# ABSTRACTS OF ACC CONFERENCE PROCEEDINGS

## Platform Presentations

### The chiropractic care of children in Europe: Results from a practice-based research network

*Joel Alcantara, International Chiropractic Pediatric Association and Life Chiropractic College West, Jeanne Ohm, International Chiropractic Pediatric Association and Ohm Chiropractic*

**Background:** Globalization of chiropractic results in the heterogeneity of chiropractic practice and the care of children. This exploratory study in a European chiropractic practice-based research network to characterize pediatric chiropractic is presented. **Methods:** Chiropractors in Europe were recruited to participate in an observational study to characterize the chiropractic care of children. **Results:** Fourteen chiropractors (10 females, 4 males, average age of 39.36 years, average practice experience of 11 years) recruited a convenience sample of 64 parents reporting on 34 female and 30 male children. The children's median age was 7.38 years, and they presented with chronic musculoskeletal (MSK) conditions and disorders of childhood. Less than 47% ($n = 30$) were indicated to be previously under the care of a medical doctor, with 53% presented by their parents to the chiropractor as a first-line approach to care. The majority of parents (72%) rated their child's chiropractic care as highly effective. **Discussion:** Chiropractic care of children in Europe addresses both neuromusculoskeletal and disorders of childhood that are chronic. Parents found the care of their child effective. **Conclusion:** The chiropractic care of children in Europe was characterized. We support further research to characterize the safety and effectiveness of the chiropractic care of children. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Prevalence of chronic noninfectious diseases among elderly patients who seek chiropractic care

*Lucia Maria Andreis, Thiana Paula Schmidt dos Santos, Marta Casagrande Saraiva, Feevale University*

**Introduction:** The objective of the present cross-sectional retrospective study was to identify the prevalence of chronic noninfectious diseases among elderly patients who seek chiropractic care at a university clinic located in Southern Brazil. **Methods:** The sample comprised 154 patient files, of which 69.5% were for women ($n = 107$) and 30.5% for men ($n = 47$). The average sample age was 60–69 years, 67.5% ($n = 104$); 59.1% were married ($n = 91$); and 52.6% had not completed elementary level education ($n = 81$). **Results and Discussion:** The most prevalent diseases were hypertension (50%), followed by osteoarthritis (24.7%), diabetes (13.6%), cancer and osteoporosis (10.4%), depression (7.8%), rheumatoid arthritis (5.2%), and chronic obstructive pulmonary disease (1.9%). Data showed that for this sample women presented with a higher prevalence of chronic noninfectious diseases. High blood pressure as well as osteoporosis, osteoarthritis, and rheumatoid arthritis are the most prevalent conditions ($p < .05$). A significant relation was also found between diabetes and age ($p < .05$) and chronic obstructive pulmonary disease and age ($p < .05$). **Conclusion:** Due to the increase of the elderly population followed by increase of chronic noninfectious diseases, it is important that chiropractors, as health care providers, be prepared to work with patients presenting such conditions to engage in health measures and provide effective care. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Effect of treatment dosage on the therapeutic efficacy of spinal manipulation for low back pain: A systematic review

*Brian Arthur, International Collaboration on Repair Discoveries, Jeffrey Quon, University of British Columbia, Paul Bishop, University of British Columbia*

**Introduction:** Variation in clinical outcome has led to discordant conclusions in different systematic reviews of spinal manipulative therapy (SMT). One possible source of this heterogeneity is the differences in treatment dosage. This study aimed to determine if dosage variables contribute to reported differences in patient outcome in randomized controlled trials (RCTs) of HVLA-SMT (high-velocity low-amplitude SMT). **Methods:** Computerized databases were searched up to August 2009 for RCTs of low back pain (LBP). Included trials required validated measures of pain and function. Two reviewers screened abstracts, re-

viewed full-text articles, and extracted data. Weighted mean differences were pooled using random effects models. Heterogeneity was assessed using $\chi^2$ tests. Meta-regression was used to investigate the effect of dosage variables on outcome heterogeneity. **Results:** The pooled effect of HVLA-SMT on mean change in pain intensity was 2.15 mm (95% confidence interval [CI]: −0.09 to 4.38). Meta-regression analysis of 14 studies reporting sufficient data showed that duration and number of treatments were significantly associated with heterogeneity for changes in pain, but not function. **Discussion:** This is, to our knowledge, the first study of HVLA-SMT trials assessing the effect of varying dosage on patient clinical outcome. **Conclusion:** Duration and number of treatments is associated with improvement in posttreatment pain intensity. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Publication rates of abstracts presented at Association of Chiropractic Colleges/Research Agenda Conference meetings between 2002 and 2008

*Barclay Bakkum, Illinois College of Optometry, Cynthia Chapman, Occoquan Family Practice*

