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## Poster Presentations

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### Pediatric Chiropractic Care of a Patient With Conversion Disorder

Joel Alcantara, D.C., and Rebecca Adamek, D.C., Private Practice

The purpose of this article is to describe the pediatric chiropractic care of a patient with medically diagnosed conversion disorder.

#### CLINICAL FEATURES

The patient was an 11-year-old girl with complaints of constant and uncontrollable tremors of both arms and right leg. The patient was medically diagnosed with conversion disorder following negative examination findings including MRI, CT scan, blood analysis, and EEG studies. She was referred for inpatient hospital psychiatric care when her parents brought her in for chiropractic evaluation. Within 6 months prior to the onset of tremors, the patient experienced a number of traumas to her head. Chiropractic examination revealed subluxation findings at the cervical, thoracic, and sacral regions using the Cranial-Sacral Technique.

#### INTERVENTION AND OUTCOME

High-velocity, low-amplitude adjustments, incorporating the Cranial-Sacral Technique, were applied to sites of

vertebral subluxations. During and following chiropractic care, the patient's tremors abated. With each subsequent visit, her condition improved to the extent that gross movement tremors were replaced with only mild and occasional twitches.

#### CONCLUSION

This case report demonstrates that a patient with symptoms associated with a central nervous system disorder without an apparent organic origin may have benefited from chiropractic intervention.

#### ACKNOWLEDGMENT

This study was funded by the International Chiropractic Pediatric Association, Media, PA.



# The Successful Chiropractic Care of a Pediatric Patient With Spinal Subluxations and Chronic Bilateral “Glue Ear”

Joel Alcantara, D.C., and Michael Beattie, D.C., Private Practice

The purpose of this article is to describe the successful chiropractic care of a 2-year-old boy with vertebral subluxations and comorbidity of medically diagnosed bilateral “glue ear.”

## CLINICAL FEATURES

The parent of the pediatric patient consulted for chiropractic evaluation and possible care for her male child following the unsuccessful outcome of naturapathic, dietary, and medical intervention for chronic bilateral “glue ear.” In addition to hearing loss, the boy began to develop a speech impediment as a consequence.

## INTERVENTION AND OUTCOME

The patient was cared for with adjustments to sites of vertebral subluxations. Following 12 chiropractic visits

within a 2-month time frame, chiropractic outcome measures (i.e., removal of spinal subluxations) correlated with tympanometric testing and the resolution of the patient’s “glue ear” as verified by an otorhinolaryngologist. His parents also noted a significant improvement in their son’s speech and auditory functioning.

## CONCLUSION

This case report provides supporting evidence on the effectiveness of chiropractic care in a child with vertebral subluxations and otolaryngological disorders such as “glue ear.”

## ACKNOWLEDGMENT

This study was funded by International Chiropractic Pediatric Association, Media, PA.



# The Effect of Custom Orthotics on the Vertical Leap of Athletes in a Sport Demanding Jumping

William M. Austin, D.C., C.C.S.P., C.C.R.D., Foot Levelers, Inc., Dennis Nosco, Ph.D., Nosco Consulting, and Jeffrey D. Olsen, D.C., Foot Levelers, Inc.

The chiropractic literature is almost devoid of any studies related to vertical leap. In fact, scientific literature, in general, is devoid of any reference to orthotics affecting vertical leap. A number of companies have attempted to produce noncustom shoe insoles or shoe-related devices designed to improve vertical leap in jumping sports (i.e., basketball, volleyball, track and field jumping events). The current pilot project attempts to gather the first data on whether the use of custom orthotics in athletic shoes of a jump sport team can positively affect the vertical leap in a controlled, blinded study.

## METHODS

Eleven female high-school-age volleyball players from a local elite club team were recruited into this pilot study.

Parental informed consent was obtained. The subjects, who were blinded to the end point of the study, were fitted for custom orthotics supplied by Foot Levelers, Inc. Standing (first session) and three-step approach vertical reach were measured on separate days with and without orthotics to minimize complicating fatigue factors. Testing was done at almost the same time of day and at the same point in practice at both test sessions. The order (with orthotics and without orthotics) was randomized for each girl and each measurement date. Vertical leap measurements were made using a Vertec® vertical leap measurement device to minimize measurement bias. This device measures to the nearest half-inch. Vertical leap was determined as the best of three attempts for each of the four measurement conditions (i.e., standing vertical with and without orthotics, and approach vertical with and without orthotics). Statistical analysis was done using descriptive statistics and linear regression.

## RESULTS

The mean increase in vertical leap using orthotics in the first testing session was 0.14 inch and in the second testing session was 0.23 inch. In the first test session, five subjects showed improvement, two stayed the same, and four showed a decrease in vertical leap after putting in orthotics. At the second testing session, five subjects showed an increase, four stayed the same, and two showed a decrease in vertical leap after wearing orthotics. Linear regression indicated a high correlation ( $r^2 = .896$  for the first testing session and  $.950$  for the second session) for vertical leap values before and after orthotics within one testing session but not for vertical leap changes ( $r^2 = .05$ ) for individuals between test sessions.

## DISCUSSION

Despite limitations such as a very underpowered subject number, difficulties in blinding study subjects, difficulty controlling all possible variables, small ( $\leq 1.0$  inch per

subject) magnitude changes, and, finally, lack of break-in period for the orthotics, the pilot study was performed with the intention of determining if a larger, more well-controlled study should be undertaken. The results show trends that would indicate that there is some benefit to orthotics in improving vertical leap even in the limited exposure to orthotics (i.e., right before the test). The linear regression analysis shows good correlation between vertical leap values pre- and postinsertion of orthotics and there is a mean positive effect in both standing (0.14 inch) and three step approach (0.23 inch) when wearing orthotics during the test.

## CONCLUSION

Although the exact mechanism of positive effect on vertical leap from orthotics is not yet understood, and the limited results and magnitude of changes do not lend themselves to extensive statistical analysis, the results of this study suggest that further studies are warranted and needed to determine the magnitude, if any, of positive changes on vertical leap from orthotics. It is suggested that well-controlled studies be carried out.



# Chiropractic Care of a 6-Year-Old Child With Congenital Torticollis

**Jeanne E. Black**, D.C., M.S.Ed., and **Carol D. Gloar**, D.C., Palmer College of Chiropractic

The purpose of this article is to discuss the care of a patient with congenital torticollis who was treated successfully using a chiropractic diversified technique and a chiropractic technique proposed by Frogley and Wallace (1).

## CLINICAL FEATURES

A 6-year-old child suffered from diagnosed congenital torticollis with a left head-tilt subsequent to a difficult birth culminating in caesarean section. Computerized tomography of the brain revealed plagiocephaly. Left facial asymmetry was demonstrated on visual observation.

## INTERVENTION AND OUTCOME

The patient was treated with chiropractic adjusting protocol as suggested by Frogley and Wallace and by diversified chiropractic technique. The patient was placed in a supine position. The C2 vertebra was contacted on the superior portion of the spinous process in the suboccipital region. Thrust was applied in a caudal direction as determined by palpation

and motion findings. She tolerated the care well and experienced substantial changes in clinical presentation including a distinct improvement in head-tilt. The improvement in head-tilt has been maintained for a period of 1 year.

## CONCLUSION

The conservative chiropractic methodology postulated by Frogley and Wallace in the care of headache patients should be investigated further in its use for congenital torticollis. The positive results observed with this patient lead the authors to recommend that additional studies be undertaken to assess whether these clinical observations can be replicated in other cases of congenital torticollis.

## REFERENCE

1. Frogley HR, Wallace HL. Manipulation for headache patients: a brief introduction of a novel technique. *Chiropractic Technique* 1998;10(1):11-18.



# A Chiropractic Perspective of Dental Occlusion's Effect on Posture

**Charles L. Blum, D.C., Private Practice**

For years, chiropractors have used the term "Lovett Brothers" to describe the relationship between specific vertebra in the lumbar and cervical spine. Chiropractic procedures have also been proposed to be effective in treating conditions affecting the pelvis and temporomandibular joint (TMJ). In fact, the foundation of the Sacro-occipital Technique (SOT) was that its developer, Major B. DeJarnette, found relationships between the sacrum and occiput that he used in diagnosis and treatment. Chiropractic techniques need to be able to identify and treat conditions secondary to TMJ and dental occlusion dysfunction, as well as develop understanding of the dental profession's perspective for proper referral and cotreatment.

## METHODS

A review of the literature has found a body of work on the relationship between dental occlusion and orthodontic procedures and their effect on posture and the spine. SOT methods of treatment have been found effective for treatment of cranial and TMJ-related conditions. Various rationales for the relationship between the spine or pelvis and TMJ or Lovett Brothers have been found. These theories include fascial, myological interrelationships; referred pain patterns; and facilitating tonic neck reflexes involving intersegmental spinal pathways.

## DISCUSSION

If chiropractors and dentists are going to be working together to treat conditions affecting the spine and posture as well as dentofacial orthopedics and/or temporomandibular dysfunction (TMD), a common language will need to be developed. SOT has methods of TMJ, cranial bone, and whole-body evaluation and therapy that facilitate the treatment of TMD, which are primary to occlusion (ascending disorder). In addition, SOT has methods of diagnosis, which can evaluate when the TMD is primary to conditions affecting the spine and posture (descending disorder), which necessitate referral to the dental practitioner skilled in TMD treatment.

## CONCLUSION

Chiropractic and dental cotreatment of TMD, occlusion, and dentofacial orthopedics with its relationship to the spine, pelvis, and posture offer a valuable opportunity for multidisciplinary growth. This growth and intercommunication will enable patients suffering from long-term disorders to be offered the possibility of relief that chiropractic or dentistry alone cannot offer. Future studies are needed to evaluate this complementary relationship between dentistry and chiropractic to determine the effectiveness of this care and its benefit for patients with prior intractable chronic conditions.



# Sacro-occipital Technique Pelvic Block Treatment for Severe Herniated Discs A Case Study

**Charles L. Blum, D.C., Private Practice**

The chiropractic profession is beginning to gather sufficient evidence that its conservative method of care is a viable option for patients suffering from lumbar disc herniation. Recently two papers were presented which discussed the positive outcome of Sacro-occipital Technique (SOT) pelvic block placement on the treatment of lumbar disc herniation.

## CASE PRESENTATION

A 37-year-old patient presented due to an aggravation, a week earlier, of a prior work-related injury, with initial onset

approximately 5 years previously. He presented with a 1.3-cm concentric disc bulge at L5-S1 and an extruded disc at the L3-L4 level, extending 8-9 mm posterior and to the right, per the radiologist's report.

## TREATMENT METHODS

Using various SOT diagnostic and treatment protocols for the treatment of lumbosacral discopathy, the patient was treated with pelvic blocks or wedges. The majority of the treatment was performed with the patient prone

and pelvic blocks placed under the pelvis according to leg length and cervical indicators, and determined by reduction of pain. Gentle distraction was applied to the herniated disc by leg traction and/or sacral traction and stabilization of the lumbar vertebral segment superior to the herniation. Psoas tension on the anterior aspect of the discs was “released” with the patient resting prone, on pelvic blocks, and with doctor’s hand placed under the patient with finger pressure directed anteroposteriorly, gently relaxing the muscle.

## OUTCOMES

Following 3 weeks of treatment at intervals of one to two times per week, the patient noted that he felt markedly improved and had no limitations in his activities or ranges of motion. The patient received infrequent treatment following the initial 2 months, and 7 months following his initial MRI,

a follow-up MRI was performed which found a 3-mm diffuse disc bulge at L3–L4 and L4–L5, per radiologist’s report.

## DISCUSSION

Many practitioners from a variety of technique disciplines utilize pelvic wedges or blocks as a chiropractic adjustment tool. Future studies are needed to determine whether the findings in this case history can be generalized to patients presenting with herniated discs of the magnitude found with this patient. Pre- and post-MRIs seem to be an important part of the process of determining a relationship between clinical findings and objective measurements of disc herniation. While it must be noted that sometimes disc herniations will resolve over time independent of treatment, this patient’s clinical findings during the course of care make further investigation into SOT pelvic block placement for similar conditions warranted.



## A Teaching Device for Practicing “Setups” During a Chiropractic Technique Protocol Class

**Michael L. Bovee**, M.S.Ed., D.C., and **Donald F. Gran**, M.S.Ed., D.C., Palmer College of Chiropractic

Efforts to encourage critical thinking skills should be practiced in technique protocol classes. Critical thinking skills to assess, correlate, and integrate information can be enhanced during practice time in technique classes. Students can learn to synthesize clinical cues associated with a chosen adjusting procedure. A teaching device for cultivating critical thinking skills related to vertebral subluxation complex (VSC) is described in this article. The teaching devices are 14- by 15-inch wooden forms that can rest on top of a standard classroom overhead projector. They have cutout Plexiglas “informational windows” measuring approximately 1.5 inches by 5 inches that can be viewed by sliding a wooden panel from side to side. These sliding panels cover the information scribed in the window below. There is also a larger uncovered window at the top to scribe additional information such as technique procedure to be practiced and the motion-unit involved. The information scribed under the sliding panel is associated with VSC evaluation. The panels may be opened and closed in different combinations to reveal information for students to consider. Each of the teaching devices can be adjusted or set for several different listings or positional dyskinesia related to a VSC. The information from the exposed windows is evaluated and the student is instructed to demonstrate a specific technique procedure for the suggested involvement. The classroom instructor simply selects a procedure, opens various informational windows to reveal clinical

insight, and then evaluates the students’ procedure for the clinical situation revealed.

## DISCUSSION

In technique classes at our chiropractic college, students learn several parameters for evaluation of the VSC. Methods of spinal evaluation may include, but are not limited to, the use of visualization, static and motion palpation, instrumentation, and spinographic analysis. Practice sessions in technique classes are focused on patient positioning, doctor stance and contacts, segmental contacts, direction of induced force, and adjusting motions. Classroom practice is a repetitive process. The teaching device described in this article has augmented in-class practice with little expense, virtually no training for faculty, and little additional class time. It encourages students to become more engaged during class and with this learning device students must synthesize the information presented to them to be able to perform the technique procedure requested.

There are five different versions of the teaching device currently used for practice sessions. They include static palpation findings, motion palpation indicators, visualization or observation cues, spinography indicators, and the orthogonal listings (right-hand Cartesian system) for noting

sagittal, coronal, and transverse positional information. Any clinical cues could be added for practice sessions in the future. Since the technique protocol classes occur in the curriculum before the students' clinical experience, initially the process is slow with mistakes in interpretation made due to student inexperience, lack of knowledge, and time constraints. However, after just a few weeks students begin to develop the ability to synthesize and "problem-solve" the information more accurately and efficiently. By the end of the course, students often express an increased confidence

in their ability to evaluate a patient compared to when they entered the class.

## CONCLUSION

Utilizing synthesis of spinal evaluation findings with this teaching device has helped to encourage and actively engage student practice of critical thinking during a technique protocol course.



## Survey of Informed Consent Practices of Graduating Chiropractic Students

**Jerrilyn A. Cambron**, D.C., M.P.H., National University of Health Sciences, and  
**Jennifer Langworthy**, M.Phil., Anglo-European College of Chiropractic

Patients are more involved in the decision-making process regarding their health care than ever before. Likewise, health care practitioners are being trained to support the patient's autonomy. Valid informed consent comprises four main elements: disclosure about risks, costs, and treatment alternatives; patient willingness to undergo such procedures without physician coercion; patient comprehension of the procedure; and patient competence to make decisions.

The purpose of this survey was to determine the level and type of informed consent process utilized by a graduating class of chiropractic physicians within the United States. This was a pilot study.

## METHODS

A previously developed and tested questionnaire was given to 56 graduating students at one chiropractic institution within the United States. Students were approached 1 week prior to graduation and were asked to complete a two-page, IRB-approved survey on the use of informed consent in private practice. Confidentiality of all information was guaranteed and no identifying factors were collected. Issues explored included: how and how often an explanation of the diagnostic and therapeutic processes and related risks and benefits were disclosed; the location of the verbal and/or written consent process; verification of comprehension and competence of patients in the consent process; and legal issues of the consent process. Data were collapsed descriptively.

## RESULTS

All 56 students voluntarily completed the survey. The sample was 63% male and had a mean age of 28 years

(range, 25–47). The majority of students verbally informed their patients about the diagnosis process (71%) and the therapeutic process (82%). Ninety-five percent of students "always" discussed the treatment process at the first treatment. Eighty-four percent of students verbally discussed minor side effects of treatment during the first treatment session and less during successive treatments (23% always). Seventy-one percent of students also verbally discussed major side effects of treatment during the first treatment and less during successive treatments (14% always). Possible benefits were "always" discussed by 96% of students during the first treatment, with 84% of students informing the patients verbally rather than in writing. Disclosure of the consequences of not undergoing treatment occurred with 68% of students and only 61% discussed alternatives to treatment. Verbal consent was frequently obtained in the treatment room (73%), whereas written consent was obtained in the treatment room (30%), the waiting room (41%), or both the treatment and waiting rooms (9%). Seventy-three percent of students felt as though they determined that the patient understood what was being told to them, and 75% documented the patient understanding. We did not ask about the form of documentation. Some students (10%) did not know that there were legal requirements of informed consent; 18% felt as though they did not receive adequate guidance on this issue; only 38% believed that their professional association provided guidance documentation; and 22% believed their insurance carrier provided this information.

## DISCUSSION

The results of this study offer promising information that the majority of graduating students are informing their

patients about the therapeutic processes as well as the associated risks and benefits. Consent regarding the diagnostic process was the one area not covered by the majority of students. This finding might be due to the fact that students worked directly under clinicians and staff (i.e., radiology technicians) who performed diagnostic processes. Therefore, the students may have assumed that others gathered

consent. Although some suggest that the informed consent can interfere with the doctor–patient relationship, others have found that information provided during the consent process is highly valued, increases patient satisfaction, and minimizes medical litigation. Future studies will assess the informed consent process of practicing chiropractors in the United States and in England.



## Accuracy of Recall of Pain Intensity and Pain Affect in Low Back Patients

**Carolina Cancelliere**, B.Sc. (Hons), **Shawna Green**, BSc (Hons), **Kim Humphreys**, D.C., Ph.D., and **Judith Waalen**, Ph.D., Canadian Memorial Chiropractic College

There is little research that explores patients' ability to remember their pain experience over time. Recent work suggests that average pain intensity is the most accurate indicator of actual pain over a 1-week period. It is also known that patients' pain experience is influenced by sensory, affective, cognitive, and social aspects. This study explored both the accuracy of recall of pain intensity as well as pain affect over a 2-week period.

### OBJECTIVES AND HYPOTHESIS

The objectives of this study were: 1) to investigate daily pain profiles over 14 consecutive days in low back patients; 2) to determine the accuracy of recalled pain intensity and suffering over 7 days and 14 days; 3) to establish the most accurate single-point ratings(s) of usual pain intensity over a 2-week period; and 4) to explore the effect of current "pain" and "suffering" status on recall of pain intensity and suffering. These objectives were pursued in order to develop better techniques for quantitatively assessing the multidimensional nature of patients' pain syndromes and to formulate valid and reliable outcome measures and effective treatment programs.

Our hypothesis was that the most accurate single-point rating of pain intensity and suffering will be the patient's average pain intensity and suffering for both 7 and 14 days, and current "pain" and "suffering" status will bias the recall of pain intensity and suffering.

### METHODS

Patients with low back pain (LBP) were recruited from five chiropractic practices to complete a 14-day pain diary. The sample size estimate was determined to be 17 ( $ICC \geq 0.4$ ,

80% power,  $p = .05$ ). Subjects rated their current level of pain intensity three times/day and level of suffering once/day using the visual analogue scale. On day 8, patients recalled their "current" pain and "suffering," "worst" pain, "least" pain, "average" pain and suffering for the previous 7 days. On day 15, subjects recalled the same variables for the previous 14 days. The ICC (SPSS, 10.1) was used to examine agreement between pain intensity and pain recall, and pain affect (suffering) and pain affect recall.

### RESULTS

Thirty-eight respondents participated and were predominantly female (58%). The majority reported that the current episode had been present for greater than 1 month and that they experienced LBP "most of the time." There was strong agreement between actual "average" pain intensity and recall of "average" pain on both day 8 ( $ICC = 0.79$ ;  $p < .001$ ) and day 15 ( $ICC = 0.85$ ;  $p < .001$ ). Strong agreement was also found between actual "average" suffering and recall of "average" suffering on both day 8 ( $ICC = 0.83$ ;  $p < .001$ ) and day 15 ( $ICC = 0.86$ ;  $p < .001$ ). There was only fair agreement between actual "average" pain intensity and "current" pain intensity on day 8 ( $ICC = 0.45$ ;  $p < .001$ ) and good agreement on day 15 ( $ICC = 0.71$ ;  $p < .001$ ). There was only fair agreement between actual "average" suffering and "current" suffering on day 8 ( $ICC = 0.45$ ;  $p < .001$ ) and day 15 ( $ICC = 0.60$ ;  $p < .001$ ).

### DISCUSSION

The results of this study support previous work that patients can accurately recall their average pain intensity

over a 1-week period. This study also demonstrates that patients can more accurately recall “average” pain intensity over a 2-week period, and patients can accurately recall

“average” suffering over 1 and 2 weeks. Current “pain” and “suffering” does not seem to influence recall of pain intensity and suffering.



## The Effectiveness of Multiple Impulse Therapy for Musculoskeletal Complaints Analysis of 249 Consecutive Case Studies

**Daniel L. Collins**, D.C., Private Practice, **Joseph M. Evans**, Ph.D., Sense Technology, Inc., and **Reed H. Grundy**, B.S.E.E., Reed Design, Inc.

This study presents the treatment results of 249 patients using multiple impulse therapy provided by the PulStar FRAS™. Prospective multiple cohort Kaplan–Meier analysis of patient files was used to determine symptomatic improvement over the course of treatment for a variety of musculoskeletal complaints encountered in clinical practice. Multiple impulse therapy was supplemented, at the discretion of the practitioner, with manual adjustments. The manual adjustments represented fewer than 5% of the patients and consisted of high-velocity, low-amplitude (HVLA) and drop table. A single practitioner in a private clinic setting provided the therapy.

### METHODS

Survival analysis was used to plot probability of pain versus the days required for symptom resolution for each of eight major complaints. The survival analysis results were compared to an external independent standard representing a first-order approximation of the natural course of low back pain.

### RESULTS

Findings of the study include the average number of visits required to achieve a pain-free state for each of eight patient symptoms, the half-life for response to multiple impulse therapy using the PulStarFRAS for each of eight patient symptoms, and support for two hypotheses designed to test the effectiveness of multiple impulse therapy for low back pain.

### DISCUSSION

The use of multiple impulse therapy for the treatment of low back pain was judged to be effective when compared to an independent reference standard representing the best estimate of the course of low back pain without manipulative treatment. The results of this study support the continued use and study of multiple impulse therapy provided by the PulStarFRAS as a means of resolving musculoskeletal symptoms. These results compare favorably with published studies of techniques of musculoskeletal therapy.



## Interexaminer Reliability of Videofluoroscopy in Viewing Lateral Bending of the Upper Cervical Spine in Uninjured Adults

**Alan Cook**, D.C., Private Practice, **Eric Wennerholm**, D.C., M.S., Motion X-Ray Center, and **Rock Braithwaite**, Ed.D., Humboldt State University

The objective of this study was to examine the level of agreement among three examiners, two with significant videofluoroscopy interpretative experience and one novice, when assessing the lateral flexion of the upper cervical spine in a healthy uninjured population.

### METHODS

Fifty adult subjects (25–43 years; mean,  $33.4 \pm 4.2$  years), 25 male and 25 female, with no history of neck trauma, no

history or presence of inflammatory arthritides, no significant degenerative disease or bony anomalies, and no congenital disease known to impact the cervical spine were recruited. Super-VHS tapes were recorded of the 50 healthy subjects taken in the anteroposterior open mouth (APOM) position while performing lateral bending (three consecutive repetitions to the right and three consecutive repetitions to the left). Millimetric measurements of C1–C2 translatory motion associated with ipsilateral lateral flexion were performed by three readers.

