138/401 or 34% of athletes indicated acute neck pain
  - Those with neck pain reported significantly more symptoms overall relative to their non-neck pain counterparts
- **Conclusion**
  - Data suggests that acute neck pain is a frequent acute symptom following SRC
  - Prospective studies should seek to assess the benefit of cervical therapy in the early stages of SRC patients with neck pain to reduce the risk of persistent post-concussion symptoms

Source: Clinical Journal of Sports Medicine (2022) Prevalence of acute neck pain following sports-related concussion in high school athletes.

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- **Background**
  - Neck pain in a concussion population is an emerging area of study that has been shown to have a negative influence on recovery. The effect has not yet been studied in collegiate athletes
- **Results**
  - A total of 2163 injuries were studied
  - New or worsened neck pain was reported with 47% of injuries
  - New or worsened neck pain was higher in female athletes
  - The presence of new or worsened neck pain was associated with delayed recovery

Source: The American Journal of Sports Medicine (2024) The prevalence and influence of new or worsened neck pain after a sports-related concussion in collegiate athletes.

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- **Conclusion**
  - This study shows that neck pain was:
    - common in collegiate athletes sustaining a concussion
    - Influenced by many factors
    - Negatively affected recovery

Source: The American Journal of Sports Medicine (2024) The prevalence and influence of new or worsened neck pain after a sports-related concussion in collegiate athletes.

Concussion Research

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- **Objective**
  - To determine the frequency of neck pain in patients presenting to a level 1 trauma center Emergency Department with mild traumatic brain injury
- **Results**
  - Frequency of reported neck pain was:
    - 68% within 72 hours
    - 51% at 8 days
    - 49% at 15 days
    - 42% at 45 days
- **Conclusion**
  - A sizable percentage of patients presenting to a level 1 trauma center ED with mTBI report neck pain
  - Neck pain is commonly rated as similar to or worse than other mTBI symptoms
  - These findings support identifying cervical injury as an important concurrent dx in patients with mTBI

Source: Archives of Physical Medicine and Rehabilitation (2020) Frequency of primary neck pain in mild traumatic brain injury/concussion patients.

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Evidence that supports chiropractic treatment of neck pain

Neck Pain Management Research

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- **Objective**
  - Purpose of this study was to develop best-practice recommendations for chiropractic management of adults with neck pain
- **Results**
  - The following are covered in this paper:
    - Assessment (History & Examination)
    - Evaluate for red flags
    - Diagnosis
    - Treatment Planning and Implementation
    - Informed Consent
    - Concurrent Management
    - Referral
- **Conclusion**
  - For uncomplicated neck pain, including neck pain with headache or radicular symptoms, chiropractic manipulation and multimodal care are recommended

- Source: Journal of Manipulative & Physiological Therapeutics (2019) Best Practice Recommendations for chiropractic management of patients with neck pain

Neck Pain Management Research

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- **Background**
  - Spinal Manipulative Therapy (SMT) is frequently used to manage neck pain; however, its efficacy and safety in treating acute neck pain (ANP) remains uncertain
- **Objective**
  - This study aims to comprehensively evaluate the efficacy and safety of SMT in the treatment of ANP
- **Results**
  - 8 Randomized Controlled Trials (RCT's) with 965 patients were included
  - Analysis showed that SMT was better than the control in reducing pain, improving cervical range of motion (CROM) and reducing disability scores
  - No serious adverse events were reported
- **Conclusion**
  - The evidence supports the use of SMT as an effective and safe intervention for reducing pain, improving CROM and decreasing disability in patients with ANP

Source: Systematic Reviews (2025) Efficacy and safety of spinal manipulative therapy in the management of acute neck pain: a systematic review and meta-analysis

Neck Pain Management Research

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- **Background**
  - Acute neck pain is common and usually managed by medication and/or manual therapy
  - General practitioners hesitate to refer to manual therapy due to uncertainty about adverse events
- **Objective**
  - Review RCTs assessing the effectiveness of spinal manipulative therapy (SMT) for acute neck pain
- **Results**
  - 6 studies were included
  - Overall pool size for neck pain was large
  - SMT was favored
  - No serious adverse events were reported
- **Conclusion**
  - SMT alone or in combination with other modalities was effective for acute neck pain

Source: Journal of Clinical Medicine (2021) Spinal Manipulative Therapy for Acute Neck Pain: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

Concussion Research

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- **Objective**
  - Describe the chiropractic management of 6 patients with post-concussion syndrome
- **Clinical Features**
  - Six patients ranging in age from 39-82 with a history of post-concussion syndrome with a duration of at least 6 weeks were evaluated
  - Confirmation of head/neck trauma leading to a concussion was established
  - Previous treatment for concussion included: physiotherapy, vestibular therapy, massage therapy, craniosacral therapy, OTC medications
- **Intervention & Outcome**
  - The patients received low force chiropractic adjustments to the upper cervical spine over a 12-week period
- **Conclusion**
  - Improvements in all patients were demonstrated
  - Results suggest an encouraging relationship between upper cervical chiropractic treatment for post-concussion patients