**Introduction:** There have been studies that have examined the publication rates of abstracts from scientific meetings associated with various spine and orthopedic surgery national organizational meetings, but there have not been any studies conducted concerning publication rates from chiropractic research meetings. This study determined the publication rates of presentations at the Association of Chiropractic Colleges/Research Agenda Conference (ACC/RAC) meetings. **Methods:** Comprehensive literature searches using PubMed and ChiroIndex were performed for all abstracts of poster and platform presentations at the 2002 through 2008 ACC/RAC meetings. **Results:** There was a total of 776 presentation abstracts at the ACC/RAC meetings for these years. From these abstracts, 249 articles were eventually published, for an overall publication rate of 32.2%. Platform presentations were more than twice as likely to result in a published article than were poster presentations. There was a high congruency of protocols, including sample sizes, between the meeting abstract and the published article, that is, 88.8%. **Discussion:** A likely barrier to publication for those in the chiropractic profession is lack of time. **Conclusion:** The publication rates of ACC/RAC meetings compare reasonably well with those of other spine and orthopedic surgery national organizational meetings. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Sonographic assessment of the normal suprascapular nerve and inferior belly of the omohyoid muscle

*Patrick Battaglia, Daniel Haun, Logan College of Chiropractic*

**Introduction:** To use ultrasonography to obtain normative data on the suprascapular nerve (SSN) and omohyoid muscle in the lateral cervical region. **Methods:** Approval was granted from the institutional review board, and all ethics guidelines for human subjects research were met. Cross-sectional, long axis, and linear distance data of the SSN and omohyoid muscle were obtained. **Results:** The mean cross-sectional area (CSA) of the SSN at both its origin and over the first rib was 1.94 $mm^2$ and at the distal clavicle was 1.97 $mm^2$. The average linear distance from the inferior belly of the omohyoid (IBO) to the SSN at these locations was 7.6 mm, 4.23 mm, and 2.80 mm, respectively. **Discussion:** The SSN and IBO follow a similar course and have consistent sonoanatomy in healthy subjects. The relationship of the omohyoid muscle to the SCM and internal jugular vein is highly variable. **Conclusion:** Knowledge of these normal sonographic values and relationships may improve the diagnostic ease of suprascapular neuropathy or enhance the clinical picture of combined neck and shoulder pain in cases of whiplash-associated disorders and cervical radiculopathy. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Is interprofessional education a common factor in chiropractic continuing education?

*Edward Bednarz, Department Of Veterans Affairs, Puget Sound Health Care System, Anthony Lisi, Department Of Veterans Affairs, Director of Chiropractic Service*

**Background:** Integrating chiropractic services into medical systems is challenging. Interprofessional education can facilitate interprofessional collaboration and improve teamwork. This study describes chiropractic continuing education (CE) vis-à-vis interprofessional education with medical physicians. **Methods:** This paper is part of a larger descriptive analysis of interprofessional characteristics in CE. Here we present the results of policy content analysis for each US state and the District of Columbia. We queried each board to determine if continuing medical education (CME) could apply to chiropractic relicensure requirements. **Results:** In 26 of the 51 jurisdictions (51%), insufficient information was obtained to determine the applicability of CME to chiropractic relicensure. Thirteen jurisdictions (25%) do not accept CME; 4 of these reject it outright, and 9 would require the CME event to be accredited as a CE event. Twelve jurisdictions (24%) accept CME credits for chiropractic relicensure. **Conclusion:** The majority (76%) of the licensing boards studied either do not accept CME credit or provide insufficient information on the topic. This appears to impede access to interprofessional education in doctor of chiropractic (DC) relicensure. A minority (24%) of licensing boards accept CME credit. Future work assessing the prevalence and impacts of DCs' participation in CME may be important. (This is an abstract

from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Investigating high-quality interactive applications for value-added teaching

*Judy Bhatti, Mary Frost, Elissa Twist, Palmer College Chiropractic*

**Objectives:** To find high-quality interactive iPad applications for use in human embryology and for their discipline and to record the results of their findings. Discussions regarding classroom and lab application use were brought forth at each weekly meeting. Faculty members demonstrated the applications in front of the group, and a verbal consensus was taken on the quality of the applications presented. Each of the group-selected applications was added to a list to be distributed to the group. The list was categorized by each discipline. **Results:** During the weekly meetings, applications related to embryology and gross anatomy lab were demonstrated and found to have useful information for the interactive dissemination of knowledge. A list of appropriate applications was complied. **Conclusions:** This iPilot project exhibited the usefulness of interactive applications for learning fundamentals in embryology and gross anatomy labs. This project highlights the direction for future studies to evaluate students' satisfaction of the use of technology for student-based learning. Future assessment of learning outcomes would also be evaluated. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Self-perceived skills confidence: A follow-up study of chiropractic students in the early phases of a college's clinic program