## RESULTS

The intraclass reliability coefficient for all three readers ( $r = .65$ ) suggests moderate level of agreement. The intraclass reliability coefficient for just the two experienced

readers ( $r = .69$ ) suggests a moderately strong level of agreement. In a post hoc analysis asking if C1 laterally translates on C2, in a yes or no format, the level of agreement between the two experienced readers reached statistical significance ( $p = .0008$ ) as per the two-tailed  $t$  test.

## DISCUSSION

This investigation shows a moderate level of interexaminer agreement when comparing two experienced and one novice readers of videofluoroscopic studies. The level of agreement is higher when comparing experienced readers. The level of concordance was greatest when limiting the question to a motion vs. no motion format.



# Intra- and Interexaminer Reliability of Prone Extension Motion Palpation A Pilot Study

**Stephan R. Cooper**, B.Sc., **Mark T. Pfefer**, M.S., D.C., **Nathan L. Uhl**, **David Deupree**, Ph.D., and **Tim Schoof**, Ph.D., Cleveland Chiropractic College, Kansas City

Motion palpation is one of the more common clinical analysis methods used by chiropractors as well as many other manual therapists. The purpose of this study was to investigate the reliability of a novel motion palpation, prone extension motion palpation, currently taught at NUHS and in Motion Palpation Institute seminars. This palpation is a scanning type palpation that involves imparting slight PA force to the spine of a prone and extended subject to determine areas of greater resistance/stiffness as opposed to a specific motion restriction of a vertebra.

## METHODS

Seventeen asymptomatic students were recruited (four female and 13 male). All subjects signed IRB-approved informed consent forms. Four examiners were selected; one experienced examiner (A) (>3 years of experience), two novice (B and C) (2–3 years of experience), and one beginner (D) (<1 year of experience) were chosen. Subjects were randomized, gowned, and placed prone while extending their trunk by propping their upper body on their elbows. Lines were drawn at level of the vertebral prominens (VP), inferior angles of the scapulae, and S1. The marks were kept consistent throughout the trial. A strip of masking tape was then placed along the spine from the VP to the sacrum. The

subjects were covered with sheets exposing only the back. The examiner stood beside the table facing down on the patient. With the arm closest to the subject fully extended and the heel of the palm on the midline of the spine, the examiner imparted a slight downward force perpendicular to the spine (PA). The examiner scanned down the subject from approximately T5–T7 to S1, noting any restricted areas. The examiner then turned around and performed the same maneuver up the spine. The examiner then placed a mark at the level of greatest resistance on the masking tape. All subjects were palpated twice at random intervals. One-way random effect model intraclass correlation coefficient (ICC) was the statistical method used. The level of significance was set at  $p < .05$ .

## RESULTS

Intraexaminer reliability was moderate among three of the four examiners. Examiner D did not reach statistical significance. ICC values were as follows: examiner A, 0.60 ( $p = .0034$ ); examiner B, 0.58 ( $p = .0048$ ); examiner C, 0.51 ( $p = .0132$ ); and examiner D, 0.28 ( $p = .1208$ ). Interexaminer reliability among all four examiners for each trial was weak but statistically significant. ICC for trial 1 was 0.41 ( $p = .0001$ ), and for trial 2 was 0.44 ( $p = .0001$ ).

## DISCUSSION

Studies of vertebral motion have shown a connection between low back pain and abnormal joint motion. Others have shown that spinal stiffness could be assessed in asymptomatic subjects using a matching task. It has previously been demonstrated that increased reliability is associated with standardization of motion palpation in the cervical spine. Development of new techniques has been driven, to a large degree, by entrepreneurs and not by chiropractic science and academia. New chiropractic techniques and systems are generally developed, popularized, and adopted prior to any testing or peer review. Testing novel assessment methods

and modifying them according to current literature prior to popularization should be the standard, not the exception.

## CONCLUSION

Our data, though limited, show modest but statistically significant intraexaminer reliability. Intraexaminer reliability did seem to be dependent on the amount of experience the examiner had with this palpation method. Interexaminer reliability did show weak, although significant, reliability with this palpation method.



## Sitting PSIS Positions and Prone Blocking Preferences A Preliminary Report

**Robert Cooperstein**, M.A., D.C., **Eri Crum**, M.P.H., Palmer College of Chiropractic West, **Elaine Morschhauser**, D.C., Palmer College of Chiropractic, and **Anthony Lisi**, D.C., University of Bridgeport, College of Chiropractic

Blocking the pelvis with padded wedges, a technique procedure most closely identified with Sacro-occipital Technique, is believed to correct pelvic torsion, in which the innominate bones have rotated in opposed directions. The direction of pelvic torsion (e.g., left posterior-inferior ilium, or left PI) is identified by a prone leg check, where the short leg is thought to identify relatively posterior ilium rotation. This study used the direct approach of sitting PSIS palpation to identify pelvic torsion, rather than the more typically used and indirect approach of leg checking. This study also tested the assumption that blocking preferences are related to pelvic torsional patterns as assessed by PSIS palpation.

## METHODS

In a 28-subject study, investigator 1 palpated each of these asymptomatic participants in the seated position for evidence of PSIS positional asymmetry. Immediately following, investigator 2 examined each of the participants for blocking preferences. One block was inserted under the left ASIS and the other under the right greater trochanteric area, after which the blocks were removed and reinserted in the opposite pattern.

## RESULTS

Of the 26 study participants whose PSISs were palpable, 21 exhibited preference for one of the blocking patterns, and three did not: 16 preferred a pattern corrective of a right PI, and five preferred a pattern for a left PI. Twelve had a

lower PSIS on the right (thought to identify right PI), four had a low PSIS on the left (thought to identify left PI), and eight were judged symmetric. A subset of 14 participants had both PSIS asymmetry and a clear blocking preference. Of these, nine showed concordant right-sided PSIS calls and blocking preferences, three showed left-sided concordance, and two were not concordant. Thus, 12 of the 14 study participants showed a concordant pattern of PSIS asymmetry and blocking preferences.

## DISCUSSION

Since the incidence of anatomic leg-length inequality (LLI) of 1/4 inch or more is as much as 50% in asymptomatic subjects, leg checking procedures may not be able to distinguish the functional short leg thought to be associated with posterior innominate rotation from anatomic LLI. Moreover, an anatomic short leg has been found associated with anterior innominate rotation, and anatomic long leg with posterior innominate rotation. Therefore, we decided against using leg checking to identify pelvic torsion, and used instead static palpation of the pelvis in the seated position. Given the evidence that congenital asymmetry of the innominate bones is minimal, it is likely that PSIS asymmetry reflects pelvic subluxation rather than innominate dysplasia. The high degree of concordance ( $Kappa = .65$ ,  $CI = 0.5$ ) found in this study between inferred pelvic torsion and corrective blocking preferences suggests that blocking subjects might predict positive clinical outcomes in a program of chiropractic care. The relatively wide confidence interval for the Kappa statistic suggests the need for a larger data set.

## CONCLUSION

The results of provocative prone pelvic blocking and seated PSIS palpation were strongly concordant in this

preliminary study. If the current findings are substantiated, Sacro-occipital Technique and other practitioners may consider re-evaluating the manner in which they obtain their indications for pelvic blocking.



## Development of a Mixed Mode Undergraduate Chiropractic Program

**Christina Cunliffe**, Ph.D., and **David Newell**, Ph.D., McTimoney College of Chiropractic

Undergraduate education in the United Kingdom has changed considerably over the past decade, driven by statutory self-regulation and new educational demands on institutions. Educational methods adopted by universities and other tertiary training institutions are increasingly focused on distance, self-directed, or mixed mode approaches, that both increase access and result in more autonomous and self-motivated individuals. This is particularly important within the orthodox and complementary health care community, as the burden of evidence-based practice demands rapid updating and continuing skill acquisition.

## METHODS

This article describes the development of an undergraduate honors degree in chiropractic using a mixed mode approach, and documents both the educational underpinning of the method, the planning and writing of the course, and the involvement of the institution's academic and administrative staff in its realization. The new 5-year B.Sc. degree program was developed to address the contemporary needs of the chiropractic profession, out of a desire to improve the delivery of knowledge and skills necessary to produce primary contact graduate chiropractors.

## RESULTS

Changes were made to the academic and administrative structures as well as to assessment strategies in order to create an integrated program that had a high degree of ownership at all levels of the college organization, as well as sound

mechanisms for student support. Ownership at wider levels of the course encouraged a more involved, integrated team with extensive knowledge of where, how, and why the elements of the course fitted together. This level of involvement and communication between the academic and administrative team, resulting from the design process, has now become an embedded culture that has extended beyond the completion of the course design and will have considerable positive input on the subsequent delivery of the new program.

## DISCUSSION

Given the presence of extensive specialized expertise among staff, it was the organization and maintenance of communication in the process that proved to be the biggest learning curve. Success in this area, however, has provided a more cohesive, knowledgeable, and involved team who will have considerable positive input on the delivery of the course. The new program has augmented and improved the College's performance in a number of ways, including development of a strong, integrated academic team with broad knowledge across the program; the introduction of new key academic staff positions with the responsibility for assuring the quality of delivery of the program within and between years; the formation of additional operational academic committees, including a Formative Committee to monitor student performance; and introduction of a Directed Learning Diary that strengthens the direction and monitoring of the student's progression. The program has been validated by a UK university as a full-time program, delivered by mixed mode over 5 years, leading to a B.Sc. (Hons) Chiropractic. It is a pathway for acceptance to the professional Register of the General Chiropractic Council.



# A Tool for the Monitoring and Support of Directed Learning in Undergraduate Chiropractic Education

**Christina Cunliffe**, D.C., Ph.D., and **David Newell**, Ph.D., McTimoney College of Chiropractic

The use of “open” learning methods has increased considerably within the UK tertiary educational arena over the last few years. Electronic learning, the use of virtual learning environments, distance learning, and self-directed approaches are increasingly recognized as effective routes to producing autonomous and lifelong learners able to keep abreast of new information as it applies to their own specialized fields. This is particularly true in medicine and allied health professions, where the generation of new information in the context of evidence-based practice is rapid.

## METHODS

We have recently undertaken the design and implementation of a mixed mode honors degree program that contains significant distance learning elements. As such, we have designed a mechanism by which directed learning by the student is generated, monitored, and supported. This article describes the Directed Learning Diary (DLD), an innovative approach to directed learning in undergraduate chiropractic education, and further describes an ongoing development of this approach that will result in an electronic version suited for the distance learning element of our mixed mode approach. Developed from Student Workbooks that have been in use on the current program for some years, the DLD is a portfolio of work accumulated by the student for each module to support their learning and is the main formative assessment method. The DLD is a more rigorous, regularly monitored and assessed instrument, which not only supports students in their directed learning but also provides an early warning system for students who may be falling behind in their studies. The college recognizes the challenges that students face in completing the high workload required by the program and sees the DLD as a mechanism for keeping students focused on their studies. While some students may be sufficiently skilled to manage the workload

on their own, the DLD serves to ensure that all students are clear on the work that needs to be done. The assessment methods used within the DLDs are dependent on the module itself. For academic modules, directed learning is formatively assessed in class through multiple-choice questions, short-answer tests, asking students to read out preprepared work, or class discussion. For practical skills modules, the DLD is assessed in class through any of the above methods if appropriate. Technique instructors performed direct assessment of set tasks to monitor the progression of psychomotor skills. This serves as a way of consolidating learning at the start of each new session and provides the lecturer/tutor with an immediate window on the progression of the class.

## RESULTS

The DLD provides structured and supportive directed learning, feedback of a formative nature that allows students to monitor their progress toward achieving module learning outcomes, the module leader with a regular window onto the students’ progression, information that allows early intervention by the module leader in cases in which student progress is unsatisfactory, and a body of work for reflective and revision purposes for the student.

## DISCUSSION

The introduction of the DLD builds on our previous experiences and utilizes more regular formative assessment as checks and balances to support end of module summative assessments. We believe that this is a strong enhancement to the program, compared with standard routes to learning, and that this would be a positive addition to any program.



## University Students’ Knowledge and Attitudes Toward Chiropractic

**Niles C. Davis**, M.A., and **Dean L. Smith**, D.C., M.Sc., Miami University, Ohio, and **Jane Palmer Smith**, D.C., Private Practice

Chiropractic care has traditionally been characterized as an alternative medical profession. However, to call chiropractic

“alternative” is problematic; in many ways it is distinctly mainstream. It is a misrepresentation to consider chiropractic

an alternative, as it does not attempt to replace traditional medical methods, but rather has its own philosophical, therapeutic, and theoretical basis. According to a survey of patients seeking alternative care, chiropractors are used more often than any other so-called alternative provider group, and the satisfaction with chiropractic care is very high. Chiropractors are the most commonly chosen "alternative" health care provider, with 11% of the population seeing one in 1997. To date, there exists little information on public attitudes toward chiropractic. With more people visiting chiropractors every year, we felt it appropriate to examine the attitudes and knowledge of young health care consumers about this profession.

## METHODS

The survey was completed by a convenience sample of 630 undergraduate students enrolled in an introductory psychology class at Miami University. Students received course credit for their participation. The Miami University Divisional Review Board approved the study. The survey consisted of 43 items in a pencil-and-paper type, "scantron" testing format. Specifically, the survey asked about demographics, health and lifestyle habits, and attitudes toward and knowledge about chiropractic. All analyses were performed using SAS statistical software (version 6.12). Basic descriptive statistics, chi-square tests, and interitem correlations were used in our analysis.

## RESULTS

Sixty-four percent of our sample participants were female, 92% were white, the average age in years was 19.4, and the typical family income was \$51,000. Analysis of general health and lifestyle factors indicated that the average person

rated both their physical and mental health as between good and excellent, rarely smoked, engaged in cardiovascular exercise often, and rated their use of prescription and over-the-counter medication between rare and sometimes. Ninety percent of students reported to have never used any type of alternative medicine. Sixteen percent of all students reported that they had seen a chiropractor before. Interestingly, 16% also reported having a previous back or neck injury. When those who had never seen a chiropractor were asked why not, 56% felt no perceived need, but 80% would consider seeing a chiropractor. Ninety-one percent of students rated their level of confidence in medical doctors to be either confident or very confident, while only 47% felt the same level of confidence in chiropractors. Further, on average, students believe that chiropractors receive 5.4 years of university-level training and 43% felt that chiropractic care is supported by a considerable to extensive amount of research.

## DISCUSSION

Our sample data, derived from a population of young college-age adults, provide much new information on the patterns of use of chiropractic care within this cohort, as well as on their attitudes and basic knowledge of the profession. Our finding that 16% of students have seen a doctor of chiropractic is similar to previous findings from a large adult sample. Students underestimated the number of years of university-level training that a chiropractor receives. It appears that those who have or do experience back or neck pain are more likely to report seeing a chiropractor and having confidence in them. In addition, women are more likely to consider going to a chiropractor than men. In general, those who have seen a chiropractor have a higher degree of confidence in chiropractors and perceive that they have higher levels of expertise in multiple therapeutic areas. Those who have not seen a chiropractor do not show these findings.



## Biomechanical Evaluation of Four Different Mattresses

**James W. DeVocht**, D.C., Ph.D., Iowa Spine Research Center, University of Iowa, and Palmer Center for Chiropractic Research, **David G. Wilder**, Ph.D., and **Kevin G. Spratt**, Ph.D., Palmer Center for Chiropractic Research

Virtually everyone spends more time sleeping on a mattress than in any other single activity. In spite of that, very little could be found in the literature regarding the evaluation of mattresses. Most of the articles that were found were concerned with the healing of wounds or the prevention of bed sores for those who are bedridden for extended periods

of time. Contact pressure has been shown to be a major factor in the development of such sores, but does not seem to be directly related to comfort. This study was developed in an effort to provide an objective biomechanical evaluation of four different mattresses from four different manufacturers.

## METHODS

Two objective biomechanical measurements were used in this study. One used pressure-sensitive pads to measure the greatest contact pressure in the pelvic and thoracic regions with participants in the supine position. The mean of the highest 10 pressures of the 1296 cells in each pad was the metric that was used. The other measurement quantified distortion introduced into the spine when in the side-posture position. Eight spinous processes were marked on the overlying skin each time position was changed to account for skin movement. The coordinates for each of the eight points were obtained from high-resolution digital photographs. The degree of deviation from a straight line through those eight points was used as a metric for the degree of distortion. The four mattresses used were each top of the line from King Koil, Simmons, Sealy, and Serta. The participants were 18 healthy adult males. The sequence of testing the four mattresses was randomized for each participant.

## RESULTS

No significant difference was found in the degree of distortion induced by any of the four mattresses when the participants were in the side-posture position. The King Koil mattress was found to have a significantly lower maximum contact pressure in both the pelvic and thoracic regions as compared to each of the other three mattresses.

## DISCUSSION

The effect of pressure distribution on the quality of sleep is not known and would likely be difficult to quantify. However, it is commonly thought that a more even distribution of contact pressures would be preferable to having isolated points of relatively high pressure which, although not firmly established, does at least seem to be reasonable. Similarly, it has not been established that sleeping with a well aligned spine is more advantageous than sleeping with the spine in some degree of distortion, although that too is commonly thought to be the case. Spinal distortion, however, is a moot point in regards to this study because no such significant difference was found among the mattresses tested.

## CONCLUSION

The results of this evaluation indicate that lying on one's side induces essentially the same degree of distortion to the spine regardless of which of the four mattresses is being used. However, this evaluation also indicates that the support provided by the King Koil mattress for adult males in the supine position does not induce points of pressure as high as those induced by any of the other three mattresses that were tested. If it is true that there is a biomechanical advantage to having lower maximum contact pressures, the results of this study would therefore suggest that the King Koil mattress that was tested is more advantageous than the other three mattresses that were also tested in this study.



# Chiropractic Manipulation in Vestibular Rehabilitation

**Joseph O. Di Duro**, B.A., D.C., D.A.C.N.B., Private Practice

A recent article referring to acute vertigo following chiropractic manipulation prompted a study of a patient group from within a private practice that presented with vestibular dysfunction.

## METHODS

Entrance exam in the chiropractic office includes testing of ocular movements with infrared videonystaggraphy on each patient that presents regardless of complaint. Patients with aberrant ocular movements were also evaluated by vestibular evoked myogenic responses (VEMR). In a 2-month period, VEMR was recorded on 20 patients (11 male, 9 female,

mean age 47 years) who presented with aberrant ocular movements.

## RESULTS

Vertigo, neck pain, and cervical spine pathology (spondylosis or straightening) was present in 65% of these patients (40% in males and 25% in females, respectively), indicating the high frequency of patients with these problems presenting to a chiropractic office. Furthermore, 35% of these patients were hospitalized for acute vertigo at one time prior to receiving chiropractic cervical manipulation. These patients found our care satisfactory and outcome in this clinically diverse group was complete resolution of

vertigo and neck pain. Furthermore, no acute vertigo was noted following chiropractic care and 65% had resolution of nystagmus.

## DISCUSSION

These results suggest that either cervical manipulation was highly therapeutic for this dysfunction, or that this pathology was transitory, or both. These results are in agreement with the literature, which supports a manual exam of cervical spine dysfunction and therapeutic trial of manipulation for patients with vertigo. While acute vertigo after chiropractic

manipulation may lead some authors to conclude that cervical manipulation created vascular damage as in dissection of vertebral artery and subsequent infarction, inherent pathological abnormalities within this specific patient population need to be considered. Although VEMR and ocular movement testing in patients who present for chiropractic manipulation showed a high percentage of abnormal responses, these tests did not have prognostic value in our study. These results do support the contention that patients with cervical spine disease frequently exhibit concurrent deficits in eye mobility and vestibular testing. Benefits-to-risk ratios can only be valid if a large group of patients is followed from the onset of care, not from examining the rare, transient, negative outcomes that present to hospital emergency rooms.



# A Prospective Study of Hereditary Disorders of Connective Tissue in a Chiropractic Patient Population

Joseph O. Di Duro, B.A., D.C., D.A.C.N.B., Private Practice

Recent reports in the literature of a spinal chiropractic manipulation leading to intracranial hypotension via tearing of the dura prompted a prospective study of hereditary disorder of connective tissue (HDCT) in patients seeking chiropractic care.

## METHODS

The Bieghton and Brighton hypermobility index was used in 118 consecutive patients who entered a clinic over a 5-month period.

## RESULTS

Of the 69 patients under 45 years of age (34 female and 35 male), 39% demonstrated benign joint hypermobility syndrome (BJHS) (53% and 26%, respectively), an extremely high percentage in comparison to other specialties. Furthermore, eight patients were identified with characteristics of Marfan syndrome, carrying the highest risk for dural

weakness. Interestingly, four of the patients with marfanoid habitus did not demonstrate BJHS.

## DISCUSSION

Chronic musculoskeletal pain is a common manifestation of HDCT, with back or neck pain dominating the lives of many patients with these hyperlaxity syndromes. Not surprisingly, these patients' musculoskeletal complaints lead them to seek care from specialists in the field such as doctors of chiropractic. The literature is in agreement with the data here, that a high percentage of chiropractic patients under 45 years of age harbor HDCT. In accordance with their predisposing genetic weakness, reports have occasionally noted negative reactions to manipulation, including dissection of cervical arteries. Patient selection from within a chiropractic patient group, without testing of their genetic loads, certainly biases the conclusions of these studies. There is a distinct possibility that, as there exists within the chiropractic patient population a high prevalence of HDCT, it would be premature to conclude that external forces from a cervical chiropractic manipulation can lead to intracranial hypotension via a dural tear or dissections of cervical arteries.



# Orthotic Insole Use and Patient Satisfaction in an Outpatient Chiropractic Clinic

**Manuel A. Duarte**, D.C., M.S., D.A.B.C.O., D.A.C.B.S.P, and **Jerrilyn A. Cambron**, D.C., M.P.H., National University of Health Sciences

The effectiveness of foot orthotics is a controversial and often debated topic. Some authors suggest significant clinical advantages, mainly based on studies with heterogeneous samples. However, reviews of the literature assessing the benefit of orthotics for more specific disorders demonstrate equivocal results. Prevention of back and lower extremity disorders through the use of orthotics has also demonstrated equivocal results. Even though data are lacking on specific therapeutic efficacy of foot orthotics, there appears to be a high level of satisfaction with use. However, there are no data on patient satisfaction of foot orthotics in a general population. Furthermore, there are no data on the reasons for use within a chiropractic population. The purpose of this study was to survey the reasons for foot orthotic use and the resultant level of satisfaction within a chiropractic outpatient clinic.

## METHODS

Subjects were randomly sampled from a list of patients who previously purchased Foot Levelers orthotics at a chiropractic teaching clinic. A three-page, IRB-approved survey was either mailed or personally presented to each selected subject. The survey consisted of 19 questions including the subject's chief complaint when initially presenting to the clinic, the reason orthotics were recommended, and the subject's overall satisfaction with their orthotics. All patients were fitted for orthotics in the manner described and taught by Foot Levelers, Inc. Prior to use, patients were instructed to wear the orthotics for progressively longer periods of time each day in order for the body to accommodate, until the orthotics could be comfortably worn as needed. Data collected from the survey were collapsed descriptively. Variables significantly associated with level of satisfaction were determined using multivariate modeling.

## RESULTS

Of the 100 questionnaires sent out, 100 were eventually returned for a response rate of 100%. The majority

of respondents were male (66%) and Caucasian (82%). The majority of patients receiving orthotics initially presented to the clinic with a chief complaint of foot pain (32%), low back pain (31%), or knee pain (26%). However, when queried why orthotics were prescribed, the majority of patients stated the reason was the symptom of knee pain (27%) or the biomechanical stress caused by flat feet (71%). After receiving the foot orthotics, the majority of patients reported that it took more than 1 week to acclimate (47%). The majority of subjects (79%) were satisfied with their orthotics, and 73% would recommend orthotics to a friend. "Level of satisfaction" was positively associated with the duration of orthotic use ( $p < .05$ ) and whether the orthotics helped the patient become more physically active ( $p < .05$ ). "Level of satisfaction" was negatively associated with the length of time the patient took to get used to the orthotic ( $p < .05$ ) and whether there were new symptoms related to orthotic use ( $p < .05$ ).