Source: Journal of Contemporary Chiropractic (2019) Chiropractic Management of the Craniocervical junction in post-concussion syndrome: A case series

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Safety of Chiropractic Care

Patient Safety Research

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- **Background**
  - Chiropractic manipulation is a popular treatment for neck pain and headache, but may increase the risk of cervical artery dissection and stroke. Patients with carotid artery dissection can present with neck pain and/or headache before experiencing a stroke. These are common symptoms seen by both chiropractors and primary care physicians (PCP).
- **Results**
  - Positive associations were found for both chiropractic and PCP visits and subsequent stroke in patients less than 45 years of age.
- **Conclusion**
  - Study found no excess risk of carotid artery stroke after chiropractic care. Associations between chiropractic and PCP visits and stroke were similar and likely due to patients with early dissection-related symptoms seeking care prior to developing their stroke

Source: Journal of Stroke and Cerebrovascular Disease (2017) Risk of carotid stroke after chiropractic care: A population-based case crossover study

Patient Safety Research

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- **Background**
  - Case reports have suggested an association between chiropractic neck manipulation and cervical artery dissection (CAD), but a causal relationship has not been established
- **Results**
  - Search yielded 253 articles. The meta-analysis revealed a small **association** between chiropractic care and dissection.
- **Conclusion**
  - While the analysis does show a small **association** between chiropractic neck manipulation and cervical artery dissection, there is no convincing evidence to support a **causal** link between chiropractic manipulation and CAD

Source: Cureus (2016) Systematic Review and Meta-Analysis of Chiropractic Care and Cervical Artery Dissection: No evidence for causation

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- **Background**
  - There is controversy surrounding the risk of manipulation, which is often used by chiropractors, with respect to its association with vertebrobasilar artery system (VBA) stroke. The objective of this study was to compare the associations between chiropractic care and VBA stroke with recent primary care physician care and VBA stroke.
- **Results**
  - The findings showed no significant association between chiropractic visits and VBA stroke in both the commercial and Medicare Advantage population, irrespective of age.
- **Conclusion**
  - No significant association between chiropractic care and the risk of VBA stroke. Conclude that manipulation is an unlikely cause of VBA stroke. The positive association between PCP visits and VBA stroke is most likely due to patients seeking care for symptoms (headache and neck pain) of arterial dissection.

Source: Chiropractic & Manual Therapies (2015) Chiropractic care and the risk of vertebrobasilar stroke: results of a case-control study in U.S. commercial and Medicare Advantage populations

Safety of Chiropractic Care

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Data on chiropractic malpractice costs/claim activity:

- Typical Nebraska doctor of chiropractic malpractice premium: $1,000/year.

- Claim activity
  - Credentialing experience in four-state midwestern region (NE, IA, SD, MN)

Safety of Chiropractic Care

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- **Takeaways**
  - Based on published research, cervical spine manipulation is a safe treatment for neck pain
  - **<u>However, all healthcare providers</u>** need to be vigilant during their patient history and examination to screen for potential arterial dissection and make proper referrals when necessary

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The chiropractic profession as part of the healthcare team in TBI

Team-based approach

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- Practice as part of a team, not in isolation
- Ensure all red flags are ruled out prior to implementation of treatment
- Co-manage
- Practice evidence-based care

Proper Assessment

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Evaluate patient

- Assess for red flags, refer if appropriate.
- Image only if necessary.
- Use baseline and serial outcome assessment tools (OATs).
- If examination warrants treatment, place on care plan.

Begin care trial

- Re-evaluate a minimum of every 12 visits.
- If patient is not progressing:
  - Alter treatment
  - Consider further diagnostic testing
  - Refer to another provider

Discharge when appropriate

Source: *Topics in Integrative Health Care* (2012). Algorithms for the chiropractic management of acute and chronic spine-related pain.

Highlights & Recommendations

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- Cervical spine injuries are prevalent after concussions or mild Traumatic Brain Injuries
- For cervical symptoms beyond 10 days in adults or 4 weeks in children, cervical rehabilitation is recommended
- Sports chiropractors are one of the recommended healthcare providers
- Evidence supports chiropractic care as a safe and effective treatment for cervical spine conditions
- Chiropractors should be included as part of the interprofessional team used to treat concussion and mTBI conditions

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Interprofessional Collaboration

Interprofessional Collaborative Efforts

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- Nebraska Medical Association
- APTA NE
- NE Spine + Pain Center
- Nebraska Hospital Association
- UNMC
- Creighton University

Goals of Interprofessional Collaboration

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- Focus on common goals
- Work together for the betterment of patients
- Develop referral relationships
- Ensure patients are in the best setting for care
- Education related to best evidence

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Questions?

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