## DISCUSSION

This study represents the first survey of foot orthotic use and satisfaction of use in a chiropractic setting. The majority of disorders treated by orthotics in this setting were biomechanically related, as previously hypothesized. The main disorders described were flat feet and knee pain, which have consistently been described as indications for treatment with orthotics. Also, the majority of subjects surveyed were satisfied with the use of orthotics, similar to previous studies. Patient satisfaction and willingness to refer indicates that chiropractic physicians might better help their patients resolve painful conditions related to biomechanical deficits by prescribing custom-made orthotics as indicated.

## CONCLUSION

In a random sample of chiropractic patients who utilized foot orthotics, the majority of subjects indicated that they wore orthotics for knee pain and flat feet and that they were satisfied with foot orthotics for their symptoms.



# The Successful Management of a Centenarian Presenting With Bilateral Shoulder Pain Subsequent to a Fall Using Chiropractic Care A Case Report

**Brian J. Gleberzon**, D.C., Canadian Memorial Chiropractic College

The purpose of this report is to describe the chiropractic management of a 100-year-old patient presenting with bilateral shoulder pain subsequent to a fall.

## METHOD

Using standardized assessment methods including history taking, physical examination, static and motion palpation, joint play examination, and orthopedic tests, a 100-year-old man was diagnosed with mild to moderate traumatic impingement syndrome of the right shoulder and mild traumatic strain of the deltoid muscle of the left shoulder. These injuries were sustained subsequent to a fall. Conservative management of this patient consisted of soft tissue and mobilization techniques. In addition, the patient was given home stretches, suggestions as to how to safety proof his home, and strength training exercises. Ultrasound was used in the initial stages of care to decrease inflammation and promote healing in the involved areas.

## RESULTS

Outcome measures of therapy included diminished subjective pain, improvement in active and passive shoulder joint motion, normalization of orthopedic tests, and improvement in the patient's quality of sleep. The ability of the patient

to perform his activities of daily living and to live independently were closely monitored. Based on these outcome measures, the patient realized clinically relevant benefits within 10 weeks of care. Reoccurrences of the patient's chief complaint, subsequent to other falls, were also successfully managed within a relatively short period of time following the same therapeutic protocols. No adverse effects attributed to the therapy provided were reported during the patient's course of care.

## DISCUSSION

This particular case illustrates several important features germane to the care of an older patient:

1. Chiropractic care, consisting of conservative manual therapies, can be successfully delivered to a older patient, even a centenarian, without adverse effects.
2. Following each treatment session, pain, function, and outcome measures important to the patient should all be simultaneously monitored.
3. The danger that falls present to older persons cannot be understated.

In addition, home safety-proofing, strength training, and other simple exercises are important for patient recovery and aid in maintaining an older person's ability to life independently, which is often of primary importance to them.



## Patient Days An Integrative Approach in Teaching

**Nancy J. Gour**, R.N., **Emile Goubran**, M.D., Ph.D., **Paul Hooper**, D.C., M.P.H., and **Gene Tobias**, Ph.D., D.C., Southern California University of Health Sciences

A recent curriculum revision at the Southern California University of Health Sciences provided the opportunity to introduce and facilitate a new approach to integration in teaching. The need for additional integration of subjects was a key factor in the reorganization of the curriculum. The students in the third trimester participated in this experience. This article describes the project design and the responses from both the faculty and the students involved. The goal

of this project was for faculty to demonstrate to students an integrative step-by-step process in clinical problem solving.

## METHODS

The first step in designing the project was to form a first-year faculty committee from the basic and clinical

sciences. The committee was charged with the selection of a case history, case presentations, and techniques. The duration of the project was 2 days. The first day consisted of three sessions: student history-taking encounter with a standardized patient; panel discussion of what is an adjustment; and faculty presentations from basic sciences and clinical sciences of the case history. The second day consisted of six small-group technique sessions, each lasting 1 hour.

On day 1, the students participated in an orientation for the 2-day event. In the first session, the students participated in taking a clinical history from a standardized patient. During the history encounter, the standardized patient was trained to ask the student doctor to explain what a chiropractic adjustment is. Each student history was 15 minutes in length. Following the history, the students were provided with immediate formative feedback on their interview technique. The feedback was designed to provide the students with written assessments on strengths, weaknesses, and a prescription for improvement. The second session involved a panel discussion. Three chiropractic faculty members discussed and reviewed with the students how to explain a chiropractic adjustment to a patient. The third session of day 1 consisted of multiple faculty presentations discussing integration of the case history. The faculty presentations provided the students with a list of case references to the case topic, which was carpal tunnel syndrome. The presentations that were integrated were on anatomy of the wrist, biomechanics

of the wrist, physiology of the wrist, pathology of the wrist, special studies of the wrist, diagnosis, nutrition, treatment, and patient management.

On day 2, the students were placed in groups of 10 and participated in six technique sessions, of which two involved the case topic. The students were provided with informative handouts on each of the techniques. The chiropractic preclinical and clinical faculty presented the techniques that were instructed.

## RESULTS

The overall feedback for each individual session was positive. However, the students did request that there be additional technique sessions.

## CONCLUSION

The faculty consensus was that the project was successful. It was felt that the project had accomplished its goal. In the future, the faculty plan to increase the amount of technique sessions.



# Use of a Clinical Seminar to Integrate Basic Science and Clinical Topics for Year 1 Students

**Bart N. Green**, D.C., M.S.Ed., Contracted Chiropractor, Naval Medical Center, San Diego, **Jill Vuong**, B.S., **Arlene Luckock**, Ph.D., and **Gerald Waagen**, Ph.D., D.C., Palmer College of Chiropractic West

Various stakeholders identified a need for greater integration of basic science and clinical information in the first year of our program. Several faculty members demonstrated an interest in piloting a project to address this need. The purpose of this article is to describe a clinical seminar introduced as a pilot program to meet this need. Results obtained from assessing student knowledge and confidence in the topic area before and after the seminar, as well as student perceptions of the program, are also presented.

## METHODS

A 2-hour interactive seminar was created to integrate information from a diverse array of courses that students take in the first quarter of our program. A real patient from our teaching clinic comes to the classroom and serves as the clinical focus for integrating basic science and clinical topics. Student knowledge, confidence in knowledge, and

perceptions of the program were assessed using blinded questionnaires. Changes in student knowledge were analyzed using the sign test; changes in student confidence in knowledge were assessed using the Wilcoxon Signed Rank test for two related samples. Student perception of the experience was assessed using six Likert items and by collecting written comments that were analyzed qualitatively.

## RESULTS

One hundred ten students participated in the seminar during the pilot year in which it was offered. A statistically significant improvement in student knowledge was observed immediately after the seminar. A statistically significant increase in student confidence in knowledge was also observed immediately after the seminar. Students found the seminar to be very enjoyable and well prepared and felt that it integrated basic science and clinical information.

## CONCLUSION

Overall, student knowledge related to the topic was higher at the end of the seminar, as was student confidence in knowledge. Students enjoyed the seminar and the seminar

achieved the goal of integrating clinical information with basic science information. Based on the success of this seminar experience, we continue to offer it in the first quarter and new programs are being planned for other quarters in the program.



## A Model for Learning to Understand and Communicate the Philosophy of Chiropractic

**Timothy A. Gross**, M.S., D.C., L.C.P. (Hon.), and **Charles Butler**, D.C., L.C.P. (Hon.),  
Palmer College of Chiropractic

Since the early beginnings of the chiropractic profession, understanding and communicating the philosophy of chiropractic seems to have created turmoil within the profession. The philosophy of chiropractic has caused debate, been accused of being religious, and has even been discarded by some as useless and/or harmful to the chiropractic profession. Taking this perception into consideration, the authors began an investigation to search for a model that could create an avenue for learning to understand and communicate the philosophy of chiropractic. This exploration revealed Steven R. Covey's book, *The 7 Habits of Highly Effective People*, which suggests a model for learning successful habits to solve personal and professional problems. The concepts put forth by Covey inspired the authors to take these basic ideas and apply them to strategies that the chiropractic educator could use in a philosophy course, or in the process of integrating the philosophy of chiropractic into other curricular courses.

## DISCUSSION

Because of the seemingly countless perceptions of what the philosophy of chiropractic is, or if it should even be a part of the practice of chiropractic, this article makes an attempt at crafting a new model of communication. By synthesizing the seven habits identified by Stephen Covey with the works of R.W. Stephenson, in *The Chiropractic*

*Textbook*, a tool may be created that could be useful for the chiropractic student or educator. This communication tool creates principled perceptions, or a paradigm shift, that illustrates the value of the philosophy for clinical practice, adds to the educational experience, and is more easily heard and understood by a wider audience.

It is the opinion of these authors that the philosophy of chiropractic is as vital to the profession as is the science and the art. During the earliest days of the profession, Stephenson said "Science, Art and Philosophy. Science tells us what it is; art tells us how it is done, and philosophy, the why of the other two." Challenges have also existed since the earliest days of the profession—communication of ideas being one of them.

Professionals in other fields have used Covey's seven habits as a model for success in conveying their ideas and incorporating thoughtful applications to their principles. Areas of medicine, pharmacology, and education have taken the seven habits and created effective communication processes. The chiropractic profession could make similar attempts. While these authors acknowledge that this particular model is not perfect, the concepts it contains are useful, practical, and worthy of inclusion in a model for chiropractors to use. This model can be examined and then applied to create another avenue for dialogue, advancing the philosophy of chiropractic and serving as a platform for learning to better understand and communicate the philosophy of chiropractic.



# A Bioengineered Chiropractic Mannequin

## A Preliminary Development

**M. Ram Gudavalli**, Ph.D., Palmer Center for Chiropractic Research, and **Roger Titone**, Titronocs Research and Development

The art of chiropractic palpation and adjusting is taught by skilled practitioners and teachers to students. Students practice on each other under the supervision of a competent teacher. The teacher observes visually how the students are acquiring the skills and gives feedback for the improvement in the performance. Currently, there exists no realistic device on which chiropractic students can learn and perfect their palpation and adjusting techniques. Instrumented models could provide specific feedback to the students about their palpatory and adjustment skills. This feedback would allow the students to perfect their method as well as decrease the time needed to learn a technique. Therefore, the development of a bioengineered chiropractic teaching mannequin could pave the way for a new level of improvement in student education. The objectives of this investigation are to develop a mannequin that has the realistic feel to touch similar to a human spine, muscles, and skin; and to place instrumentation in the mannequin to give feedback on the anatomical location of the palpation.

### METHODS

A plastic skeleton with the vertebrae, rib cage, and head served as the basic structure. To simulate skin and muscles, silicone was used throughout the model. There are many muscles in the posterior torso of the human. Due to the limited nature of the project and because chiropractors primarily palpate along the spine, the group chose to focus on the muscles along the spine. Development of a three-dimensional (3-D) model was done by first acquiring x-y coordinate data of individual slices of the human thorax and abdomen from The Visible Human Project, which when linked together by triangulation software, would provide a full 3-D model. Artificial intervertebral discs were made from silicone so that the spine is flexible. The development of the intervertebral discs involved molding discs from two different types of silicone and testing the lumbar region to compare motion characteristics with values from previous published

research. The comparison verified that the spine designed accurately represents the motion characteristics of a human spine. The muscles and skin were remolded to conform to the rib cage and produce a realistic look and feel. Fiber optics and pressure sensors are located on the spinous processes of several of the vertebrae, concentrating on the lumbar region.

### DISCUSSION

We have been able to achieve some of our objectives. The intervertebral discs behaved very similarly to the cadaver properties in the lumbar spine. The skin and muscles had a realistic feel to touch. The pressure sensors were able to give feedback of the anatomical location of the palpation through a lighted display board. The current mannequin reported here is still in its early development. The development of a chiropractic mannequin as a teaching tool for chiropractic students would be beneficial for students, professors, and patients. A product such as this will offer a safe alternative to current practices. The technology involved will give both the student and teacher insight into how the techniques being applied will affect the spine (i.e., location of pressure application). This feedback will enable the students to hone their skills and help teachers recognize possible problem areas, with respect to technique.

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# Self-Management Program for Chronic Low Back Pain in the Elderly

**Mitchell Haas**, D.C., M.A., **Elyse Group**, Ph.D., Western States Chiropractic College, **Dale Kraemer**, Ph.D., **John Muench**, M.D., M.P.H., Oregon Health & Science University, **Ken Brummel-Smith**, M.D., Florida State University, **Bonnie Ganger**, **Alisa Group**, and **Michael Attwood**, Western States Chiropractic College

Chronic low back pain is a common, costly, and recurrent health problem. According to the US census, in 1995 there were 54 million people age 60 and over and by the year 2030, this number will increase to 92 million, representing 20% of the total projected US population. Management of low back pain in seniors will become an increasing burden on health care resources, so a program enhancing seniors' self-reliance in managing their pain is desirable. The purpose of this federally funded, randomized, controlled trial was to determine the effects of Stanford's Chronic Disease Self-Management Program (CDSMP) on chronic low back pain in the elderly.

## METHODS

One hundred twenty white and African American seniors, 60 years or older, were randomized into two groups. One group received the CDSMP classes immediately, the other 6 months later (wait-list control). The program is a community-based, 6-week workshop taught by trained lay people. This patient-education program encourages people with chronic conditions to implement behaviors that result in better symptom management and maintenance of functional ability. Primary outcomes were the Modified Von Korff Pain and Disability Scales collected at 6 months following enrollment in the program. General health status was evaluated with the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) appended with a three-question depression screen. Perceived self-efficacy was measured with a subset of questions from the Arthritis Self-Efficacy Scale (ASES). Outcomes and demographic information were collected using a baseline questionnaire prior to randomization and by mailed survey for the 6-month follow-up. Data were also collected in a bimonthly phone interview on health services and medication use, as well as pain and disability.

Two members of the Western States Chiropractic College (WSCC) staff were sent to Stanford to become certified CDSMP trainers. The trainers then conducted several classes to recruit seniors with back pain to become lay leaders (program facilitators) in the community. The trainers then conducted instruction classes for the lay leaders. Community-based partnerships were formed and recruitment strategies

employed including lectures at senior centers. Interested parties then attended an organizational meeting to learn about the details of the study, determine eligibility for the study, and meet the lay leaders and study personnel with whom they would be interacting over the course of the study. Participants were randomized to intervention or control arm. The intervention group attended the 6-week class. A research assistant kept participants engaged in the study through bimonthly telephone calls.

## RESULTS

Enrollment of participants in this study took place from September 2002 through June 2003. Overall, the majority of the participants were women (84%) and white (85%). Approximately 30% were married and 44% widowed; 95% were high school graduates and 14% college graduates. The mean age was 77. Mean pain (49) and disability (42) were moderate. The mean SF-36 (55) scores show that participants had fair to good general health and well-being (68), with a tendency toward fatigue (44). Only a small proportion had a positive screen for depression (15%). The mean scores for the self-efficacy pain and other symptoms subscales were 62 and 67. The vast majority of participants believed that they should maximize self-care efforts for prevention/reduction of low back pain "often" or "always" (102/109), while 72/109 felt that they had energy/time to accomplish the task often or always.

## DISCUSSION

Recruiting seniors was challenging, especially African Americans. Follow-up data collection will be completed by December 2003. This presentation will focus on reporting study outcomes and the effectiveness analysis. There will also be a discussion on challenges and techniques for recruiting elderly participants. The study was funded by a grant from Health Resources and Services Administration (R18 HP10012).



# Conservative Methods for Reducing Lateral Translation Postures of the Head

## A Nonrandomized Clinical Control Trial

**Deed E. Harrison**, D.C., Private Practice, **Rene Cailliet**, M.D., University of Southern California School of Medicine, **Joseph W. Betz**, B.S., D.C., Private Practice, **Jason W. Haas**, D.C., Private Practice, **Donald D. Harrison**, Ph.D., D.C., M.S.E., Université du Québec à Trois-Rivières, **Tadeusz J. Janik**, Ph.D., CompMathRC, and **Burt Holland**, Ph.D., Temple University

The purpose of this nonrandomized clinical control trial was to determine the amount of improvement in lateral head translation posture with Harrison mirror image postural methods. Clinically, altered vertical alignment of the head relative to the median sagittal plane of the thoracic cage is common. Improvements in lateral head translation posture have not been reported in the literature.

### METHODS

Fifty-one retrospective, consecutive patients were compared to 26 prospective volunteer controls. Both groups had chronic neck pain and lateral head translation posture. For treatment subjects, beginning and follow-up pain scales and AP cervical radiographs were obtained after 12.8 weeks of care (average of 37 visits), while the duration was a mean of 12 months for control subjects. Digitized radiographs were analyzed for Risser-Ferguson angles and a horizontal translation distance of C2 from a vertical line through T3. Patients were treated with the Harrison mirror image postural methods, which include mechanically assisted manipulation,

opposite head posture exercise, and opposite head translation posture traction.

### RESULTS

While no significant differences were found in control group subjects' pain scores and AP radiographic measurements, there were statistically significant improvements in treatment group subjects' pain scores and lateral translation displacements of C2 compared to T3 (pre: 13.7 mm; post: 6.8 mm) and angle measurements.

### CONCLUSION

Harrison mirror image postural methods result in 50% improvement in lateral head translation as measured in millimeters on AP cervical radiographs in a program of care with a duration of 12.8 weeks.



# Modeling of the Sagittal Cervical Spine as a Method to Discriminate Hypolordosis

## Results of Elliptical and Circular Modeling in 72 Asymptomatic Subjects, 52 Acute Neck Pain Subjects, and 70 Chronic Neck Pain Subjects

**Donald D. Harrison**, Ph.D., D.C., M.S.E., Université du Québec à Trois-Rivières, **Deed E. Harrison**, D.C., Private Practice, **Tadeusz J. Janik**, Ph.D., CompMathRC, **Rene Cailliet**, M.D., University of Southern California School of Medicine, **Joseph R. Ferrantelli**, B.S., D.C., Private Practice, **Jason W. Haas**, D.C., Private Practice, and **Burt Holland**, Ph.D., Temple University

A computer analysis of digitized vertebral body corners on lateral cervical radiographs was conducted. Using elliptical and circular modeling approaches, the geometric shape of the path of the posterior vertebral body margins of

C2 to C7 was sought in normal, acute pain, and chronic pain subjects. Least squares error per point for paths of geometric shapes, minor axis to major axis elliptical ratios (b/a), Cobb angles, sagittal balance of C2 above C7, and

posterior tangent segmental and global angles were calculated.

## METHODS

Radiographs of 72 normal subjects, 52 acute neck pain subjects, and 70 chronic neck pain subjects were digitized. For normal subjects, the inclusion criteria were no kyphotic cervical segments, no cranial-cervical symptoms, and less than  $\pm 10$  mm horizontal displacement of C2 above C7. In pain subjects, inclusion criteria were no kyphotic cervical segments and less than 25 mm of horizontal displacement of C2 above C7. Measurements included segmental angles, global angles of lordosis (C1–C7 and C2–C7), height-to-length ratios, anterior weightbearing, and, from modeling, circular center and radius of curvature.

## RESULTS

In the normal group, a family of ellipses was found to approximate closely the posterior body margins of C2 to

C7 with a least squares error of less than 1 mm per vertebral body point. The only ellipse/circle found to include T1, with a least squares error of less than 1 mm, was a circle. Compared to the normal group, the pain group's mean radiographic angles were reduced and the radius of curvature was larger. For normal, acute, and chronic pain groups, the mean ARA C2–C7 were 34.5°, 28.6°, and 22.0°; C2–C7 Cobb angles were 26.8°, 16.5°, and 12.7°; and radius of curvature were 132.8 mm, 179 mm, and 245.4 mm, respectively.

## CONCLUSION

The mean cervical lordosis for all groups could be closely modeled with a circle. Pain groups had hypolordosis and smaller radii of curvature compared to the normal group. Circular modeling may be a valuable tool in the discrimination between normal lordosis and hypolordosis in normal and pain subjects.



# Implementation of an Information Literacy Course for a Doctor of Chiropractic Program A Design Model

**Phyllis Harvey**, M.Ln., and **Karen Goodell**, M.A., Palmer College of Chiropractic

In the past several years, trends in library automation and the way people gather information has been revolutionized by the introduction of the Internet. The Internet has changed the way libraries access information from databases to periodical subscriptions. For many students, information gathering begins with an Internet search. With this new array of information available, it became apparent to the Palmer College of Chiropractic Curriculum Management Team that in order for students to be successful in their studies, in their clinical experiences, and in their practices, they must become proficient in finding information in this new environment of technological advances and the Internet.

## METHODS

The goal was to develop a course for the Doctor of Chiropractic program that would train students to be proficient in searching for and using information on campus and give them the basics of how to find chiropractic and medical information when they were in their practices. Course design followed the basic precepts of the *Information Literacy Competency Standards for Higher Education* from

the Association of College and Research Libraries (ACRL) that were adopted by the Association in 2000. Course objectives were constructed following ACRL competency standards and CCE *Standards for Chiropractic Programs and Institutions*. A list of chiropractic and health science topics specific to a graduate-level program was compiled. Lesson plans based on course objectives and the topics specific to the graduate-level program were designed. The class syllabus was then written. Class lectures, handouts, exercises, midterms, and finals were designed or selected. A pretest and posttest analysis tool for the class was created. Finally, the course was revised for future trimesters.

## RESULTS

Information literacy classes are offered at institutions of higher education all across the country, but this is the first time a required, stand-alone, for-credit class was designed for a chiropractic school. We found no literature published from this environment on which to base the design of this course. The course was to be a 1-credit class that met for 50 minutes over a 15-week time period. The class was unique because it was based on proficiencies in finding both chiropractic and

health science information for classroom and clinical situations and to enhance lifelong learning skills for the student. As awareness of information literacy increases, more schools

may add these skills into the curriculum as an independent class.



## Who's the Most Stressed: Students or Alumni?

**Stephen Haslund, Ph.D., Toilynn Carson, Ed.D., L.M.F.T., L.P.C., N.C.C.,**  
and **Shawn Springer, Texas Chiropractic College**

The authors developed the Chiropractic Student Stress Assessment (CSSA) in 2001 to assess students' stress. This was prompted by the Director of Guidance and Counseling's personal counseling with students and the frequency with which students presented issues that were related to symptoms from experiencing stress. The authors wanted to further explore the stress experiences of students across the campus overall (i.e., those not in counseling) as well as to understand better what specific types of stressors students experienced. The CSSA included two parts. One part included six columns and 20 rows of stress descriptors. Each row represented either positive or negative stressors. Each column was representative of physical, cognitive/mental, relational, personality characteristics, stressful events, or emotional stressors. Part 2 of the CSSA included three open-ended questions. Students were asked, "What stresses, if any, have you experienced since you became a chiropractic student?" "What effects, if any, do you think these stresses have had on you?" "What, if anything, would help decrease the amount of stress you have experienced?" The authors thought that it would be helpful for students to be able to anticipate the next phase of their personal and professional development with stress in mind. As indicated by their responses, they suspect that "graduation" will largely determine the end of their stress. Therefore, the authors are exploring the degree and types of stresses that alumni experience and then completing a comparative study to determine which group (student or alumni) is reportedly the most stressed.

### METHODS

The CSSA will be administered to this institution's alumni in the form of the Chiropractic Stress Assessment (CSA). Alumni also will indicate the length of time since their graduation. They will also be asked if their current work is chiropractic related. Those working in chiropractic-related

positions will be assessed independently from those in nonchiropractic positions. The CSA will be assessed and interpreted using the same methods as it is for students. Then a within-group and between-group assessment will occur and the findings reported.

### RESULTS

Final results are not available at this time. The authors recently have readministered the CSSA to students and are in the process of administering the CSA to this institution's alumni. The authors are exploring various within-group and between-group questions. Their hypotheses are that alumni will be found to experience as much stress as students, and that the dynamics of alumni stress will be different than that of students.

### DISCUSSION

The value and impact of stress is often overlooked, denied, and/or misunderstood. This study affords the opportunity to confirm that it does exist, it does impact people on many levels, and it is not resolved from simple, external solutions like graduation, financial stability, leadership, family, or recognition. The investigative questions within this study may be important to answer for several reasons. First, chiropractic colleges can prepare students for the next personal and professional developmental challenges. Second, these questions may help students and alumni normalize their experiences. Finally, the authors desire to provide resources for students and professionals who have unknowingly found themselves within the snares (i.e., misperceptions) of being a professional and what it is reasonable to expect from themselves.



# Improving Adherence to Home Exercises Recommendations From a Practice-Based Study

**John K. Hyland**, D.C., M.P.H., School of Public Health and Community Medicine, University of Washington, **Cheryl Hawk**, D.C., Ph.D., Parker Research Institute, **Karen J. Sherman**, Ph.D., M.P.H., Center for Health Studies, Group Health Cooperative, **Anne McTiernan**, M.D., Ph.D., Cancer Prevention Research Program, Fred Hutchinson Cancer Research Center

Doctors of chiropractic frequently recommend home exercises to patients with back and joint problems in order to reduce pain and regain physical function, as well as for preventive and wellness benefits. In addition to speeding response to care, the home exercises can have significant social effects, such as an earlier return to functional roles in family and work settings, and better self-efficacy and locus of control, as well as economic returns, such as fewer disability days and lower utilization of health services. However, provider recommendations are frequently ignored, and the value of exercise recommendations is significantly diminished if few patients do their home exercises.

This study sought to determine what percent of chiropractic patients are doing their home exercises as frequently as recommended. It also attempted to identify moderating variables (personal factors, process variables, and provider characteristics) that were correlated with adherence. A better understanding of the process of providing exercise recommendations may suggest improvements in implementation and will permit better measurement of the effects of any changes designed to improve adherence.

## METHODS

A cross-sectional descriptive survey was performed, using a telephone interview of chiropractic patients 2 weeks after they had been given home exercise instructions. The participants were recruited consecutively at 10 independent chiropractic practices in metropolitan Denver, Colorado. The outcome variable was self-reported measure of adherence to exercise recommendations in response to questioning by the interviewer. Independent variables investigated included: personal factors (such as gender, age, level of education, stage of change for exercise, ethnic background, health beliefs, and tobacco use); process variables (such as number of exercises, time required, doctor demonstrated the exercises, doctor checked exercises later, use of preprinted materials, and use of an exercise log); and provider characteristics (such as gender, age, years in practice, rural/suburban/urban setting, personal history of exercise, belief in exercise benefits, and billing practices).

## RESULTS

Both enrollment and data collection were more challenging than anticipated, resulting in 69 interviews that met the study criteria. The average patient was a white, 46 years old, overweight female with some college education. Over three-quarters (77%) were very satisfied with their chiropractic care, and 64% met the CDC definition for arthritis. About half (49%) reported that they were performing at least 75% of their doctor's recommended home exercises. Process variables were the only ones to demonstrate a significant association with adherence in this pilot study. Being given fewer than four exercises, being asked to do the exercises more than three times a week, and not receiving printed handouts were associated with adherence.

## DISCUSSION

The small sample size produced substantial type II error. With a larger  $n$ , correlations between adherence and several personal and provider factors might have reached statistical significance. The logistics of a practice-based study present several obstacles to answering practical questions. Participation in a study affects practice behaviors to an unknown extent, and external validity is limited to similar populations and comparable exercise recommendation practices. Self-report bias is a significant issue when inquiring about health behaviors.

Doctors of chiropractic may be able to increase their patients' adherence by limiting the number of home exercises, recommending they be done more often than three times per week, and not using printed handouts. None of these chiropractors employed exercise logs, which have been shown to increase adherence in other fields. Recommending a reasonable number of frequently performed home exercises along with use of a monitored exercise log are practical approaches that do not interfere substantially with normal practice routines.



# Chiropractors and Immunization Sources of Information and Perceived Adequacy of Education

**Stephen H. Injeyan**, Ph.D., D.C., Canadian Memorial Chiropractic College, **Margaret L. Russell**, M.D., Ph.D., F.R.C.P.(C), and **Marja J. Verhoef**, Ph.D., University of Calgary

Chiropractors vary in their beliefs and behaviors related to immunization. Few data exist on their perceptions of the information sources they utilize and the adequacy of their educational preparation related to immunization. We describe chiropractors' perceptions of the adequacy of their educational preparation to counsel patients about immunization, the information sources used to obtain information on immunization, and perceived educational needs in this area.

## METHODS

Cross-sectional population-based postal survey of chiropractors of Alberta was conducted in the summer of 2002. The survey consisted of 55 items dealing with behavioral and belief questions. In addition, two close-ended questions answered on a 5-point Likert scale, inquired about respondents' perceptions of whether they felt adequately prepared to counsel patients on immunization through the education they received while in chiropractic college, and through self-directed studies since graduation. Respondents were also asked to indicate all educational sources they used to obtain information on immunization from a close-ended checklist and were asked to indicate which they used the most. Finally, two close-ended questions inquired as to which topics on immunization were of interest and as to the qualifications of the instructors they would prefer. Analyses included frequencies, cross-tabulations, and analyses of variance. Tests of association were done at  $\alpha = .05$ .

## RESULTS

Completed questionnaires were received from 503 of 643 chiropractors who had received the survey package (78.2% response rate). However, item response rates varied. Of 498 responding to the question whether they felt their college education prepared them adequately to counsel patients on immunization, 44% agreed, 46% neither agreed nor disagreed, and 9% disagreed with the statement. On the other hand, 64% agreed that their self-directed studies since

graduation prepared them adequately to counsel patients on immunization, 25% were neutral, and 11% disagreed. Chiropractors utilized a variety of sources to obtain information on immunization. Responders identified books (38%), MEDLINE/peer-reviewed articles (23%), Web sites (25%), and seminars (12%) as sources of information which they used most commonly. Other sources consulted by smaller proportions of chiropractors included government agencies, MD/RNs, undergraduate educational materials, chiropractic colleagues, trade magazines, and mass media. The sources used significantly differed between undergraduate preparation and self-directed postgraduate education. With respect to undergraduate chiropractic education, those who agreed that they had been adequately prepared were significantly more likely to use their undergraduate materials ( $p < .001$ ), chiropractic colleagues ( $p = .007$ ), MEDLINE/peer-reviewed articles ( $p = .03$ ), and government agencies ( $p = .03$ ) as sources of information than those who disagreed or were neutral. With respect to self-directed studies since graduation, those who agreed that they had been adequately prepared to counsel patients (relative to those who disagreed or were neutral) were significantly more likely to use Web sites ( $p < .001$ ), books ( $p < .001$ ), trade magazines ( $p < .001$ ), and seminars ( $p < .001$ ) as information sources. The most frequently identified immunization topic for which respondents felt more information is needed was "risks of being unvaccinated vs. benefits/risks of vaccination" (82%). By far the majority of respondents (84%) indicated that specialists with Ph.D. qualifications were their preferred choice for postgraduate instruction in this area.

## CONCLUSION

Our results indicate that self-directed postgraduate learning plays an important role in the self-perceived adequacy of preparation of chiropractors to counsel patients about immunization. There is a significant association between sources of information used by the chiropractors and perceptions of adequacy of education in the area of immunization. Responders have identified a need for further education in the area of immunization, which may be addressed by chiropractic academic institutions.



# Polyclonal Immunoglobulin Synthesis Following a Single Spinal Manipulative Therapy (SMT) in Normal Subjects

**Stephen H. Injeyan, Ph.D., D.C., Julita A. Teodorczyk-Injeyan, Ph.D., Steven Burnie, B.Sc., and Richard Ruegg, Ph.D., D.C.,** Canadian Memorial Chiropractic College

The humoral (antibody) immune response plays an essential role in host defense against infection and is regulated by numerous macrophage- and T-cell-derived soluble mediators. Recent reports suggest that spinal manipulation therapy (SMT) may alter the production of soluble factors produced by cells involved (directly or indirectly) in the regulation of human B cell responses to antigen stimulation. However, the effect of SMT on immunoglobulin synthesis has not been examined rigorously. The present study was undertaken to examine the capacity for polyclonal antibody production by peripheral blood mononuclear cells (PBMCs) from subjects treated with a single SMT.

## METHODS

Ethics approval was received from Canadian Memorial Chiropractic College's (CMCC's) Institutional Review Board. The study included 65 age- and gender-matched asymptomatic subjects who had not received a spinal manipulation for a minimum of 6 months prior to enrolment in the study. The subjects were accepted into the study according to strict inclusion/exclusion criteria and were assigned randomly to one of three groups: SMT, sham manipulation (SHM), or venipuncture control (VC). SMT subjects received a single adjustment (cross-bilateral) in the thoracic spine. SHM subjects received a thrust of a similar force in the thoracic spine using a line of drive inconsistent with cavitation. Heparinized blood samples were obtained from all subjects prior to any intervention and then at 20 and 120 minutes post-treatment. PBMCs were prepared by fractionation of blood samples on Ficoll-Hypaque gradients. Isolated cells were then cultured in the presence of the polyclonal B cell activator, pokeweed mitogen, 10 g/mL, for 7 days (37°C, 5% CO<sub>2</sub>). At the end of the incubation period, culture supernatants were collected for the subsequent determination of immunoglobulin G (IgG) and M (IgM) levels by a specific enzyme-linked immunosorbant assay (ELISA). Each sample determination was performed three to five times. In every subject, samples collected before intervention served as a self-control (baseline) to which posttreatment responses were compared.

## RESULTS

Normal human response to PWM stimulation involves the synthesis of all classes of immunoglobins and its

magnitude varies considerably. In all study groups, baseline levels of IgG secretion ranged from 280 to 1600 ng/mL and levels of IgM secretion ranged from 400 to 8000 ng/mL. Background (constitutive, without stimulation) secretion of IgG and IgM ranged from <50 to 600 ng/mL. The majority of cultures studied at 20 and 120 minutes postintervention demonstrated varying (relative to baseline) levels of IgG and/or IgM synthesis. To assess the magnitude of these changes, the levels of immunoglobulin production in each of the studied subjects were calculated as the percentage of their respective baseline. Comparison between the three study groups showed that 2-hour postintervention the mean PWM-induced production of IgG in subjects from both control (VC and SHM) groups increased by up to 19% and of IgM by up to 22%. In contrast to VC- and SHM-treated individuals, the mean IgG and IgM synthesis in SMT-receiving subjects remained largely unaltered. Interestingly, these subjects showed an increase (up to 40%) in the level of spontaneous immunoglobulin production in unstimulated cultures established 2-hour post-SMT. However, due to the marked variability in immunoglobulin levels inherent in all subjects, the observed differences between study groups were not significant.

## DISCUSSION

Increased polyclonal immunoglobulin synthesis in VC and SHM may result from the increased activity of accessory cells related to repeated venipuncture. Other work in our laboratory suggests that this does not occur in SMT-receiving subjects. The results of the present study demonstrate that a single SMT does not affect the capacity of B cells for *in vitro* immunoglobulin synthesis induced through activation by PWM. Since PWM-triggered antibody production is T-cell dependent, the PWM culture system provides also an opportunity to assess the functional activity of these cells. The present work indicates that following a single SMT, T-lymphocyte helper function remains unaltered. On the other hand, increased constitutive secretion of immunoglobulin may reflect SMT-related *in vivo* priming of the effector cells cooperating in the process of antibody production.



# Psychoactive Nutrition as a Treatment Intervention for Women With Binge-Eating Disorder

Joan S. Kent, Ph.D., Life Chiropractic College West

Ingestion of sugars activates the endogenous opioid system, which in turn stimulates dopaminergic reward neurons. Opioid release is associated with increased food intake and sustained consumption, and priming is related to the activation of dopamine receptors. In priming, a small quantity of a substance (e.g., sugar) promotes the desire for further use. It was hypothesized that certain individuals with binge-eating disorder have a relationship with food that may be an addictive process, based on neurochemical factors, and may follow an addictive pathway similar to that of other substance dependencies. It was further hypothesized that food selection, particularly consumption of sugars, may influence binge-eating episodes because of its psychoactive effects.

The objective of this pilot study was to determine whether reducing dietary sugars could reduce the incidence of bingeing and food craving in binge-eating-disordered women with addictive patterns of carbohydrate use by decreasing both opioid stimulation of consumption and dopaminergic activation of priming.

## METHODS

Twenty-five women with binge-eating disorder were divided into two groups for an 8-week pilot study to compare the effects on binge eating of a sugar-reduced (SR) diet and a non-sugar-reduced (NR) diet. Participants recorded daily food intake, binges, and cravings and met weekly. Body weight, body mass index (BMI), body fat, depression (BDI-II), and state and trait anxiety (STAI) were measured pre- and posttest.

## RESULTS

Presenting diets showed mean sugar intake of 21% of total energy intake and 40% of carbohydrate intake. Presenting sugar intakes of 96% of participants was well above the standard USDA recommendation of 10% of total energy intake (TEI), ranging from 11.5% to 38.2% of TEI, and comprising between 20% and 64.9% of total carbohydrate intake. SR showed statistically insignificant decreases in body

weight, BMI, body fat, and state anxiety (STAI-S), while NR showed insignificant increases in those values. All participants showed insignificant decreases in binge frequency, craving frequency, BDI-II scores, and trait anxiety (STAI-T). The majority of documented cravings were for carbohydrates, mostly sweet or sugary foods, with few cravings listed for fats.

## DISCUSSION

Reduced sugar intake apparently reduced dietary fat intake for several subjects and may have contributed to weight loss. However, several subjects who increased fat intake while decreasing sugars also lost weight and body fat. High carbohydrate intake is known to be an important determinant of the amount of consumed fat that is retained. Preliminary weight-loss data in the present study suggested that SR-induced weight loss could not be accounted for by decreased caloric intake alone. Food journal notations suggested that sugars were the most difficult foods for participants to moderate or avoid. Discussions in the NR group often centered on problems with sugar intake. It has been argued that so-called sugar addiction is actually a partiality to sugar/fat combinations. In the present study, however, fat consumption appeared to be driven by, or at least secondary to, a partiality to sugars. While specific, dysphoric mood states have been shown to trigger food cravings and/or preferences for sugars, sugars themselves may trigger dysphoric states and precipitate binge eating in women with presumed sugar sensitivity.

## CONCLUSION

In binge-eating-disordered women who are presumed to be sugar-sensitive, management of dietary sugars intake may be an important factor in weight management, dietary fat intake, mood state (specifically anxiety), and control of other factors associated with bingeing. Further investigation of binge-eating disorder as an addictive process with a neurochemical basis is merited and may yield a viable alternative in the treatment of binge-eating disorder and resistant weight problems.



# The Effect of Thoracic Spinal Manipulation on Heart Rate Variability and Heart Rate

**Norman W. Kettner**, D.C., D.A.C.B.R., F.I.C.C., Logan College of Chiropractic, **Issac B. Mrozek**, D.C., Private Practice, **Nicholas R. Payne**, D.C., Private Practice, **Jade M. Reynolds**, D.C., Private Practice, **Greg Rogers**, D.C., Private Practice, and **John Zhang**, M.D., Ph.D., Logan College of Chiropractic

The somatic nervous system controls physiology under conscious regulation, while the autonomic nervous system (ANS) controls unconscious internal body function. Of the physiological controls directed by the ANS, regulation of the heart rate (HR) is primary. Prolonged sympathetic nervous system activity increases the HR and shortens the cardiac diastole. This state can lead to a decrease in cardiac perfusion and to cardiac ischemia, and ultimately result in myocardial infarction. Parasympathetic stimulation has the opposite effect. Vagal stimulation is cardioprotective and is related to increased life expectancy, possibly by reducing myocardial oxygen demand and susceptibility to ventricular arrhythmia. Heart rate variability (HRV) utilizes the electrocardiogram (ECG) and time and frequency domain analysis by Fourier transformation to measure the beat-to-beat fluctuations in heart rate providing a reliable correlate of ANS function.

HRV and HR were measured following a single thoracic spinal manipulation (SM) in participants with thoracic spine joint dysfunction. We hypothesized that vestibulo-sympathetic reflexes stimulated by SM-triggered muscle and joint afferents played a role in decreasing heart rate and that HR decrease and HRV increase would occur following a single episode of SM.

## METHODS

Data were collected from a single experimental group in a pre-post design without controls. After providing consent, 59 participants underwent a history and screening thoracic physical examination to exclude heart disease and SM contraindications. Thoracic segmental joint dysfunction was

identified by static and motion palpation. Participants were 33 males and 26 females, ranging from 20 to 58 years with an average age of 28 years. Participants received thoracic SM and were analyzed for HR and HRV. All postanalyses, including fast Fourier transforms, power spectral density, and time domain measurements, were performed with digital signal processing software (Biopac Systems MP30). Data were analyzed by the *t* test with a significance threshold of  $p \leq .05$ .

## RESULTS

Following a single thoracic SM, all participants significantly decreased their HR (.016) and the R-R interval showed a significant increase (.018). No changes in HRV were recorded. Subgroup analysis revealed that right spinous rotation (.031) (.039) and the T1 level (.031) (.032) were also associated with significantly reduced HR and increased R-R interval respectively. Age group 20-26 was associated with significant reduction in HR (.039), but R-R only approached significance (.053).

## CONCLUSION

There was a statistically significant reduction in the HR and R-R interval in participants with thoracic spine segmental joint dysfunction following a single thoracic SM. No HRV changes were detected. This study, although preliminary in nature, suggests additional research is warranted.



## Spinal Manipulation and the Stroop Task

**Norman W. Kettner**, D.C., **John Zhang**, M.D., Ph.D., **Timothy Delicath**, Ph.D., Logan College of Chiropractic, **Melissa Hagen**, D.C., Private Practice, **Lindsey Day**, D.C., Private Practice, and **Ron Boesch**, D.C., Logan College of Chiropractic

The neuromodulatory effects of diversified cervical spinal manipulation (SM) on cognitive performance have received little attention. This is surprising considering that anxiety and depression are frequent comorbidities of chronic pain

syndromes. In addition, the pain neuromatrix is known to consist of an extensive cortical and subcortical network associated with sensorimotor, cognitive, and affective components. SM, through its somatosensory, proprioceptor, and

mechanoreceptor stimuli, may promote beneficial neuroplasticity resulting in improved psychomotor and cognitive function. The Stroop task is an array of tests including Color, Emotion, and Counting versions. They reliably evaluate cognitive processing interference (CPI) in a variety of experimental settings. The oldest is the Color task. It is based on the observation that there is a cognitive delay in naming a list of colors when the ink of the word is antagonistic (i.e., the word red is presented in blue ink). The Stroop task provides information about the mechanisms of CPI in normal and pathological states. The purpose of this study was to test the hypothesis that post-CPI times would be reduced compared to pre-CPI times and that the SM group would outperform the control.

## METHODS

After providing consent, participants received a cervical spine regional examination including static and motion palpation to identify segmental joint dysfunction. Twenty-nine consenting volunteers (21 male, 8 female; age range 20–55; mean age 27 years) participated in the study. Commercially available Stroop software (Stroop Effects 9.0) with statistical processing was used. Randomly assigned control and experimental arms underwent baseline and follow-up Stroop evaluations. Experimental participants received a Diversified cervical manipulation. Within 3–5 days, experimental and control groups were crossed over and the procedures were repeated. Pre- and postcontrol and experimental group

analyses were performed on total responses and total correct measures. Paired *t* tests were conducted on the pre- and postcontrol group and the pre- and postexperimental (SM) group Stroop scores. The difference between the pre- and postcontrol groups and the difference between the pre- and postexperimental groups were compared using a *t* test of two means. All *t* tests were one-tailed to detect group differences.

## RESULTS

Data analysis revealed the post-Stroop scores on measures of total responses and total correct were significantly greater than pre-Stroop scores for both experimental and control groups. Pre- and postinterference scores were not significantly different for both experimental and control groups. Combined Stroop scores for pre- and postexperimental and pre- and postcontrol groups showed no significant differences. Comparison of Stroop performance between experimental and control groups showed no significant differences on any measures.

## CONCLUSION

These results indicate that the total responses and total correct Stroop measures in participants following diversified cervical SM did not outperform those of the control. Our hypothesis was not supported.



# Developing Best Practices for Chiropractic Care of Aging Patients The Long and Winding Road

**Lisa Z. Killinger, D.C.**, Palmer College of Chiropractic

“Best Practices” are clinical practice guides found in many health professions, offering guidance and congruence to clinicians, educators, and third-party payors. In the chiropractic milieu, practice guidelines have been met with suspicion, concern over the perceived “prescriptive” nature of such documents, or outright resistance and rejection. In this presentation, the challenges, needs, and appropriateness of developing best practices for chiropractic care of aging patients (BPCCAP) are explored.

Currently, about one third of chiropractic patients are over the age of 50, and half of those are over 65. Since those over 65 constitute the fastest growing subset of the population, the proportion of aging persons within our practices is destined to increase significantly over the next few decades. Today nearly 10,000 people in this country turn 65 every day, and over 100,000 persons are currently over 100 years old. With an aging patient population, it is essential that information

be made available to chiropractors to enhance the safety and effectiveness of chiropractic care of aging persons.

## METHODS

A review of the relevant literature was performed and is summarized in this presentation.

## RESULTS

A review of the medical and allied health literature revealed several best practice type documents, books, and clinician resource publications. It appears from editorial discussions

of such documents that such best practice “guides” are not always greeted with open arms by the professionals they are intended to inform. While best practice guides may provide good information to clinicians and educators, such documents related to chiropractic care of aging (elderly) patients have not been compiled or published.

## DISCUSSION

Several needs have been identified in the literature in developing best practices, including: an evidence base related to the outcomes of various clinical procedures; a team of experienced researchers and academicians related to the topic at hand; a sizeable group of experienced clinicians with specialization in the related type of care; and an impartial publication source for production and dissemination of best practice products.

In reviewing this list, the challenges inherent in developing BPCCAP become apparent. The chiropractic literature pool on elder care is shallow, the team of experts is small and largely inexperienced in best practice development, and publication sources perceived by the chiropractic masses as “impartial” may not exist. Given such challenges, should we abandon the idea of developing best practices for care of aging patients? The need for best practice development is great, given the rapidly aging population, so in this poster

some alternative strategies for best practice development are proposed.

First, alternate sources of information may be used to augment the shallow literature pool of outcomes-based research on chiropractic adjusting strategies for the aging patient. Information gained from existing literature on observed adverse effects of chiropractic adjustments in aging patients must be included. Existing malpractice claims information regarding chiropractors and elderly patients should be utilized to identify areas of concern or scenarios that demand careful consideration of and employment of adjustive maneuvers. Practice-based research (PBR) data could be also be utilized and experienced clinicians with predominantly geriatric practices may also assist in developing the “practical” side of best practices. A broad-based group of participants in BPCCAP development is essential for professional acceptance of what should be a “seed document” from which the profession can grow.

## CONCLUSION

While the challenges to developing BPCCAP may make this process a “long and winding road,” it is important for the health and safety of an aging patient population and the credibility of the chiropractic profession to be proactive and timely in this regard.



## The Assessment of Quality of Life in Adults Planning and Implementing Individualized Wellness Plans in an Educational Environment

**Ron Kirk, M.A., D.C., Kathryn Hoiriis, B.S., D.C., Morris Braum, D.C., and Mike DeSaulniers, D.C., Life University**

According to the ACC Chiropractic Paradigm, the purpose of chiropractic care is to optimize health. In congruence with this goal, the U.S. Department of Health and Human Services affirms increasing the quality and quantity of years of healthy life for all citizens as the first priority of its Healthy People 2010 health initiative. Extensive studies indicate that lifestyle and health habits have a significant impact on the quality and quantity of peoples’ lives. Unfortunately, Americans’ interest in health matters does not necessarily translate into healthful activity. Most Americans are not engaged in healthy lifestyles. Seven out of 10 adults are not regularly active. Four in 10 engage in no active leisure pursuits. Obesity and its ramifications exist in epidemic proportions. Fifty million American adults (27% of the adult population) are obese. There are 50 million adults who are hypertensive. It is estimated that 17 million Americans are diabetic and 16 million have prediabetes. Approximately 12.6 million people in the

United States have coronary artery disease. As evidenced by these statistics, lifestyle-related disease is a highly significant health problem affecting the quality of life in America. In an effort to facilitate the improvement of the quality of life for students and their future patients, courses in wellness had been implemented in the curriculum of Life University. Progressively over a period of years, although the wellness center was quite popular, many students and also faculty began to view the wellness courses as ineffectual or unimportant. A wellness planning process was devised to instruct and empower students in self-management techniques, including goal setting in specific wellness-related domains. The current study assesses the quality of life changes in students participating in the wellness planning process. The hypothesis is that students participating in the wellness planning process would demonstrate positive quality of life changes and develop a sense of personal health empowerment.

## METHODS

Approximately 90 students in wellness-related classes were invited to participate in the study. Early in the term, instructors in first-, fourth- and seventh-term wellness classes distributed samples of wellness plans and discussed implementation strategies with students. Students created and implemented their personalized wellness plans across a diverse array of wellness dimensions. The subjects completed pre- and post-SF-36 health surveys and Global Well-Being Scales at a 5-week interval. Wellness diaries and narrative documentaries were submitted.

## RESULTS

Analysis of the pre- and postscores on the SF-36 health surveys indicate that students' quality of life improved over seven of eight of the scales. In three of the scales (physical functioning, general health, and mental health) the improvements in scores were statistically significant ( $p < .05$ ). Subjects' goal completion rate was 73%.

## DISCUSSION

Analysis of the descriptive documentaries demonstrated a plethora of positive descriptors. Several groups of students described the planning process as being "wonderful," "very beneficial," and "a great idea," respectively. These were the most prevalent descriptors. Other representative singular descriptors included: "good idea," "beneficial," "practical," "a great thing to do," "a great tool," "very valuable," "very useful," "excellent idea," "very good idea," "great framework," and "great for me." Clearly, the planning process was not perceived as a panacea. There were a small number of respondents who disliked the process or complained about it being "too stressful."

## CONCLUSION

As a result of teaching students lifestyle-related self-management skills, perceptions of students regarding wellness courses has improved dramatically and many have achieved a greater sense of empowerment in effecting quality of life improvements.



## The Validity of Brody's Navicular Drop Test

**D. Robert Kuhn, D.C., D.A.C.B.R., Nicole Bennett, D.C., Jeffrey Carpenter, D.C., Alicia Eldridge, D.C., Logan College of Chiropractic, and Dennis Nosco, Ph.D., Nosco Consulting**

The purpose of this study was to determine the validity of David M. Brody's Navicular Drop Test (NDT), recorded using the Postural Stability Indicator (PSI), by correlating the change in the vertical height of the navicular bone in weightbearing and nonweightbearing positions using clinical palpatory and radiographic measurements.

## METHODS

Clinical palpatory and lateral radiographic measurements of the navicular bone were obtained in weightbearing and nonweightbearing positions. A small metal ball was attached with an adhesive over the structure to mark the palpated landmark on the navicular bone. The metal ball provided the standard reference point for both the clinical measure and the radiographic measure. The distance between the surface upon which the subjects' feet rested and the metal ball were recorded in millimeters (mm). Comparisons of the clinical palpatory measurements to the radiograph measurements were then assessed

for accuracy in nonweightbearing and weightbearing positions. Linear regression was run along with calculation of 95% confidence intervals. A Brand Altman plot was applied to look for trends in the data of tests that produce similar results.

## RESULTS

Of the 52 subjects measured radiographically, three showed an increase in navicular height, three demonstrated no change, and 46 demonstrated a decrease in height from nonweightbearing to weightbearing positioning. The mean value of the palpated nonweightbearing group was 46 mm, while the radiographically derived nonweightbearing mean value was 47 mm. The palpated mean nonweightbearing measure was 42 mm and the radiographically derived average was 43 mm. The  $t$  test value for the weightbearing data was 0.194, and was 0.614 for the nonweightbearing data ( $p > .05$  for both).

## DISCUSSION

Proper identification and application of orthotic intervention in patients with pes planus could prevent injury and improve performance within the kinetic chain of the spine and pelvis. The often-cited NDT has been both praised and criticized. A thorough search of the literature failed to uncover any studies documenting the accuracy of the measure. This study compared the navicular position in nonweightbearing and weightbearing conditions, as advocated by Foot Levelers, Inc. These values were compared to the more accurate values produced by radiography. The paired *t* test and other statistical tests showed that there was no significant statistical difference between the values

derived by palpation and from radiographs. This suggests that the clinically derived (palpatory) measure of navicular bone position was as accurate as the more reliable radiographic assessment.

## CONCLUSION

This study suggests that the PSI card is an adequate tool to record navicular position, as advocated by Foot Levelers, Inc. The ability of the NDT to reflect navicular position accurately was verified by comparison to the currently accepted procedure, X-ray analysis. The PSI developed by Foot Levelers, Inc. is a simple, reliable test for navicular position.



## Orthotics A Correlation to Spinal Biomechanics

**D. Robert Kuhn**, D.C., D.A.C.B.R., **Michael Tremba**, D.C., Logan College of Chiropractic, and **Dennis Nosco**, Ph.D., Nosco Consulting

This student research project was designed to take the first steps toward determining whether any positive changes on spinal gravity lines can be detected after a trial of flexible orthotic devices on subjects who exhibit asymmetric flexible pes planus and spinal towering.

## METHODS

This study was approved by an IRB at Logan College of Chiropractic. Seven students who passed all entry criteria and gave, in writing, informed consent to participate were enrolled in the study. Study subjects were fitted with orthotics that they wore for 2 weeks. Anteroposterior full-spine radiographs were obtained both pretrial and posttrial, with the posttrial radiographs taken with orthotics in place. A spinal gravity line (plumb line) was constructed in both pre- and postorthotic radiographs that ran from the level of the apex of the odontoid process and intersected with the second sacral tubercle. The right or left deviation of the odontoid versus the plumb line intersecting with the second sacral tubercle was measured on all radiographs. Data analysis consisted of descriptive statistics and a two-tailed *t* test.

## RESULTS

Of the 10 subjects who began the study, seven completed the protocol. The study showed, qualitatively, that six of the

seven subjects involved moved in the direction of correction (mean pretrial deviation 11 mm; mean posttrial deviation 3 mm;  $p = .158$ ).

## DISCUSSION

Lack of a statistically significant difference may be an artifact of the small sample size, rather than a reflection of the ability of the orthotics to create a significant change. There is a distinct possibility that larger sample sizes will change the outcome.

There are several limitations to this study. Patient compliance was not assessed. Careful control to eliminate the possibility of radiographic artifacts arising from errors of positioning was not employed. Interexaminer reliability of the primary outcome measure used in this study is unknown. Future studies of this type should include efforts to eliminate or minimize these potential confounding factors. The quantitative improvement seen in six of the seven subjects suggests the desirability of future studies with a larger sample size.

## CONCLUSION

Further research is needed on the use of orthotic devices for the correction of spinal distortions.



# Effects of Changes in Specific Management Policies on the Utilization Rates of X-Rays by Chiropractors in a Managed Care Setting

**Thomas LaBrot, D.C., R. Doug Metz, D.C., Craig F. Nelson, M.S., D.C., Kurt Hegetschweiler, D.C., and Rene Vega, M.D., American Specialty Health, Inc.**

A growing body of clinical evidence indicates that a more conservative use of plain-film radiographs is appropriate for the management of common neuromusculoskeletal (NMS) pain syndromes. Within the chiropractic profession, the routine use of spinal radiographs has often been considered an essential part of patient evaluation. Such routine use of radiographs exposes patients to unnecessary radiation and places the chiropractic profession outside the standard of care for NMS pain management. This study evaluates the effects of changes in specific management policies regarding X-ray utilization rates by chiropractors.

## METHODS

Using administrative data (claims data) from a managed care organization (MCO) specializing in providing chiropractic benefit coverage, X-ray utilization was evaluated over two study periods. The first period (calendar years 1995–1997) is used as a baseline. During this period of time, the MCO's approval for radiographs was made by part-time case managers and without a specific set of clinical guidelines. The second period, the postintervention period (calendar years 2000–2002), represents the current management practices which include full-time case managers and a specific set of written guidelines governing X-ray utilization.

ICD-9 codes were used to define episodes of care in 11 different diagnostic categories: low back pain (uncomplicated); low back pain (complicated); neck pain (uncomplicated); neck pain (complicated); thoracic spine/ribs; headache; myalgias and arthralgias; upper extremity; lower extremity; latent effects; and other (miscellaneous). All services using a particular category of ICD-9 code and with a maximum gap of 45 days between claims were aggregated into one episode of care. A new episode was created when claims exceeded the 45-day period or a new code category was used. An expert

panel of chiropractors and medical physicians evaluated the list of ICD-9 codes for appropriateness and completeness.

## RESULTS

During the baseline period, 307,895 episodes of care were evaluated. For the intervention period, 896,095 episodes of care were evaluated. For these two periods of time, rates of utilization of plain-film radiographs in the various diagnostic categories, expressed as percent of episodes in which radiographs were taken at baseline and post-intervention, respectively, were as follows: neck pain (complicated), 20% and 9%; neck pain (uncomplicated), 18% and 7%; low back pain (complicated), 22% and 11%; low back pain (uncomplicated), 14% and 4%; thoracic spine and ribs, 12% and 9%; headache, 14% and 6%; myalgias and arthralgias (complicated), 12% and 3%; upper extremity, 12% and 5%; lower extremity, 11% and 6%; latent effects, 17% and 6%; and other (miscellaneous), 16% and 8%. The overall rate of X-ray utilization as a percentage of episodes was 15% at baseline and 6% postintervention. The overall rates of radiograph utilization on a per patient basis for the two periods were 31% at baseline and 14% postintervention.

## CONCLUSION

Following the implementation of management policies specifically designed to bring utilization into conformance with the best available clinical evidence, the X-ray utilization was dramatically reduced in all studied diagnostic categories. The ability of third-party payers to positively influence clinical decision making should not be discounted.



# Is Body Mass Index Correlated With Body Fat Level?

David C. Lin, Ph. D., Southern California University of Health Sciences

Body mass index (BMI) and waist-hip ratio (WHR) are correlated with morbidity and mortality of the cardiovascular system, gallbladder, type 2 diabetes mellitus, and postmenopausal breast cancer. These measurements are generally assumed to reflect the level and distribution of the body fat, although experimental evidence is lacking. The intention of this study was to test this assumption.

## METHODS

A cohort of students from a chiropractic college were recruited for this project. Anthropometric measurements were collected to allow calculation of BMI and WHR for each subject. Body fat for each subject was assessed by both 4-point skinfold measurement and bioelectric impedance analysis (BIA). Descriptive statistics for each assessment were generated. Correlation for assessment methods was examined using Pearson's correlation coefficient.

## RESULTS

There were 53 males and 51 females recruited for the study. The age range was 22–41, with a median age of 26, for

both gender groups. The BMI for males was  $24.6 \pm 3.6$ , and for females  $22.7 \pm 4.3$ . The WHR for males was  $0.85 \pm 0.05$ , and for females  $0.75 \pm 0.05$ . Body fat percentage as assessed by skinfold measurement was  $17.6 \pm 0.46$  for males and  $25.9 \pm 4.7$  for females. Body fat percentage as assessed by BIA was  $17.2\% \pm 5.6$  for males and  $26.1 \pm 7.6$  for females. A highly significant ( $p < .001$ ) positive Pearson correlation coefficient was observed for the following pairs of parameters in males: BMI vs. WHR; BMI vs. BIA % body fat; WHR vs. BIA % body fat; and BIA % body fat vs. skinfold % body fat. The female results varied. Only BMI and BIA % body fat, and BIA % body fat and skinfold % body fat are highly correlated ( $p < .001$ ). A significant correlation ( $p < .01$ ) was observed for BMI vs. WHR, and BMI vs. skinfold % body fat. A weaker correlation ( $p < .02$ ) was observed between WHR and BIA % body fat. No significant correlation ( $p > .1$ ) was detected between female WHR and skinfold % body fat.

## CONCLUSION

We concluded that the correlation between BMI/WHR and body fat level is affected by gender. Male BMI or WHR, and female BMI are well correlated with their actual body fat level, but not the female WHR.



# Cessation of Persistent Bed-Wetting in Both an 8- and 9-Year-Old Male Following 2 Months of Combined Chiropractic Multisegmental Adjustments and a Homeopathic Remedy for Enuresis

Danny G. Lipas, D.C., M.F.A., Palmer College of Chiropractic

Homeopathy is a natural form of healing medicine that has been used for over 200 years, and it utilizes microunits of a substance or a combination of substances to facilitate the body's own healing powers. The basic premise of homeopathy is treating patients with a substance that is similar to the cause of the illness.

This case report is a retrospective case report on two enuretic patients, ages 8 and 9, presenting with lifelong nightly bed-wetting. The purpose of this article is to assist practitioners with another option in treating bed-wetting patients. A search of the Internet for cases involving enuresis referenced from 1995 to 2003 (utilizing Pub-Med and Mantis databases) found a number of citations. However, the variety

of approaches revealed no consistent methodology for long-term resolution of the problem.

## CASE PRESENTATIONS AND TREATMENT METHOD

Prior to entering our office, the 8-year-old boy (patient 1) was experiencing nightly bed-wetting. He was carefully being monitored by his parents each night by elimination of fluid intake after 8 pm and voiding prior to bedtime. The 9-year-old boy (patient 2) was experiencing similar nightly

bed-wetting scenarios prior to entering our office for care. His parents went through similar precautions as those used by patient 1's parents in an attempt to avoid nighttime bed-wetting accidents. Both patients were treated over a 2-month period with contact-specific, low-amplitude, and high-velocity chiropractic adjustments in addition to a suggested homeopathic enuretic therapy.

## RESULTS

Patient 1 was treated three times a week for the first 2 weeks. The office visit schedule changed as improvements were seen. Bed-wetting occurred nightly until the sixth visit, when the patient reported his first night of no accidents. Sporadic occurrences occurred until the 13th visit. On subsequent office visits, the patient maintained bladder control with no negative bed-wetting scenarios as monitored and reported by the parents. Patient 2 was treated three times a week for the first 2 weeks. The office visit schedule changed as improvements were observed. He experienced a slower resolution to his situation compared to patient 1, and continued to have situations, sporadically, during the treatment plan. After the 18th office visit, consistent dry periods were noted as monitored and reported by the parents. Resolution of the

bed-wetting was attained by the end of the 2nd month of treatment for these patients.

## DISCUSSION

Nocturnal enuresis (NE) is a common occurrence encountered by many preadolescent children. Customarily, western culture has tended to stigmatize the child with NE and, in many cases, the family, to the degree that reporting of such cases is minimized relative to the frequency of occurrence. In addition, the family physician has also experienced difficulty in handling such cases, and many doctors hope the problem will self-resolve. It is encouraging that in this study a conservative approach was beneficial to both patients.

## CONCLUSION

This limited, private office experience suggests the described protocol as a clinical outcome for these two individual patients. However, the protocol should not be construed as a wide-based resolution for NE. Further expanded study and research should be performed.



# Alterations in Sacroiliac Joint Motion Palpation in a Patient With a Trans-Tibial Amputation and Prosthesis

**Anna Livdans-Forret, D.C., L.C.P. (Hon),** Palmer Chiropractic University

The sacroiliac joint may be one of the most misunderstood joints in the body. It is a synovial joint and as such is subjected to the same inflammatory and infectious conditions that affect other similar joints. Motion in this joint is also complex and some authors feel that it has at least eight different types of motion and thereby eight different types of dysfunction. A patient with left leg trans-tibial amputation, prosthesis, and right leg foot drop orthotic presents an evaluation challenge in that some traditional evaluation procedures can not be used. A consistent method of evaluating the motion in the sacroiliac joint needed to be decided on, as the weight of the prosthesis and the orthotic precluded using the method taught in our college's technique classes. The students involved have taught to each other, with input from the patient, how to utilize the motion noted in the thigh as an indicator of the need to adjust the left sacroiliac joint. This article hopes to offer assistance to those working with similar patients.

## CASE HISTORY

Our patient was a 40-year-old male presenting with low back pain at the left sacroiliac joint of 3 days duration. The

pain was described as constant in nature, but nonradiating. Past history was significant for a motor vehicle accident 19 years earlier that resulted in fracture of the T12 and L1 vertebrae with spinal cord traction. Surgical fusion was performed at the site of the fracture using bone from the left sacroiliac joint. In 1986 the patient had a trans-tibial amputation of the left leg due to osteomyelites from the 1980 accident and was fitted for a prosthesis. The right leg had foot drop for which the patient wears a foot drop orthotic.

## EVALUATION METHOD

The fluid motion at the left sacroiliac joint was assessed, using the posterior sacroiliac spine as a segmental contact point. The extern applied superior to inferior motion and, rather than using the amount of motion of the left foot as a guide in this patient with a below-the-knee prosthesis, the amount of motion of the left femur on the table was used as a guide. This motion was minimal in amount, but the need for consistency is necessary, which is why externs observed the procedure for many visits before actually doing it themselves

with supervision. If adjustments were indicated, a manual adjustment was performed on a Zenith-Thompson Terminal Point table.

## DISCUSSION

Most studies point to intraexaminer reliability as being more consistent than interexaminer reliability, with motion palpation being the second most commonly used chiropractic test method (static palpation being number one). Our use of training through observation and hands-on practice helped to ensure that our interexaminer performance was consistent. We also utilized input from the patient in the performance so as to modify the procedure when a new student took over

the case and worked alone for the first time. The sacroiliac joint adjustments for this patient have produced significant reduction in his lower back pain, but because of his altered gait, it is an area that will need continued monitoring. The sacroiliac joint is a complex entity, and its importance in the management of low back pain cases cannot be ignored.

## CONCLUSION

In patients with additional challenges, such as amputation and prosthesis, the evaluation procedure needs to be modified but at the same time stay consistent from visit to visit. Additional material on this subject is needed in the literature.



# Examining Efforts to Encourage Research and Scholarship Among Nonfaculty Chiropractic College Employees

**Cynthia Lund**, C.T., A.L.C.P. (Hon), and **Linda Carlson**, B.S.R.T., A.L.C.P. (Hon), Palmer College of Chiropractic

The pursuit of scholarship by those who are not faculty members has not been examined in the chiropractic profession. Mechanisms that could facilitate scholarly activity include developing this activity as an imperative for the institution, managers supporting staff, and the formal identification of scholarship by staff. Some have concluded that the more institutionalized and integrated a staff development program is, the more effective the organization will be.

## METHODS

A model of a program called “Developing as Researchers” was used to create workshops and surveys to offer information to nonfaculty employees. Background information was gathered with the use of a survey of accomplished scholars within the college. The data were assembled into a presentation and offered to all nonfaculty college employees. If nonfaculty employees at this chiropractic college respond to information offered via the “Developing as Researchers” model, the result may be the continuation of a program that would formally encourage, develop, and assist them in the pursuit of scholarship.

A search of the relevant literature was conducted with minimal results applicable to the area of nonfaculty mentoring or development. The authors created a survey of faculty scholars and asked five questions related to the behaviors of those who attempt research and scholarship. Another survey was created to ascertain attitudes of nonfaculty staff both before and after receiving information about the methods of scholarship. A Power Point presentation/workshop was designed to be informal, educational, and accessible to all nonfaculty employees.

## RESULTS

The nonfaculty population was 60% of the total number of persons employed. The actual attendance was 4% of the target audience. Comparison of prepresentation and postpresentation surveys indicated that seven of the eight attendees had an increase in “knowing how to get started on a research paper.” In an instrument used for presentation content, 15 faculty scholars were surveyed regarding scholarship efforts. Eight individuals responded and described motivators and behaviors in conceptual terms: curiosity, responsibility, recognition, personal growth, personal challenge, focus on goals, achieving results, and effective communication.

## DISCUSSION

The proportion of the target audience that attended the presentation and completed the survey was too small to allow for generalization of results. Scholarly behavior manifests itself in recognizable and describable ways. Accomplished scholars list a myriad of behaviors that contribute to success. The college can make resources available, free up time, and provide a climate of support—all of which offer the potential scholar an environment conducive to production.

What are the motivations of scholars? Are they born or made? A formal offering of information and assistance did not attract a significant number of people. Accomplished scholars list motivations and behaviors that are also identifiable in nonfaculty scholars.

The behaviors of those who engage in scholarly activities are not unique to faculty. However, the rewards of scholarly

effort are so closely affiliated with promotion for faculty that nonfaculty see little extrinsic gains for their efforts. The intrinsic value of performing scholarly activities provides the stronger motivation for nonfaculty in this specific situation.

The use of resources to encourage the scholarly efforts of either faculty or nonfaculty should be reserved for those who possess a personal interest in developing the skills necessary to become true scholars.



## Short-Term Effects of Spinal Manipulation on “Diffuse Noxious Inhibitory Controls” (DNIC)

**Parvaneh Mohammadian, Ph.D., Antonio Gonsalves, D.C., Chris Tsai, D.C.(c),** Cleveland Chiropractic College, **Thomas Hummel, M.D.,** University of Dresden Medical School, and **Thomas Carpenter, D.C.,** Cleveland Chiropractic College

Spinal manipulation treatment (SMT) has been commonly applied for years to produce hypoalgesic effects in various conditions. It has been discussed whether hypoalgesic effects associated with SMT are due to descending inhibition. Descending inhibition has been described to be the underlying mechanism in “diffuse noxious inhibitory controls” (DNIC). Wide dynamic range neurons in the dorsal horn of the spinal cord and trigeminal dorsal horn are inhibited strongly by heterotopic noxious conditioning stimulation remote from the excitatory receptive fields of the neurons. It has also been shown that supraspinal structures such as the brain stem are involved in DNIC mechanisms in which activation of brain stem pathways reduces the output in spinal somatosensory systems.

In order to investigate the supraspinal mechanisms of SMT, we applied a model that has previously been established to demonstrate DNIC effects. The objective of the study was to investigate as to whether the DNIC effects were modified by SMT. There would be an indication of involvement of supraspinal areas, especially the brain stem, if such changes are observed.

### METHODS

Eighteen healthy volunteers participated in this experiment. Subjects participated in three experimental sessions separated by at least 7 days. The order of the three sessions was randomized across all participants. Only the treating doctor of chiropractic was aware of the randomization. The investigator, who performed the measurements, was blind to the treatment. During each session, capsaicin cream was applied first. After 20 minutes, the cream was removed, and

pain intensity and the areas of both allodynia and hyperalgesia were measured. Then subjects were treated with SMT, non-SMT, or control, respectively. Following the treatment, subjects were asked to immerse their foot in the cold water. The pain threshold and tolerance were recorded. Finally, pain intensity and the areas of both allodynia and hyperalgesia were measured again. For statistical analyses, SPSS was used. To minimize interindividual variance, differences were calculated between measures obtained during the posttreatment and the pretreatment condition. In addition, paired *t* tests were used for comparisons between treatments.

### RESULTS

The treatments did not significantly affect responses to cold pain stimulation in terms of the subjects' pain intensity ratings. Also, treatments did not produce differences of the responses to capsaicin-induced pain. There was no significant effect for pain intensity ratings, measures of areas of allodynia, or measures of areas of hyperalgesia obtained before and after treatment.

### DISCUSSION

In this study we applied topical capsaicin, instead of injecting capsaicin, as was done in previous studies. This may have caused a problem with the controllability of the inflammatory reactions. Increasing the number of subjects in future studies may also help achieve clearer results.



# Using Critical Incident Technique to Improve Faculty Selection Processes

## A Case Study

**Jean Murray**, M.B.A., Ph.D., Palmer College, Florida

Hiring of professionals has been a task with uncertain outcome and high potential cost, both directly in terms of a career decision on the part of the institution and indirectly in terms of effect of a faculty member on students. In traditional settings, faculty are hired using either traditional interviews or behavioral interviews, often in combination with demonstrations.

The objective was to develop a faculty selection process that incorporated equity, involvement, communication, flexibility, respectfulness of the participants, and appropriate evaluation methods.

### METHODS

Palmer College, Florida, implemented a nontraditional curricular delivery model when it opened in July 2002. This delivery model requires that faculty have and use different skill sets. In this situation, the need for a nontraditional method of faculty selection was evident. After much study and discussion, a variation of critical incident technique (CIT) was chosen for the process.

CIT is a qualitative approach to analyzing work and identifying critical job requirements. CIT was developed as an outgrowth of studies to improve military flight training. The process involves analyzing critical tasks or behaviors crucial to job effectiveness. The American Institutes for Research defines CIT as a "set of procedures for systematically identifying behaviors that contribute to the success or failure of individuals. . . in specific situations." CIT previously has been used successfully to collect data in interview situations.

As often implemented, CIT in selection involves definition of requirements for successful performance and design of a selection process that incorporates these requirements. In some contexts, CIT includes interviews with candidates. In others, candidates are rated by evaluators, based on performance in specified activities. In the current situation, the researchers were determined to find a more effective way to hire faculty in order to match more carefully faculty abilities and skills with the skills required for the nontraditional curriculum. The researchers studied traditional interviewing methods and talked with successful interviewers and human resources advisors. The process was developed over several months as the researchers refined the elements to be included in what were termed "group interviews." Issues most important to success in teaching at the college were the focus of the research group. Several critical issues were identified and the hiring managers used these criteria, in the context of CIT, to develop a selection process that incorporated all goals.

### DISCUSSION

An evaluation of the selection process by all participants is being prepared for dissemination in Fall 2003, so that further refinements may be instituted. Additional evaluation measures incorporating the application of CIT to faculty selection processes will be performed at Palmer Florida to assess the effectiveness of the selection process by developing a selection assessment form to rank faculty more specifically and to correlate ranking with success.



# The Prevalence of Lateral Head Shift Postures in a Patient Population

## A Correlation of Posture Magnitude, Pain, and Demographic Variables

**Paul A. Oakley**, M.Sc., Palmer College of Chiropractic, and **Deed E. Harrison**, D.C., Private Practice

Since the advent of the evaluation of three-dimensional human postures as rotations and translations of the head, rib cage, and pelvis, a deficiency in spinal coupling patterns

for human translation postures was discovered. Recently, it was determined that lateral head translation postures elicit a "S-shaped" coupling pattern in the cervicothoracic

spine. Clinically, it has been noticed that lateral head shift postures are common in patients seeking chiropractic care. No literature on this posture could be found. The purpose of the present study was to report the prevalence of side-shift head postures in a population of chiropractic patients, and to evaluate the correlations between posture magnitude, pain intensity, pain duration, and demographic variables.

## METHODS

Patient data were randomly, retrospectively surveyed from a population of chiropractic patients attending a spine clinic during the years 2002 and 2003. Patient AP cervicothoracic radiographs were screened for head translations of at least 5 mm with concomitant head/neck complaints. Patient file data of age (minimum of 18 years), sex, height, weight, pain intensity (NRS; NDI), and pain duration were gathered. Three reliable radiographic measures were recorded from AP cervicothoracic radiographs: 1) lateral head translation distance, being the horizontal distance from C2 dens tip to vertical axis line (VAL) extending up from T4 CM; 2) the cervicodorsal angle (CD) between the best-fit lines intersecting the upper and lower neck; and 3) the rotation angle (Rz) between the VAL and lower CD line. Correlations between variables were evaluated.

## RESULTS

Of 335 radiographs screened for head translations ( $\geq 5$  mm), 176 (53%) were identified. Of these, 146 (67 male, 79 female) having head/neck complaints were included for study. Males were taller, heavier, and had greater absolute head translation distances and Rz angles. Thirty-eight percent (56/146) had left head shifts, whereas 62% (90/146) had right head shifts. The typical pattern was a Rz angle toward, and a CD angle away from, the side of head shift. Those with left head shifts

suffered from pain longer but had smaller absolute CD angles. Significant correlations existed between patient age and pain duration, pain duration and head translation distance, absolute head translation distance and age, and absolute CD angle and NDI score.

## DISCUSSION

The source of neck pain remains controversial, and little evidence of effective interventions has been uncovered. The identification of a causal factor for neck pain origin would be advantageous clinically, as understanding causal factors facilitates treatment. Our findings support the possibility that asymmetrical forces in head shift postures may be one unrealized factor in pain production. Patients were symptomatic for  $7.2 \pm 8.3$  years at presentation. It was determined that the older the patients were, the longer they had tolerated painful conditions, and the greater their head shifts. Once a subject has developed a significant head shift, the asymmetrical forces may contribute to ever-increasing distances from body midline, further increasing asymmetrical forces and presumably contributing to greater pain. The prevalence rate in this study (53%) and the lack of literature existing on the nature of this postural distortion suggest that this is an unrealized yet significant occurrence. Considering neck pain is second only to low back complaints in leading patients to seek chiropractic care, this posture should be screened for in regular practice.

## CONCLUSION

Lateral head shift postures have high prevalence rates in common chiropractic practice. Clinically, this posture is going unrecognized, despite its being a possible source of neck pain in those individuals.



## Clinical and Quality-of-Life Changes in a Patient With Cervical Spinal Stenosis Following Chiropractic and Homeopathic Care

**Jonice Owen, D.C., Chom, M.App.Sci., N.D., Private Practice, and Bart N. Green, D.C., M.S.Ed., Contracted Chiropractor, Naval Medical Center, San Diego**

Few studies exist that describe nonsurgical, conservative clinical management strategies for patients with cervical canal stenosis. The purpose of this article is to describe and discuss the combined use of chiropractic and homeopathic methods in the clinical management of a patient with cervical spinal canal stenosis.

## CASE REPORT

A 70-year-old, Chinese-American man experienced bouts of sudden falling, loss of strength in his arms and legs, neck pain, paresthesia in the upper and lower extremities,

and a loss of several normal activities of daily living. Severity of neck pain was 4/10, as measured by a numerical rating scale and his revised Oswestry Disability Questionnaire indicated 30% functional disability. The following physical examination signs were present: unsteady gait; left short leg revealed by Allis' sign and measured as 0.25-inch discrepancy; tenderness to palpation at left C1–C3 area, levator scapula, and upper trapezius muscles; cervical active range of rotation motion of 50° when measured using a goniometer; decreased intersegmental motion of C1–C2 and C5–C7; hypesthesia of the right four distal fingers, thumb, and hypothenar area; grip strength (Jamar dynamometer) averaging 2 psi and 10 psi on the right and left, respectively. Magnetic resonance imaging of his cervical spine revealed: hypolordosis; prominent extrusions at C3, C5, and C6 with effacement of the anterior epidural space and the spinal cord; prominent osteophytosis involving the right anterior lateral vertebral bodies principally at C3–C4 and anteriorly at C6–C7; a disc protrusion involving the posterior aspect of the C4 disc with degenerative posterior subluxation of C4; anterior disc protrusion at T2, with osteophytosis. The patient was advised to have surgery by two neurologists, but declined and elected to seek an alternative health care opinion.

## INTERVENTION AND OUTCOME

Chiropractic care involved the use of mechanical force, manually assisted chiropractic adjustments of the neck and upper extremities using an Activator instrument. Postural support was provided using a cervical pillow and a left heel

lift. A homeopathic remedy of *Calcarea carbonicum* was selected using a classic homeopathic analysis. The remedy was prepared at LM1 potency (highly dilute) and increased over time. The patient placed 5 drops of the solution into approximately 1 tablespoon of water, and administered the preparation twice daily. During the management period, the patient experienced shoulder pain with no abnormal physical examination findings. A new homeopathic preparation of *Rhus toxicodendron* (30 c) was suggested and alternated with *Calcarea carbonicum* treatments. The patient was also given rotator cuff exercises for strength and proprioceptive training. At 1-year follow-up, the patient no longer experienced bouts of sudden falling or loss of strength in his arms and legs and his gait was normal. The numerical rating scale score was 2/10, the revised Oswestry Disability Score indicated 12% functional disability, and full cervical active range of motion was present. Sensation was normal when assessed objectively. However, the patient continued to experience a mild tingling sensation in his hands. Handgrip dynamometer readings were an average of 60 psi and 72 psi on the right and left sides, respectively. He returned to his normal activities of daily living.

## CONCLUSION

There is little evidence supporting or disputing the use of combined chiropractic and homeopathic care for patients with cervical spinal stenosis. This article demonstrates one situation in which this approach seemed to benefit the patient.



## Undergraduate Students' Perceptions on Research in a Capstone Course

**Sujatha Pamula, Ph.D., and Parvaneh Mohammadian, Ph.D.,** Cleveland Chiropractic College, Los Angeles

The objective of this study was to explore the students' perceptions on research using library research as a tool.

## METHODS

The survey was conducted at Cleveland Chiropractic College, Los Angeles, at the end of a research-based capstone course during the students' final term of the undergraduate program. All these students were preprofessional students. The survey was given to the students on the last day of the course.

## RESULTS

About 44% of the students enrolled in the capstone course participated voluntarily in the survey. Survey showed that 19% of the respondents had prior research experience before taking the capstone course. Fifteen percent of the respondents indicated that they participated in chiropractic research. After going through the research-based capstone course, 57% responded positively in conducting library research; 93% responded that they understood the disease they had researched and could communicate on that topic effectively

with their patients. In terms of the role played by library research in developing various skills, 76% of the respondents indicated that library research helped them to further their intellectual development, 79% thought that the research would help them to provide better patient care, 78% of the responses showed that knowledge beyond textbooks and lectures could be gained through library research, and 73% of the responses indicated that research is important in their future practice. When asked about their participation

in conducting research, only 48% of the responses indicated their willingness to be involved in research.

## DISCUSSION

Students recognized the importance of research in the intellectual development, patient care, and future practice, but were apprehensive about being actively involved in research.



# Student Utilization of a Chiropractic Rehabilitation Department

**D. Ranier Pavlicek, D.C., A.T.C., C.S.C.S.,** Palmer College of Chiropractic

The purpose of this study was to compare the clinical training, application, and education of student externs at a chiropractic college to practice habits of chiropractic practitioners in the United States.

## METHODS

Data were collected from the chiropractic school registrars' office, clinical computer record system, and the clinical assessment department. The information collected was the total number of student externs in the clinic system, number of students registered for Physiotherapy I (Active Care) and Physiotherapy II (Passive Care), and the number of services (active and passive) provided by the chiropractic rehabilitation department during January 1, 2000 to December 31, 2002. Information from the National Board of Chiropractic Examiners (NBCE) Job Analysis of Chiropractic was included in this comparison.

## RESULTS

During the time interval under study, 1667 student externs were recorded as receiving credit from the clinical assessment department. Enrollment records show 1649 (98%) students in Physiotherapy I (active care) and 1425 (85%) in Physiotherapy II (passive care) during that same time period. Total services provided by the chiropractic rehabilitation department were 17,324. Of these, 66.3% (11,485/17,324) of services were passive modalities, whereas 33.7% (5,839/17,324) were active care. Records showed that the number of encounters each extern experienced in the rehabilitation department varied widely, with 521 (31.3%) externs having 0 visits/encounters; 232 (13.9%) externs having 1–2 encounters; 311 (18.7%) externs having 3–6 encounters, 164 (9.8%) externs having 7–10 encounters; 133 (8.0%) externs having 11–15 encounters; 86 (5.2%) externs

having 16–20 encounters; 45 (2.7%) externs having 21–25 encounters; 56 (3.4%) externs having 26–30 encounters; and 119 (6.7%) externs having 31–200 encounters. Job analysis of a chiropractor showed that 98% of chiropractors instruct their patients in some form of corrective or therapeutic exercise and 94% of chiropractors advise their patients on activities of daily living.

## DISCUSSION

Exercise has been known to help with obesity, arthritis, diabetes, and cardiovascular disease. A survey showed that 97% of chiropractors viewed the adjustment as an important component of maintenance care. In that survey, chiropractors (96%) felt exercise was just as important as the adjustment. NBCE job analysis showed that 98% of chiropractors educate their patients on the value of exercise. Ninety-eight percent of student externs received 60 hours of Physiotherapy I (active) training. However, 31% of student externs did not have one clinical encounter in the rehabilitation department, and 41% of the student externs had only 1–10 encounters. The rehabilitation department records show that 66% of services provided are passive in nature and 34% are of an active type. Are student externs able to implement an exercise program that can be incorporated into a patient management plan that encourages healing and wellness? The Council on Chiropractic Education (CCE) mandates that physiotherapy (active and passive) be taught a total of 120 hours within the academic curriculum. However, there are no CCE requirements for this education to be applied clinically. Some states have taken it upon themselves to mandate certain criteria before a chiropractor can practice in that state. Practicing chiropractors have stated that active care (exercise) is a tool that they use to enhance the care and health of their patients' lives. Can institutions incorporate what the field doctor is practicing and experiencing and transfer that information into the clinical and academic experience of the student extern?



# A Prospective Case Series of Soft Tissue Conditions Treated With Graston Technique

**Stephen M. Perle**, D.C., M.S., C.C.S.P., University of Bridgeport, College of Chiropractic, **Douglas G. Perry**, Ph.D., School of Informatics, Indiana University, and **M. Terry Carey-Loghmani**, M.S., P.T., M.T.C., School of Allied Health Sciences, Indiana University

Graston instrument-assisted soft tissue mobilization (GISTM) is a soft tissue diagnostic and therapeutic method that was developed approximately 10 years ago. Originally introduced to the physical therapy profession, GISTM, a key protocol of the Graston technique, has only recently been introduced to the chiropractic profession. Graston instruments were developed as an alternative to transverse friction massage wherein specially designed stainless steel instruments are used to aid in the diagnosis and treatment of soft tissue dysfunction or pathology. In vitro research with a rat tendon injury model has shown that GISTM significantly activates fibroblasts to both replicate and synthesize. A few case studies have been published about the effects of GISTM treatment. The purpose of this study is to evaluate the effects of GISTM on a variety of soft tissue conditions in humans in a large case series.

## METHODS

A prospective multicenter case series with outcomes analyzed comparing intake with discharge visual analog scale (10-cm long VAS) ratings in four domains; function, pain, numbness, and achievement of treatment goals. Function was assessed in three categories by the health care provider (HCP): activities of daily living, work, and recreation. A mean percent composite function level was analyzed. Long-term treatment goals were established by the patient and HCP at intake and rated by HCP at discharge on a VAS for percent achievement of these goals. Wilcoxon signed ranks test, one-way analysis of variance (ANOVA), general linear models for repeated measure, and Dunnett's T3 post hoc tests were used to analyze the data set.

## RESULTS

Fifty-one clinical sites participated with 1004 patients included in the data set. Conditions treated include carpal

tunnel syndrome, cervical pain, de Quervain's syndrome, epicondylitis, fibromyalgia, iliotibial band syndrome, joint sprain, lower back pain, muscle strain, painful scar, plantar fasciitis, postfracture pain, and tendinitis. Patients were treated a mean of eight treatments per patient, with significant differences ( $p = .001$ ) between clinics unrelated to the diagnosis. The average treatments per patient ranged from four to nine. The mean number of treatments per patient was significantly related to the specific condition, with a high of 10 for low back pain and a low of five for iliotibial band syndrome. There were no significant differences in outcomes between clinics. For all conditions treated, there was a significant decrease in pain ( $p < .001$ ) and numbness ( $p < .002$ ), and increase in function ( $p < .001$ ). These improvements in condition were generally not related to the patients' diagnosis. Eighty-seven percent of patients achieved at least 50% of their treatment goals, 73% achieved at least 75% of their goals, and 42% achieved at least 90% of their goals. The proportion of patients on full work duty increased from 69% at beginning of treatment to 83% at end of treatment. In addition, the proportion of patients on restricted duty or unable to work due to injury fell from 14% to 10% and 17% to 7%, respectively, at beginning and end of treatment. These results were statistically significant ( $p < .0001$ ).

## DISCUSSION

Despite the fact that soft tissue conditions are commonly treated by chiropractors and taught in chiropractic colleges, there is a paucity of articles on the topic in the chiropractic literature. These results suggest that GISTM appears to be effective in reducing pain, numbness, and work-related disability and increasing patients' functional ability and thus is an effective treatment for the variety of soft tissue conditions studied. Obviously, a case series such as this cannot distinguish between the effect of the treatment independent of placebo effect or natural history. Randomized controlled clinical trials are currently in the planning stages.



# Instrument-Assisted Soft Tissue Mobilization for the Treatment of Failed Back Surgery Syndrome

## A Case Study

**Mark T. Pfefer**, R.N., M.S., D.C., **Stephan R. Cooper**, B.Sc., and **Nathan L. Uhl**,  
Cleveland Chiropractic College, Kansas City

Failed back surgery syndrome (FBSS) is a relatively frequent occurrence. Despite this, FBSS is not well understood. FBSS sufferers often experience intractable pain, inability to work, decreased physical functioning, decreased quality of sleep, and decreased quality of life. Many causes have been suggested for this syndrome, including epidural fibrosis, pathology from adjacent segments, anatomical abnormalities, damage that was irreparable at the time surgery was done, secondary foraminal stenosis, and local denervation of the multifidus. Changes in connective tissue and muscle after immobilization are well documented. Instrument-assisted soft tissue mobilization using Graston instruments has been suggested for soft tissue dysfunction and pain. Treatment components using Graston technique include warmup of the affected area, instrument-assisted soft tissue mobilization, and posttreatment stretching exercises targeting restricted tissues. Cryotherapy can be used as an adjunct if needed and strengthening exercises are recommended to prepare the patient for return to activity.

### CLINICAL FEATURES

The case of a 40-year-old female complaining of chronic pain following cervical fusion at C3–C4 is described. This patient continued to have neck pain 6 months after surgery, which had become severe and unremitting. She stated that since the surgery she had tried additional epidural steroid injections, electrical stimulation, laser treatments, and various medications with no significant change in her pain. She rated her pain at presentation as 78 mm on a 100-mm visual analog pain scale.

### INTERVENTION AND OUTCOME

Treatment consisted of first warming the area with a moist heat pack for 5 minutes followed by instrument-assisted

soft tissue mobilization using the Graston instruments. Each session was followed by passive stretching of the neck, using contract/relax procedure. Graston instrument GT-4 was used initially in the cervicothoracic paraspinal region and Graston instrument GT-3 was used focally around the border of the scapula and in the right cervicothoracic paraspinal region. The treatment was well tolerated and the patient stated that she felt slightly better immediately following the first treatment session. The patient returned every 4 days for treatment. After four visits she reported that she felt moderate to markedly improved and reported her level of pain as 43 mm on a 100-mm visual analog pain scale. Active cervical range of motion was markedly improved after four visits with only slight limitation in rotation and extension. Treatment was continued and the patient reported marked reduction in pain after a total of nine visits. She rated her level of pain as 26 mm on a 100-mm visual analog pain scale and stated that although she continued to have slight pain, she felt it was quite manageable. There was a 3-week break between the eighth and ninth treatment visits. The patient was assessed 30 days after the ninth treatment session and stated that she was experiencing no significant increase in pain.

### CONCLUSION

The case reported here demonstrated reduced pain and improved range of motion in response to instrument-assisted soft tissue mobilization using Graston protocol. Additional research is needed to evaluate efficacy and effectiveness with this treatment protocol in the challenging population of failed back surgery patients.



# Instrument-Assisted Soft Tissue Mobilization for the Treatment of Achilles Tendinosis

## A Case Study

**Mark T. Pfefer**, R.N., M.S., D.C., **Stephan R. Cooper**, B.Sc., and **Nathan L. Uhl**,  
Cleveland Chiropractic College, Kansas City

Achilles tendinosis is one of the most common conditions of the lower extremities. Seen with greater frequency in athletes, most commonly in male runners between 30 and 60 years of age, it is also observed in deconditioned populations. Age-related degeneration and overuse injuries have also been implicated in the etiology of this condition. Predisposing factors are multifactorial and include heel cord flexibility, training errors, excessive foot pronation, foot supination, and tibial varum. Achilles tendinitis, as the name implies, was previously thought to be an inflammatory condition, but recent research indicates that this condition, when chronic, is not associated with inflammatory cells or inflammatory mediators, and many now advocate the use of the term tendinosis rather than tendinitis. There is a need to identify and refine effective methods of conservative management in the treatment of these common tendinopathies. Instrument-assisted soft tissue mobilization using Graston instruments has been successfully used in the treatment of tendinosis. Graston instrument-assisted soft tissue mobilization (GISTM) is a patented form of treatment that uses stainless steel instruments designed with a unique curvilinear treatment edge, contoured to fit various shapes of the body. Treatment components using Graston technique include warmup of the affected area, instrument-assisted soft tissue mobilization, and posttreatment stretching exercises targeting restricted tissues. Cryotherapy can be used as an adjunct if needed, and strengthening exercises are recommended to prepare the patient for return to activity.

### CLINICAL FEATURES

A 40-year-old female recreational runner presented with marked pain over the left Achilles tendon that was aggravated by activity. She described a gradual onset over the course of 6–8 months with significant increased pain within the

preceding 5 weeks. Examination revealed no palpable defect in the left Achilles tendon, but there was apparent tenderness and swelling in the musculotendinous junction. MRI examination was obtained and the impression was a grade 1 partial tear/degeneration of the distal Achilles tendon without evidence of full-thickness tear.

### INTERVENTION AND OUTCOME

Treatment consisted of first warming the area with a moist heat pack for 5 minutes followed by instrument-assisted soft tissue mobilization using the Graston instruments. Each session was followed by passive stretching of the left Achilles tendon using contract/relax procedure. The treatment was well tolerated and after a course of eight visits the patient's pain and swelling were resolved. The patient was started on a strengthening protocol and gradually had a return to normal activity. At 30-day follow-up posttreatment, the patient stated that she continued to feel no pain in the affected region and was starting to walk and run for gradually longer distances without discomfort.

### CONCLUSION

The case reported here demonstrated reduced pain, improved range of motion, and enhanced function in response to GISTM. This technique appears promising in the treatment of tendinopathy and the benefits of using this protocol include the possibility that the instruments provide a mechanical advantage to the clinician, allowing deeper penetration and greater specificity. Future prospective research is needed to evaluate efficacy and effectiveness with this treatment protocol.



# Loads and Postural Strategies Associated With Backpack Use in Young Adults

## A Pilot Study

**Mark T. Pfefer**, R.N., M.S., D.C., **Stephan R. Cooper**, B.Sc., **Nathan L. Uhl**, Cleveland Chiropractic College, Kansas City, and **Joe Soltys**, B.S.M.E., University of Kansas

Backpack wear has been implicated as a risk factor for back pain in school children and adolescents and the use of book bags has also been associated with gait and posture abnormalities. Few studies to date involve college-age backpack wearers or static loads.

### METHODS

This project was approved by the Institutional Review Board of Cleveland Chiropractic College, Kansas City Campus. Subjects ( $n = 8$ ) of ages 21–26 years were recruited among students attending a chiropractic college for this pilot study. Lateral photographs were taken of subjects standing in a natural upright posture both without and with wearing their backpacks. Subjects were also weighed with and without their backpacks. From these pictures, the following anatomical landmarks were approximately located: the glenohumeral joint; the greater trochanter; and the L5–S1 level. Erector spinae was assumed to be an average of 6 cm from L5–S1. A line was drawn connecting the glenohumeral and trochanter locations and used to locate the head, arm, and torso (HAT) center of mass. In the case of the backpacks, the center of mass was also approximated. Moment arms were measured for HAT and backpack center of mass. All measurements were corrected for distortion in the photographs.

### RESULTS

Moment loading at L5–S1 increased with the backpack on in four out of eight of the subjects, while compressive

force at L5–S1 increased with wearing of the backpack in five of the subjects. Erector spinae force increased with wearing of the backpack in five of the subjects. Various postural strategies were employed while wearing the backpack, including exaggerated forward or backward trunk lean.

### DISCUSSION

Postural strategies play an important role in determining the moment and compressive forces at L5–S1 while wearing a backpack. Increasing the percent of body weight of the backpack, as is found in heavier backpacks or smaller individuals, may contribute to a larger moment and compressive force at L5–S1. While this qualitative study is limited by a small sample size, this does point out the need for further research to assess the effects of wearing a backpack and to evaluate the relationship of back pain with use of a backpack. In some cases, backpack wear in smaller individuals may lead to greater loading of the low back, and this may have special importance for young adults and women.

### CONCLUSION

Future research should explore the relationship between use of backpacks, postural strategies, and associated back pain.



# The Transformative Journey Into a Natural Health Lifestyle

## A Collective Case Study

**Judith Polipnick**, D.C., Ph.D., Palmer College of Chiropractic

The purpose of this qualitative, retrospective, collective case study was to examine the transformative processes of six individuals into a natural health lifestyle. Mezirow's transformative learning theory served as the theoretical framework

for this study and guided the interview questions, analysis, and discussion of the findings. Bennett and George's structured-focused comparative method was used to theoretically focus the design.

## METHODS

The tradition of inquiry was the case study, and the focal point of each case was the transformative process into a natural health lifestyle. Six cases were combined to form a collective-case study. Purposeful sampling was used in case selection. The chief selection criterion was that each participant had lived a natural health lifestyle for at least 10 years. Both the participants and one individual from their immediate support network were interviewed in a face-to-face setting. A list of semistructured questions was used to collect the data. A matrix consisting of core constructs from transformation theory as well as the key areas comprising the critiques of the theory were used for the analysis. A within-case and cross-case analysis of the interview data was conducted.

## RESULTS

Related to the field of health, the findings suggest that the participants developed holistic understandings of health. A theme that emerged was the inseparability of the physical, mental, and spiritual aspects of self. The participants grew to understand that to be healthy meant keeping these aspects of

self in balance. They developed an ecological understanding of health, that is, that health is influenced at multiple levels. They also reported developing a proximal understanding of health, conceptualizing health as a dynamic, interactive, permeable, and adaptive process. Related to the field of adult education, the findings revealed that there were distinctive onsets, key events, and catalytic experiences that oriented the journeys of the participants and provided impetus for growth.

## DISCUSSION

This ability to shift understandings of health has repercussions at the individual as well as the societal level. At the individual level, the transformative stories of each of the participants spoke to their increased adeptness at attending to their health, which reflected higher order intentions of health. Such learning would suggest that the participants are optimally influencing their phenotypic expression and, as a result, may be positively impacting the aging process. If this were broadened to the macro perspective, the findings from the present study suggest the need to reconceptualize how we, as a society, define, value, and measure health to include individuals at the wellness end of the health continuum.



## Two Patients With Mechanical Back Pain or Cancer? A Case Report

**Kevin Pringle**, D.C., M.Ed., Kelsey-Seybold Medical Group, and **Lawrence H. Wyatt**, D.C., D.A.C.B.R., Texas Chiropractic College

The objectives of this report are to present two cases of mechanical back pain that had an etiology of cancer; to describe the evaluation, treatment, management, and referral of two patients with mechanical back pain; and to review the X-rays, MRIs, CT scans, blood work, and management by an oncologist for each case.

### CASE 1

A 54-year-old black female presented with low back pain without radiculopathy. Initial examination suggested mechanical back pain. She had moderate pain that was persistent for several months. She was referred by her primary care physician for evaluation and treatment of the low back pain. Treatment consisted of high-velocity, low-amplitude chiropractic manipulation, spray and stretch, massage, and therapeutic exercise. The patient initially responded positively to therapy, including a decrease in pain scale findings and increase in subjective functionality. She felt she was improving after

2 months of care. After 9 weeks of care, she developed severe pain in the pelvic region. She reported a 23-pound weight loss over the past month. Plain-film examination was normal, but subsequent MRI demonstrated a lesion suggestive of metastasis at L3. Blood work was normal. CT scans of the chest, abdomen, and pelvis were obtained. Primary bronchogenic carcinoma with metastasis to the spine and pelvis were identified.

### CASE 2

A 55-year-old white male presented with midback pain without any radiating symptoms. Treatment consisted of high-velocity, low-amplitude chiropractic manipulation, spray and stretch, massage, and therapeutic exercise. He was referred for trigger point injections into several intercostal muscles when he was not improving after 6 weeks of care. He returned after 2 months with the same midback pain and pain along the midright anterior axillary line. His pain was different and

more severe than when care was initially provided. A chest film was previously read as normal. MRI was performed and a soft tissue sarcoma was discovered. Referral to his primary care physician, and eventually the oncology service, was made for management of his tumor.

## CONCLUSION

In these two cases, standard chiropractic management guidelines were followed. In cases of mechanical back pain,

chiropractic manipulation and adjunctive therapies are typically successful. Manipulation provided positive outcomes in these patients, who also had malignancies, possibly masking the serious underlying pathology. In both cases, plain-film radiographs were thought to be of little help as there was a low index of suspicion for cancer. Plain-film radiographs were eventually obtained and were essentially normal without indication of cancer in either case. In both cases, MRIs were ordered and cancer was identified. Management was altered from pain control to referral for evaluation and management of malignancy.



## Patient Recruitment for a Randomized, Clinical Trial on Acute Neck Pain Description of a Multistrategy Recruitment Plan

**Susan Ricketts**, B.S., and **Sarah Zwagerman**, B.S., Northwestern Health Sciences University

Clinical trials depend on the successful recruitment of study participants. An organized, flexible approach to recruitment, which involves a variety of recruitment strategies and ongoing monitoring of the outcomes of each strategy, is essential. All too often, however, the recruitment of study participants is assigned a lower priority than other clinical trial activities. The result is that inadequate financial and personnel resources are assigned to subject recruitment and insufficient time is devoted to planning, monitoring, and implementation. Consequently, study investigators may find themselves scrambling midway through a trial when confronted with inadequate enrollment, declining advertising budgets, and rapidly approaching recruitment deadlines.

This article describes the experience of a research team that was faced with inadequate enrollment for a federally funded clinical trial on acute neck pain. The article describes how the team implemented a dynamic, multistrategy recruitment plan to counteract the shortfall in subject recruitment. This experience may assist other investigators in the successful planning and implementation of clinical trials.

## METHODS

The targeted population was adult patients suffering with acute neck pain (neck pain that has lasted for less than 3 months). In the first 6 months of recruitment, only 13 patients were successfully enrolled in the randomized clinical trial. As a result, the trial was placed on probationary status by the federal funding agency. With future funding in jeopardy, the study team implemented a multistrategy recruitment plan in order to reach the goal of enrolling a total of 270 patients.

The recruitment plan included the following elements: designation of a recruitment coordinator responsible for managing the recruitment activities; a multistrategy recruitment plan which included both population-based multimedia strategies and targeted condition-specific strategies; and ongoing weekly monitoring of the relative costs and success of each recruitment strategy.

## RESULTS

The first year of the multistrategy recruitment plan ended in August 2003. Prior to this period, only 13 patients were randomized to treatment. After the implementation of the recruitment plan, 96 additional patients were randomized into treatment. The recruitment strategies that were employed varied widely in terms of cost and the number of randomized patients. An ongoing assessment was conducted to determine which strategies would be continued or discontinued. The most salient factors in this determination were: total costs of the strategy, total number of randomized patients yielded per strategy, and the relative costs per randomized patient.

Population-based recruitment strategies cast a wide net over the geographic area with the expectation that a percentage of the population will have acute neck pain. The most expensive method, but the method that yielded the most randomized patients, involved mass mailings of postcards that advertised the research study. Other population-based strategies included distribution of advertising posters and brochures to businesses and retail establishments (low cost, moderate yield), advertising in local newspapers (moderate cost, low yield), television news broadcasts (no cost, low yield), advertising at health fair expos (moderate cost, low yield), and the placement of advertising signs on university

grounds (low cost, moderate yield). Targeted, condition-specific strategies involved the identification of individuals who may have acute neck pain or be at risk for acute neck pain. These targeted strategies included the direct referral of patients from university-affiliated chiropractors (low cost, low yield) and mailings to individuals recently involved in motor vehicle accidents (moderate cost, no yield).

The described multistrategy recruitment plan and the designation of a full-time recruitment coordinator enabled the research team to increase patient enrollment seven-fold.

As a result, the research study was taken off probationary status by the funding agency.

## DISCUSSION

The future recruitment plan incorporates the experience with past population-based strategies and the implementation of new, condition-specific strategies.



## Documentation and Classification of Musculoskeletal Pain in Pregnancy

**Clayton Skaggs**, D.C., Logan College of Chiropractic and Washington University School of Medicine, **Michael Nelson**, M.D., Ph.D., **Heidi Prather**, D.O., and **Gil Gross**, M.D., Washington University School of Medicine

Fifty to 80% of pregnant women report low back pain and/or pelvic pain (LBP/PP) during pregnancy. Unfortunately, many women are not offered intervention for this pain. However, 20–40% of patients experiencing LBP/PP postpartum continue to have pain at 18 months. In an effort to assess the extent and nature of musculoskeletal pain during pregnancy in the United States, we performed a retrospective analysis of prospectively collected data on a population of pregnant women within a multidisciplinary clinic in Barnes-Jewish Hospital at Washington University Medical Center in St. Louis, Missouri. Using patient-reported questionnaires, we have identified, classified, and described musculoskeletal pain in a population of pregnant women.

## METHODS

Participants in this study were prospectively recruited through the Collaborative Practice at Washington University School of Medicine in St. Louis, Missouri. The Musculoskeletal Pain in Pregnancy Clinic (MSPP) is part of the Collaborative Practice and is staffed by chiropractic physicians, chiropractic residents, and chiropractic interns. Coordinating staff for the MSPP includes obstetrical practitioners, physiatrists, nurses, and nurse assistants. All women presenting for their initial obstetrics visit completed a questionnaire containing information regarding their general medical health and all were asked to complete a specific musculoskeletal pain questionnaire.

## RESULTS

Pregnant women were recruited from the Collaborative Practice clinic in Barnes-Jewish Hospital at Washington

University Medical Center between April 1999 and July 2000. Women were selected to fill out a musculoskeletal questionnaire and more than 90% of the women complied with the request. This led to 599 women completing the initial questionnaire. Fifty-seven percent (344/599) complained of LBP on the initial visit. Twenty-six percent (156/599) complained of groin pain or pain at the pubic symphysis, and 26% (158/599) complained of mid-thoracic pain. Of those reporting musculoskeletal pain, 15% (51) rated the intensity of their pain as severe ( $\geq 8$  on the visual analog scale). Thirty percent (182/599) were taking medication for pain at the time of the initial visit, and 49% admitted to sleeping less than half the night. Surprisingly, 80% (479) of the women with pain did not perceive that they had been offered treatment for their pain at the time of their initial questionnaire. Seventy-five percent (449) reported no LBP before becoming pregnant for the first time and 59% (353) reported onset of their pain within 8 weeks of the questionnaire. These results suggest pregnancy as an important trigger for LBP.

## DISCUSSION

The results presented here represent the largest prospective study of musculoskeletal pain in pregnancy in the United States. We identified a high incidence of LBP (57%). To our knowledge, our finding of midback pain is the first report of this musculoskeletal problem in a pregnancy population. Nearly one-third of our patient population reported midback pain. This highlights the need for further investigation of midback pain during pregnancy and the possible persistence of midback pain postpartum. Approximately 25%

of women with chronic back pain report their first episode of back pain during pregnancy. Clearly, chronic musculoskeletal pain that continues postpartum is a serious societal concern. With these data demonstrating and classifying musculoskeletal pain in pregnancy in hand, we intend to design a comprehensive musculoskeletal management program for pregnancy within the confines of standard obstetrical care.

## CONCLUSION

We were able to classify different types of pain and surprisingly, in addition to LBP/PP, we identified a high incidence of midback and groin pain in our pregnancy population. Therefore, we conclude that musculoskeletal pain in pregnancy is a major problem, and is largely ignored clinically.



## Information Technology in the Chiropractic Office

**Monica Smith, D.C., Ph.D., and Lynne Carber, B.S.,** Palmer Center for Chiropractic Research

Converging imperatives are increasing pressure for health care providers such as chiropractors to incorporate more electronic information technologies use into clinical and business aspects of practice. Health Insurance Portability and Accountability Act (HIPAA) rules will include mandates for small service providers such as chiropractors. Practitioners can ensure quality service provision by using current evidence-based best practice standards, increasingly accessible via the Internet. Managed care organizations, hospital and ambulatory clinic systems (e.g., DVA, DoD, and IHS), and multidisciplinary physician practices are increasingly being run by clinical information systems, and the successful integration of chiropractic providers into such extant health care systems requires that today's D.C. be "information literate" and "computer savvy." Federal and state initiatives to advance the development of telehealth technologies emphasize electronic and Web-based clinical decision-support systems to support "real-time" access to additional expertise and otherwise assist health care providers in rural and underserved areas. Chiropractors were surveyed to assess their use of PC and Web-based technologies to manage the business and clinical aspects of chiropractic practice.

## METHODS

Following a preliminary pilot survey of 105 "key informants" of the chiropractic profession (45% response rate), three separate samples of licensed US chiropractors were surveyed in 2002: simple random sample of US chiropractors ( $N = 66,790$ ;  $n = 400$ ), simple random sample of Pennsylvania-licensed D.C.s ( $N = 3390$ ;  $n = 250$ ), and a sample of Kentucky-licensed D.C.s ( $N = 636$ ,  $n = 150$ ) stratified by proximity to Health Professional Shortage Areas (HPSAs). Response rates were similar to other surveys of health care professionals (USA sample 22%; Pennsylvania 25%; Kentucky 30%). Survey items included queries to identify the market service area from which the practice's patients were drawn; personal and practice demographics;

computer technology and Internet use within the practice; and factors associated with clinical decision making such as use of various information resources and perceptions regarding subluxation, and of neuromusculoskeletal specialist vs. primary-generalist chiropractic clinical care models.

## RESULTS

Results from both the key informant and profession-wide surveys indicate a moderate to high use of electronic technologies for the business aspects of practice. Use of automation in clinical applications, or of automated systems that link between billing and clinical charts, was far lower. Clinical decision making is primarily based on textbook and peer reference, and the majority of respondents have never used clinical support software packages and only sometimes use on-line (Internet) references to assist in clinical decision making. While less than 40% of D.C.s use electronic claims processing, those who do automate this function, do so for most of their claims. Overall, most computer systems are personally selected by the practicing D.C. (78%) rather than a practice management group (14%), and most respondents also plan to increase automation within the next 2 years.

## DISCUSSION

Chiropractors are an important part of the health care work force in rural and underserved areas, necessitating that chiropractic educational and research institutions "reach out" to assist and improve chiropractic health care delivery in these areas. Electronic information and telecommunications technologies can support and improve long-distance clinical health care, patient and professional health-related education, public health, and health administration. Applications with particular relevance for chiropractic education,

practice, and research include continuing education in on-line and other e-formats, electronic and Web-based dissemination of clinical information (e.g., from clinical practice guidelines, integrated information systems, or physician education programs), and electronic clinical sources such as informational CD-ROMs and clinical decision support systems

to improve clinical decision making. A clinical informatics curriculum in chiropractic education can better prepare chiropractic students for the challenges and opportunities of modern health care delivery, and can further support other initiatives in chiropractic education such as evidence-based care and student-directed learning.



## **Goniometric Measures of Cervical Lateral Flexion Asymmetry Before and After a Diversified Cervical Adjustment**

**Rodger Tepe**, Ph.D., and **John Zhang**, M.D., Ph.D., Logan College of Chiropractic

The purpose of the study was to investigate the effects of a single diversified cervical manipulation (CM) on cervical lateral flexion range of motion (ROM) asymmetry on subjects with 10° or more of asymmetry and one or more cervical fixations.

### **METHODS**

One hundred volunteer subjects were screened, resulting in 42 qualified experimental subjects with both cervical lateral flexion asymmetry (CLFA) over 10° and one or more cervical fixations. Experimental subjects received active lateral flexion ROM goniometer readings immediately before, immediately after and 20 minutes after, a diversified CM was delivered to the side of greatest restriction.

### **RESULTS**

Pre-, post 1, and post 2 difference scores were analyzed with a one-way repeated measures analysis of variance.

Results showed that post 1 and post 2 asymmetries were significantly less than the pre-CM asymmetry values (means = 3.9, 3.3, and 10.9, respectively;  $p < .0001$ ). Scheffe post hoc analysis confirmed that post 1 and post 2 asymmetries were not significantly different, while both were significantly less than the pre-CM levels.

### **CONCLUSION**

Among the qualified experimental participants, the delivery of a single diversified CM to the side of greatest restriction resulted in statistically significant reductions in CLFA immediately after and 20 minutes after the CM.



## **A Survey of Student's Perceptions of a Chiropractic Curriculum in Relation to Practice and National Board Performance**

**Rodger Tepe**, Ph.D., and **John Zhang**, M.D., Ph.D., Logan College of Chiropractic

The purpose of the study was to investigate students' perceptions of a chiropractic curriculum in relation to practice and national board performance using a survey instrument.

### **METHODS**

This study was conducted through the use of a questionnaire containing 36 major questions and 53 subdivided

questions ranging from demographic factors to factors defining perceptions of chiropractic curriculum in relation to practice and national board performance. Chiropractic students at a chiropractic college from varying levels of education were given the questionnaire with no prior knowledge of the survey to ensure that their responses were spontaneous and reflected their true feelings. Frequency analysis, mean values, standard deviation, and analysis of variance (ANOVA) were used for the statistical analysis.

## RESULTS

A total of 86 students completed the survey, but only 44 students' data were used for this report (80% male, 20% female, representing 4.1% of the student population). All students' data will be used for the final report. Their ages ranged from 22 to 46 years with an average of 31. Student surveyed reported high student loan and no to low monthly income. Only three students reported having scholarship. The success rate of passing the NBCE I, II, III, and IV for the first-time takes were 77%, 71%, 64%, and 11%, respectively. The percentage of students who had taken the NBCE I, II, III, and IV review were 87%, 77%, 73%, and 24%, respectively. Students felt basic science classes were moderately helpful in preparing them for the NBCE I and not helpful for preparing for practice. Students rated clinical and chiropractic courses highly for preparing them to pass the NBCE II and for practice. Students preferred instructors to use PowerPoint presentations combined with lecture and lecture notes but not to read notes in classes. Many study aids

and library utilization were not rated important for students to pass courses and the NBCE.

## DISCUSSION

This study demonstrated that students had high student loan and low income in school, which was not unexpected. It was significant that many students felt that the basic science courses did not prepare them well for the NBCE and practice. This was not consistent with reported correlation of students' grade point average to their NBCE performance. It has been reported that chiropractic students tended to have higher basic science scores on the NBCE than the clinical science scores. Whether this was a perception difference or a real difference needed further study. In this survey, most students were satisfied with the clinical and chiropractic courses and their NBCE II and III performance. Apparently, there were differences between the perception in the survey and in the reality. Students had a higher first-time passing rate at the NBCE I than II, III, and IV. The NBCE IV had the lowest passing rate of 24%. It was not clear from this study whether this difference arose from the educational program or from the test itself.

## CONCLUSION

There were noticeable differences in students' perception of a chiropractic educational program and their NBCE performance and practice.



# Chiropractic Postgraduate Education A Compilation of Chiropractic Certification/Specialty Programs

**Shawn Thistle**, B.Kin. (Hons), **Jaroslav (Jerry) P. Grod**, D.C., F.C.C.S.(C), C.A.E.,  
**Edward R. Crowther**, D.C., F.C.C.S.(C), Canadian Memorial Chiropractic College

It is our objective to generate a current and comprehensive list of postgraduate chiropractic certification, specialty, and continuing education programs in order to describe and compare them based on selected criteria. The recent emergence of numerous certifications, designations, and specialties that chiropractors can obtain and use after their names in professional and business communications underscores the need for a clear description of these "letters." We hope this project, when finished, will provide a tool for assessing the quality and validity of chiropractic literature and information, and act as an accurate guide for graduating students and practitioners considering postgraduate certification throughout their career.

## METHODS

Over 130 certifications and specialties were identified through a hand-search of over 50 chiropractic publications, including peer-reviewed and non-peer-reviewed journals and trade publications. Web sites and publications from chiropractic political organizations were also included in the search. Organizations offering postgraduate certification programs will be contacted and asked to fill out a survey providing the research group with information about their program(s). Surveys will be conducted via e-mail/Internet, conventional mail, or based on information packages received

by the research group via post, fax, or e-mail/Internet. Each postgraduate program will be described using the following criteria: length of certification program; nature of program participation (full time or part time); undergraduate or postgraduate prerequisite requirements; entrance requirements; method of instruction; method of evaluation; course completion requirements; recertification requirements; faculty qualifications; recognition of the certification by accrediting bodies or organizations; cost of program and certification; and location and accessibility of the program internationally.

## DATA ANALYSIS

Information obtained from each organization will be entered into Statistica v. 6.0. Frequencies and other descriptive measures will be used to present data in tabular format, and guide discussion of the data.

## PROGRESS TO DATE

Upon completion of the hand-search, the focus shifted toward identifying contact information of the various organizations that offer the identified credentials. This was accomplished primarily through Internet searches and was successful in most cases. More than 120 credentials were identified initially. After reviewing them and omitting programs that would not be considered postgraduate, are very common and not unique to the chiropractic profession, or are no longer offered, we were left with 94 credentials. Of these, we successfully located contact information for 80 of them and are still searching for information on the other 14. The breakdown of topic areas for the 80 successfully identified credentials is as follows: acupuncture, 6; biomechanics, 1; chiropractic techniques, 13; disability assessment, 2; ergonomics, 2; forensics, 5; neurology, 4; nutrition, 4; orthopedics, 3; pediatrics, 3; radiology/imaging, 4; rehabilitation or sports sciences, 9; and miscellaneous, 24. We are currently collecting and analyzing data.



# Cadaver Pelvic Biometrics and Radiographic Mensuration With Comparison to Pelvic Radiographic Mensuration of Healthy Subjects

**Dale M. Thompson, D.C., Brooke L. Gajeski, D.C., and Rudolf P. Vrugtman, M.B.A.,**  
Logan College of Chiropractic

Various chiropractic techniques have utilized radiographic marking analysis as part of their clinical evaluation of joint dysfunction. A previous report indicated strong to moderate symmetry may be present between certain pelvic landmarks commonly used in some pelvic radiographic marking systems. The symmetry found on cadavers needs to be examined in a larger database and also to any symmetry changes due to radiographic projection. Also, these findings need to compare findings found from pelvic mensuration on radiographs from asymptomatic low back subjects.

## METHODS

Anatomical and radiographic mensuration of cadaver innominate heights and widths was performed while the cadaver pelvis was in the spino-symphysial plane. Pelvic mensuration was performed from full-spine radiographs from position-controlled subjects who were asymptomatic for lumbo-pelvic pain as determined by history, pain diagrams, and five pain provocation orthopedic tests. Regression analysis was used to obtain  $R^2$  values to compare symmetry, and the intrapelvic mean differences (IMD) between innominate

heights, iliac widths, and, for the live subjects, femur head heights were calculated.

## RESULTS

A total of 102 cadaver pelvises were selected (mean age, 71) with radiographs. There were 47 radiographs, from 54 asymptomatic subjects (mean age, 24), which provided the necessary landmarks for mensuration of the desired height and width, and 53 radiographs were used to examine femur head height. Cadaver innominate heights were similar both anatomically ( $R^2 = .925$ , IMD = 3.0 mm) and radiographically ( $R^2 = .907$ , IMD = 4.0 mm) and comparable to live subject radiographs ( $R^2 = .825$ , IMD = 4.1 mm). For cadaver iliac widths, the anatomical measurements ( $R^2 = .607$ , IMD = 5.1 mm) did not exhibit higher symmetry than the radiographs ( $R^2 = .722$ , IMD = 6.1 mm). The live subjects showed moderate symmetry for iliac widths ( $R^2 = .582$ , IMD = 5.8 mm). Femur head height was strongly correlated between left and right side ( $R^2 = .943$ , IMD = 6.8 mm). A post hoc analysis for gender for cadaver height and width revealed males slightly more symmetrical both anatomically and on radiographs. Live subjects revealed significant

differences on the radiographs for gender of both innominate heights and iliac widths. Also, a significant difference was found for those with a history of a major accident for the right innominate height, right iliac width, and left femur head height. Those with current pain had a significant difference in right iliac width. No significance differences were found for shoe lifts, history of chiropractic adjustments, or age.

## DISCUSSION

Although a high degree of symmetry was found on radiographs for innominate height and femur head height, and moderate symmetry for iliac width, marking systems may need to account for natural anatomical differences. Since up to 4.0 mm of mean difference on radiographs can be present for innominate heights, 6.1 mm for iliac widths, and 6.8 mm

for femur head heights, further research is needed to determine if marking systems are sensitive enough to isolate pelvic joint dysfunction using these landmarks.

## CONCLUSION

Cadaver innominate heights appear to maintain strong symmetry on radiographs when controlled for pelvic positioning and there appear to be similar findings on healthy younger subjects. For iliac width, although the findings between groups were similar, evidence of strong symmetry was not found. Whether radiographic pelvic marking systems can account for osseous structural differences requires further investigation. Future studies should also consider issues of subject positioning errors, effects of age, gender, and joint degeneration as potential covariables.



# Influence of Sacroiliac Joint Belt on Pain Threshold Along the Inguinal Ligaments

**Dale M. Thompson, D.C., Joesph Unger, D.C., D.I.C.S., and Kent Johnson, D.C.,**  
Private Practice

The sacroiliac joint (SIJ) has been credited as a source of low back pain partially because of the role of this joint in providing stability for the passage of forces from the upper body to the legs. The external oblique muscles are thought to aid in the stability of the sacroiliac joint and the aponeurosis forms the inguinal ligaments. Sacro-occipital technique challenges the inguinal ligament area by using the arm fossa test as an indicator of pelvic instability. Pelvic belts have been examined in the role of reducing pelvic instability. This study utilized these concepts by challenging the inguinal ligaments to the point of pain by using a pressure algometer before and after the application of a SIJ belt. The hypothesis is that the pain pressure threshold along the inguinal ligament will be increased and become more symmetrical along portions of the ligament after the application of a pelvic belt as compared to those who do not wear a pelvic belt.

## METHODS

A total of 21 individuals agreed to participate in the study, 10 in the belted group and 11 controls. The pressure algometer was used on four areas of inguinal ligament. Immediately after testing the inguinal ligaments, the SIJ belt was placed on alternating subjects. All subjects were instructed to either walk or stand for 15–20 minutes and immediately return to the testing area. Each subject was then placed supine and the belted was removed, if being worn, and each subject was retested with the pressure algometer.

## RESULTS

Significant differences for pain threshold along the inguinal ligament were found in the belted group for the left upper and lower portion and the right lower portion. The right upper portion was not significant for the belted group and there were no areas significantly different for the control group. The mean differences between pre- and posttesting show that the significant changes occurred in the belt group as a result of an increase in pain threshold. The lower inguinal areas, after adjusting for the change of the control group, both increased by 5.0 psi. When comparing inguinal areas, neither group had a significance difference between pre- and postmeasurements.

## DISCUSSION

When artificially inducing a force into the pelvic ring, such as the wearing of a SIJ belt, alteration in the balance of forces may take place. This study suggests that the SIJ belt produced a greater change in the status of the structures in the lower ligament areas as seen by an increase in the pressure required to induce pain. However, a comparison between ligament areas does not seem to give any insight into any changes that may have occurred from wearing the SIJ belt.

## CONCLUSION

There was a change in pain pressure threshold within, but not between, most inguinal ligaments areas after the wearing of a sacroiliac joint belt with the greatest change

seen in the lower portions of the ligaments. Further studies are needed to determine if these findings hold true in a blinded subject base as well as with those with confirmed SIJ dysfunction. Such findings may aid in the validation of using the inguinal ligaments as a diagnostic structure when addressing SIJ dysfunction.



## Performance Assessment Preparing Undergraduate Students for the Clinical Experience

**Hettie Till**, M.Sc., M.Med.Ed., D.Ed., Canadian Memorial Chiropractic College

The undergraduate curriculum should not only prepare students academically, but it should also help them to make a smooth transition from classroom to patient care. The match between the undergraduate chiropractic program and the assessment method(s) is important because assessment drives student learning and will thus ultimately shape the curriculum. Consistency in assessment methods will have an effect on how well students will be able to respond to problems in the real world. It is thus important to assess by various methods and in situations that closely approximate the work environment. The Canadian Memorial Chiropractic College (CMCC) has recently changed the 3rd-year curriculum to be more integrated and practice based. However, curricular changes are, themselves, not enough to ensure competent doctors of chiropractic. It was thus decided to move away from the traditional assessment methods used and to develop and institute assessment methods that tested students in situations that resembled the eventual workplace. This article describes the changes in assessment methods that were introduced in the new 3rd-year curriculum in an attempt to prepare students better for their clinical experience.

## METHODS

In the new 3rd-year modular system, the students are assessed at the end of each of the nine modules. Theory assessment required all students to write two 2-hour integrated theory papers relative to the theme of that module. All the questions were in the extended matching (type R) format in which clinical vignettes are followed by problem-solving questions. Practical assessments relative to the theme of each module included assessing all students on technique and orthopedic tests; having all students do a basic sciences OSPE examination; and having one third of the students do a history, physical examination, and diagnosis examination (HPD exam). At the end of modules 3, 7, and 9, all the students do an X-ray-reading examination. All students

who score less than 60% in a theory or practical assessment are expected to undergo remedial work and retake the examination.

## RESULTS AND DISCUSSION

The 2-hour integrated theory assessments at the end of each module discriminated well and consistently identified those students in need of remediation, allowing the weaker students to improve their marks over the subsequent modules. The results of practical assessments indicated that the students performed well in the technique and orthopedic sections of the practical assessments. Students in need of remediation were identified and helped and subsequently also improved their practical performances. The HPD exams were particularly useful. All students had the opportunity to be observed and scored on at least two separate occasions. Through the use of videotapes of their own performance as well as those of students who did exceptionally well, even the weaker students were able to improve to acceptable levels in these essential skills.

## CONCLUSION

After completion of the 1st year of this curriculum, it appears as though the change in assessment methods is helping our students to think clinically. Reassessment of students after remediation indicated that the process helped them to improve their skills. Informal feedback from both interns and clinicians indicate that the students who experienced this new curriculum and assessment methods found the transition from classroom to clinic easier than previous students did. We are now planning a prospective study to determine the curricular implications of the changed assessment methods and to monitor the performance of the students in their clinical internship.



## Discopathy With Leg Pain A Randomized Controlled Trial of Orthotrac Versus EZ Brace

**John J. Triano**, D.C., Ph.D., University of Texas, **Carolyn Rogers**, M.S., **Jennifer Diederich**, B.S., Innovative Spinal Technologies, and **Stephen Hochschuler**, M.D., Texas Back Institute

This study was designed to evaluate the results of using the Orthotrac Pneumatic Vest versus an EZ form brace in patients with radiating leg pain from disc bulge, protrusion, or herniation. Specifically, our hypothesis is that patients given the Orthotrac Pneumatic Vest (OPV) will have greater pain relief, increased self-reported functionality, and fewer progressions to surgery than those using the EZ form brace (EZ).

### METHODS

A randomized clinical trial was initiated to contrast the effects of OPV ( $n = 75$ ) versus EZ ( $n = 75$ ) on patients with 4 weeks of failed conservative care, MRI confirmed disc bulge or protrusion, and radiating leg pain. The study was reviewed by the Presbyterian Hospital IRB, Dallas, Texas. Inclusion required ability to stand upright and consistent relief with recumbency. Follow-up evaluations were set at 6-, 12-, 26-, and 52-week intervals. Measures included visual analog scale, Oswestry, SF-36, and range of motion.

### RESULTS

Initial results of patients who have reached the 12-week interval are available for change in pain (low back pain and leg pain now; low back pain and leg pain in past week) observed with each device. OPV resulted in a sixfold greater

reduction in back pain and eightfold greater reduction in leg pain ( $p < .01$ ). Activities of daily living (Oswestry) improved 28 points versus 7.3 ( $p < .02$ ). The SF-36 mental health score increased by 24 points for OPV but decreased 13 points for EZ ( $p < .06$ ). Flexion improved  $20^\circ$  in the mean for OPV and  $5.2^\circ$  for EZ.

### DISCUSSION

Axial spine loading from body mass reduces the effective canal size in less than 5 minutes. Disc patients have radiating leg pain secondary to root compression or chemically induced inflammation of the nerve roots. In cadaver studies, the OPV reduces functional disc load by approximately 25% by using pneumatic lifters between a stabilizing ring on the pelvis and a second one around the rib cage. Results from this study demonstrate significant benefit in relieving both back and leg pain, improving functionality, and decreasing emotional stress.

### CONCLUSION

A therapeutic method that can reduce axial loading while weightbearing has the potential of providing significant symptomatic relief while retaining functionality. Early results strongly favor use of the OPV for patients who have failed 4 weeks of conservative treatment and are carefully selected for showing relief from spine unloading.



## Evaluating Teaching Effectiveness of the Activator Methods Chiropractic Technique Leg Check Based on Interexaminer Reliability

**Janeen Wallace**, D.C., New York Chiropractic College

Activator Methods Chiropractic Technique (AMCT) has based its methods on a systematic protocol developed to determine the functional short leg or the “pelvic deficient side.” Relative changes in leg length must be observed

accurately by the examiner in order to be certain that the diagnosis and correction of subluxation were effective. Research has been conducted in the past to evaluate interexaminer reliability of prone leg-length assessment, with

findings that reliability can be fair to good. Motion palpation and misalignment palpation have been determined to have poor to moderate reproducibility. However, these remain the gold standard of analysis at chiropractic colleges. The objective of this study was to determine if the AMCT procedures for determining leg-length discrepancy could be taught effectively by observing for reproducibility between examiners in a student population.

## METHODS

In a chiropractic college technique classroom setting, prior to training in AMCT procedures, 80 student patients were instructed to lie in the prone extended position. Each was instructed to wear shoes with welts or surgical boots and to remain motionless throughout all evaluative procedures. A chiropractor rated at advanced proficiency in AMCT used leg-length analysis to evaluate each student patient for leg-length discrepancy. The procedure includes observation of the shoe welt in the prone extended position; cupping the lateral malleoli with the examiner's palms; and a "6-point landing" which involves positioning the index and middle fingers of the examiner around the lateral malleoli and the thumbs on the patient's heels. Each student patient was assessed to have a right short leg, a left short leg, or even leg lengths. The results were recorded by the examiner and concealed. Immediately following, 80 untrained student doctors evaluated each of the student patients based on their prior knowledge of leg-length analysis. Results for each were recorded on a ballot and concealed from the next student doctor in an envelope as they rotated to the next student patient until all 80 were evaluated. The envelopes and ballots were collected and the student doctors' results were compared to the AMCT doctor. Approaching the end of the Basic AMCT course, the procedure above was repeated by both the AMCT doctor and the trained student doctors. The data were analyzed and interexaminer reliability was calculated based on the student doctors' results compared to the AMCT doctor's results pre- and post-training.

## RESULTS

Pretraining analysis revealed an average of 69.6% agreement between the students and the AMCT examiner in the 80 subjects, whereas posttraining analysis revealed an average of 82.2% agreement. Overall improvement was found in 67% of the cases upon posttraining analysis. Results were consistent in both pre- and posttraining analysis in 14% of cases and

agreement declined in 19% of cases. Forty-three percent of students were in 100% agreement with the AMCT examiner after course training, compared to only 14% prior to course training. Sixty-six percent were at or above 80% agreement posttraining, compared to 45% pretraining; 78% were at or above 70% agreement posttraining, compared to 57% pretraining; and only 10% were below 50% agreement after being trained in AMCT leg-length analysis, compared to 24% prior to being trained in AMCT leg checks.

## DISCUSSION

The data collected indicate that leg-length analysis utilizing the AMCT protocol can be effectively taught in order to generate reproducible results. When a standard procedure is utilized, the results of interexaminer reliability remain most consistent. Therefore if leg-length analysis is going to be used in practice, it should be recommended that AMCT leg checks be taught in chiropractic colleges to improve reliability in the field. Although leg-length evaluation is used only for functional deficiencies, there was no exclusion of student patients who have a structural short leg, as every student is a class participant. This inclusion may have skewed results. Students or doctors in training of leg-length analysis must be made aware of the need to evaluate for a structural short leg using Allis' test, tape measure, or X-ray analysis of femur head heights during their initial examination. They should also know that patient history of childhood epiphyseal disease or fracture could indicate an existing structural problem. The reproducibility of AMCT is dependent on some variables, and in this particular study footwear was controlled. However, inappropriate tables and patient positioning could have resulted in lower reliability. It is standard with AMCT to utilize a hi-lo elevation table to eliminate active positioning; therefore, weightbearing distortions and postural asymmetries are preserved. This study does not address the validity or clinical significance of prone leg checks. Many field practitioners value leg-length assessment to determine pelvic obliquity, assuming abnormal loading results and affects spinal alignment.

## CONCLUSION

The AMCT leg check protocol appears to offer promise in consistency and interexaminer reliability. The results of this classroom study are encouraging and suggest that with further controlled studies, uniformity in leg-length analysis could be reached within the chiropractic profession.



# Electron Microscopic Changes in Corticosteroid-Induced Myopathy

Isis Zaki, M.D., M.S., Ph.D., Cleveland Chiropractic College, Los Angeles

The widespread therapeutic use of corticosteroids in various clinical conditions created much attention regarding their adverse effects on different tissues. Corticosteroid myopathy has been successfully induced by using a wide spectrum of corticosteroid preparations and several animal models. Substituted steroids containing fluorine, such as triamcinolone, have more potent effects both in man and in experimental animals. Histological studies, however, revealed contradictory results regarding the effects of this drug on the skeletal muscles. Considering the common use of the drug in the treatment of various allergic, autoimmune, and musculoskeletal disorders, the current work was planned with the aim of studying the electron microscopic picture of rat quadriceps femoris muscle following injection with triamcinolone. The study provides valuable information to chiropractors who treat various types of musculoskeletal disorders.

## METHODS

Thirty-two male albino rats, 200 g each, were divided into two equal groups. One group was injected in the left quadriceps femoris muscle with a daily dose of 5 mg/kg (human-equivalent dose) triamcinolone acetone for 7 consecutive days. The second group (control) received identical doses of saline. Twenty-four hours after the last injection, eight animals of each group were killed. Specimens were taken from the right quadriceps femoris muscle, processed, and examined by electron microscopy. The remaining rats were similarly examined at weekly intervals for 1 month for follow-up.

## RESULTS

The animals showed progressive decrease in activity starting on the 5th day of treatment. Some became almost immobile by the end of experiment, with apparent muscle wasting. Mitochondrial alterations predominated. The hormone effects were more marked on the interfibrillar mitochondria. They were enlarged and vacuolated with partial loss of their cristae and had developed abnormal shapes. However, evidence of mitochondrial loss, such as mitochondrial fragments or myelin figures, was absent. On the other

hand, the subsarcolemmal mitochondria showed proliferation, enlargement, and aggregation. Mitochondrial alterations were reversible 2 weeks after discontinuation of hormone treatment. In some areas, the myofibrils lost their longitudinal orientation and transverse striations. Localized areas of muscle necrosis and transverse fractures were frequently observed. The interfibrillar glycogen particles were moderately increased.

## DISCUSSION

The most marked histological changes involved the mitochondria, particularly the interfibrillar mitochondria. The subsarcolemmal mitochondria were increased in size and number, perhaps as a compensatory mechanism for the changes observed in the interfibrillar mitochondria. However, changes in mitochondria observed in the two locations were completely reversed 2 weeks after cessation of the drug. Muscle necrosis and loss of longitudinal and transverse striations of muscle fibers account for muscle atrophy and weakness observed in triamcinolone-injected rats. The hormone diminishes amino acid uptake into the muscle, decreases the ability to incorporate amino acids into proteins by ribosomes, and increases the catabolism of muscle proteins. Corticosteroids inhibit mitochondrial respiration with uncoupling of oxidative phosphorylation. The decrease in energy generation explains the restricted activity of injected rats. The moderate increase in the interfibrillar glycogen may be related to the inhibitory effect of corticosteroids on muscle phosphorylase and/or activation of glycogen synthetase.

## CONCLUSION

Marked structural changes were detected in experimental animals. Doctors of chiropractic should be careful in taking the patient's medical history to exclude the possibility of corticosteroid administration as a potential cause of myopathy. This study throws light on safe, drug-free chiropractic manipulative therapy versus corticosteroid therapy in the management of various musculoskeletal disorders.



# An Interim Data Analysis of a Multisite Clinical Study to Determine the Effect of Chiropractic Care on Heart Rate Variability

**John Zhang**, M.D., Ph.D., Logan College of Chiropractic, **Dennis Nosco**, Ph.D., Nosco Consulting, and **Mark Pfefer**, D.C., Logan College of Chiropractic

Although heart rate variability (HRV) is gaining acceptance as a useful tool in a number of health care specialties, there is still debate as to its usefulness in chiropractic. The purpose of this study was to investigate the effect of chiropractic care on the balance between the sympathetic and parasympathetic nervous system in a multiclinic setting. This balance was analyzed by measuring patients' HRV in the practical setting of chiropractors' offices using a commercially available HRV apparatus.

## METHODS

Chiropractors in private practice were provided with an HRV Heart Rhythm Scanner (Biocom) and trained in its use. HRV analysis was performed before and following chiropractic adjustment on 10 patients. Eight subjects were monitored before and after a single chiropractic adjustment, and two additional patients were followed for a 4-week period with two HRV recordings per week, in addition to the baseline recording. All patient information was filed on forms provided by the Research Department. This information included: patient personal information, health care plan, frequency of treatment, and disease history. Copies of patient information forms, care forms, a pain diagram, and a visual analog scale (VAS) questionnaire were completed both before and after each chiropractic adjustment, and a computer disk containing patient's HRV data was mailed back to the Research Department for data entry and analysis.

## RESULTS

One hundred seventy-five chiropractors were recruited across the United States. Preliminary data from 96 doctors (179 patients; 106 female) was analyzed. The average age of the patient population was  $44 \pm 16$  years old. After

one chiropractic adjustment, pain as analyzed by VAS was reduced significantly from  $3.471 \pm 2.280$  to  $2.105 \pm 2.155$  ( $p < .001$ ). Statistically significant changes were also found in HRV analysis in both heart rate and in the total power. The mean heart rate was reduced from  $79.7 \pm 12.6$  to  $77.3 \pm 12.1$  ( $p < .01$ ), and the total power was increased from  $1365 \pm 2483$  to  $1610 \pm 3067$  ( $p < .05$ ). The high-frequency component was increased from  $40.33 \pm 20.13$  to  $563.71 \pm 1345.57$  ( $p > .05$ ), and the low-frequency component was increased from  $59.66 \pm 20.13$  to  $568.54 \pm 1026.60$  ( $p > .05$ ), but both did not reach statistically significant levels.

## DISCUSSION

The goal of the study was to determine if autonomic nervous activities are affected by chiropractic adjustment. As an indicator of autonomic nervous system activity, we used HRV, which was analyzed using the Heart Rhythm Scanner. The results indicate that both the pain scale and HRV were changed significantly after a single chiropractic adjustment. This preliminary analysis was limited in the number of doctors and subjects. If the trend continues, it is possible that HRV monitoring could prove an essential tool in analyzing outcome of chiropractic treatment.

## CONCLUSION

The preliminary analysis of the multiclinic study of the heart rate variability has demonstrated concomitant changes in HRV and VAS in patients who participated in this study. Heart rate variability could potentially be a good and, potentially, even quantitative outcome assessment tool for monitoring patients' autonomic nervous system activity before and after chiropractic care.



# Effects of Low-Force Chiropractic Adjustment on Body Surface EMF and EMG

John Zhang, M.D., Ph.D., and Brian Snyder, D.C., Logan College of Chiropractic

Body surface electromyography (EMG) has been used in clinical settings for decades. However, whether the body surface EMG is associated with body surface electromagnetic field (EMF) has not been investigated under chiropractic care setting. Studies in the past 20 years have linked the exposure of external EMF to brain tumors, leukemia, and abnormal embryonic growth in both humans and animals. It was unknown if there were any beneficial effects of changing body surface EMF under varying clinical conditions, especially after chiropractic care. The current study was designed to study the effect of a low-force chiropractic adjustment over a 4-week period on the body surface EMF and EMG changes.

## METHODS

Fifty-two chiropractic students were recruited and randomly assigned into control (24 subjects) and experimental groups (28 subjects) with 4-week chiropractic adjustments. The Triaxial Fluxgate Magnetometer FGM-5DTAA (Walker Scientific, Worcester, MA) with five-digit display and resolution of 1 nanotesla (nT) was used for EMF detection. The subjects' body surface (cervical, thoracic, lumbar, and sacral areas) EMF was determined in the prone position before and after the chiropractic adjustment. A low-force chiropractic adjustment was applied to the cervical, thoracic, lumbar, and sacral areas as determined by the practitioner. Body surface EMG was measured using two Biopac System EMG modules at the cervical and lumbar regions.

## RESULTS

The EMF on the subjects' body surface did not show changes after chiropractic adjustment at the cervical (50,200–

49,600 nT), thoracic (49,500–48,500 nT), lumbar (49,000–48,600 nT), and sacral (47,000–46,000 nT) regions during the 4-week treatment period. The body surface EMG electrical potential was slightly reduced at the lumbar region from 0.0033 to 0.0020 mV but not at the cervical region (0.0033–0.0041 mV). The lumbar area showed lower mean frequency than the cervical area after chiropractic adjustments. No statistically significant changes were found in the EMF and EMG readings.

## DISCUSSION

The correlation of body surface EMF with EMG was not found in the lumbar region where reduction of both EMF was not observed. This correlation was also not found in the cervical region. When power spectrum analysis was used for the resting EMG data, it was noticed that the cervical muscles had higher mean frequency components than the lumbar muscles. The difference in the muscle electrical activity may have contributed to the difference in the surface EMF readings.

## CONCLUSION

A correlation of body surface EMF and EMG was not found in the current study. The cervical and the lumbar muscles had different frequency components that might contribute to the difference in body surface EMF and EMG readings.



# Chiropractic Adjustments and Orthotics on Reducing Discomfort From Prolonged Standing A Case Report From a Pilot Study

John Zhang, Ph.D., M.D., and Joe Zhou, D.C., Logan College of Chiropractic

These case studies are from a pilot data collection of a randomized controlled study to determine the effect of

chiropractic care and orthotics on reducing discomfort in individuals who spend long hours standing during working hours.

## METHODS

The subjects signed an informed consent form before participating in the study. Then they filled out a patient information sheet and prescreening foot pain questionnaire. The chiropractic treatment was performed using the Activator technique. In-home exercise was prescribed to the subject receiving orthotics and chiropractic care. Foot and Ankle Outcome Score (FAOS) was used for the specific region survey. FAOS was developed to assess the patients' opinion about a variety of foot- and ankle-related problems. FAOS consists of five subscales: pain, other symptoms, activities in daily living (ADL), function in sport and recreation, and foot- and ankle-related quality of life (QOL). The study used a computerized F-Scan offered by Foot Levelers Inc. to record and analyze the foot data. Based on the data collected, the need for orthotics was determined and the data were sent to Foot Levelers Inc. for fabrication.

## RESULTS

Two cases, one from experimental and one from control groups, are reported. The experimental case was a 56-year-old Caucasian female who presented with complaints of both feet pain, right dorsal foot numbness, and right hip pain after long standing at work. After chiropractic and orthotics, the preorthotic and postorthotic foot pain questionnaire from the beginning of the study to the end of the 2nd week showed improvement of the pain score from 50 to 83, the symptom

score from 75 to 82, the ADL score from 52 to 94, the score of function in sports and recreational activities from 50 to 95, and the QOL score from 44 to 56. The control case was a 42-year-old male research assistant who presented with a chief complaint of bilateral heel pain after prolonged standing or walking. The subject also complained of lower back pain and knee pain once or twice a month. Without chiropractic care and orthotics, the preorthotic and postorthotic foot pain questionnaire from the beginning of the study to the end of 3rd week revealed no significant changes in all items. The pain score changed from 80 to 86, and the symptom score remained at 75. The ADL score worsened from 100 to 97. The score of function in sports and recreational activities also worsened from 90 to 85. The QOL score was improved from 69 to 75.

## DISCUSSION

These case studies were directed to the evaluation of the effectiveness of chiropractic care and orthotics on reducing the effects of prolonged standing. The first case showed significant improvement compared to the second case (control) in function in sports and recreational activities, ADL, and reduction of the pain. It seems that chiropractic care combined with orthotics made a difference (50 points) in function in sports and recreational activities. It was followed by a 47-point improvement in ADL. The third significant improvement was a 27-point change in subject's pain. The changes in symptoms and quality of life may be improved further with time.