*Debra Bisiacchi, Life University College of Chiropractic, Dovid White*

**Objective:** This study's purpose was to follow up on a preliminary investigation of clinic entry-level chiropractic students and their perceived confidence levels in spinal analysis and adjusting skills after a comprehensive course was added to the curriculum. **Methods:** A literature review of studies subsequent to the pilot was performed, and a survey was developed to determine students' skills perceptions. Questions focused on confidence with full-spine radiographic (Gonstead type) and descriptive analysis, motion palpation analysis, and manual full-spine and diversified spinal adjusting. The project was conducted in a new Full Spine III Technique course for 3 consecutive terms, replicating the original study. **Results:** Of the 217 eligible students, 132 participated in this study compared to 108 of 226 students during the pilot, about a 13% increase. The current study reported more confidence with descriptive listings analysis, less confidence with full-spine radiographic analysis, and little confidence in motion palpation analysis. Two adjusting trends continued: Students were still most confident with prone thoracic thrusting and least confident with seated cervical moves. **Conclusion:** Students who completed the new class reported increased confidence when compared to pilot study participants, and it may be concluded that added comprehensive course work can contribute to improved student perceptions. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Trunk neuromuscular responses to a single whole-body vibration session in patients with chronic low back pain: A cross-sectional study

*Jean-Alexandre Boucher, Jacques Abboud, Jean-Daniel Dubois, Elise Legault, Martin Descarreaux, Yves Henchoz, Université du Québec à Trois-Rivières*

**Introduction:** Whole-body vibration (WBV) exercise is progressively adopted in the management of many chronic conditions, although its clinical relevance has rarely been investigated. The present study aimed to evaluate the short-term effects of a single WBV session on trunk neuromuscular responses in patients with chronic low back pain (cLBP). **Methods:** Eighteen healthy volunteers and 15 patients with cLBP performed 10 trunk flexion-extension tasks before and after a single WBV session. Lumbar surface electromyography (EMG) activity and lumbopelvic kinematics were recorded. **Results:** The WBV session led to increased lumbar EMG activity during the flexion and extension phases, but yielded no change in the quiet standing and fully flexed phases. These effects were not different in patients with cLBP and in healthy participants. **Discussion:** The reported effects of WBV on lumbar EMG activity appeared to be significant in the dynamic, but not in the static, phases of the task. Increased lumbar EMG activity following a single WBV session most probably results from potentiation effects of WBV on lumbar muscle reflex responses. **Conclusion:** Increased lumbar EMG activity during trunk flexion and extension was observed after a single WBV session, without difference between patients with cLBP and healthy participants. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Nonphysician screening of low back or low back–related leg pain patients referred for surgical assessment: A survey of Canadian spine surgeons

*Jason Busse, McMaster University, John Riva, McMaster University, Jennifer Nash, McMaster University, Sandy Hsu, McMaster University, Charles Fisher, University of British Columbia, Eugene Wai, Ottawa Hospital, David Burnarski, Ontario Chiropractic Association, Jeffrey Quon, University of British Columbia, Brian Drew, McMaster University, Stephen Walter, McMaster University, Paul Bishop, University of British Columbia, Raja Rampersaud, University of Toronto*

**Introduction:** Although the utilization of physician assistants is common in several surgical specialties, the

attitude of surgeons toward expanded scope of practice for the independent assessment of patients by nonphysician clinicians (NPCs) with additional specialty training (e.g., chiropractors, physical therapists) is unknown. **Methods:** We administered a 28-item survey to all 101 surgeon members of the Canadian Spine Society that inquired about attitudes towards the use of NPCs to screen low back patients referred for elective surgical assessment. **Results:** Eighty-five spine surgeons completed our survey, for a response rate of 84.1%. Most respondents (77.6%) were interested in working with a NPC to screen patients with low back related complaints referred for surgical assessment. Perception of suboptimal wait-time for consultation and poor screening efficiency for surgical candidates were associated with greater surgeon interest in working with NPCs. A majority of respondents (75.3%) agreed that they would be comfortable not assessing patients with low back related complaints if clear indications for a possible surgical candidate were ruled out by a NPC. **Conclusion:** The majority of Canadian spine surgeons were open to a NPC model of care to assess and triage of non-urgent or emergent low back related complaints. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Impact of guideline dissemination strategies among chiropractors enlisted in a provider network in the United States: Interrupted time series with segmented regression analysis

*André Bussières, Université du Québec à Trois-Rivières and McGill University, Anne Sales, Michigan University, Timothy Ramsay, University of Ottawa, Steven Hilles, American Specialty Health Network, Jeremy Grimshaw, University of Ottawa*

**Background:** Little is known about the impact of distribution of educational materials on appropriate care among North American chiropractors. **Objectives:** To evaluate the impact of Web-based dissemination of a diagnostic imaging guideline on chiropractors' use of spine x-rays. **Research Design:** Interrupted time series analysis of spine x-ray claims by chiropractors in a large network of complementary care providers across the United States. **Methods:** The intervention was delivered in April 2008. Administrative claims data were extracted between January 2006 and December 2010. Segmented regression analysis with autoregressive error was used to estimate the impact of guideline recommendations on the rate of spine x-ray claims. **Results:** Time series analysis revealed a significant change in the level of spine x-ray claim ordering soon after introduction of the guidelines (−.01; 95% confidence interval [CI] = −.01, −.002; $p = .01$), but no change in trend of the regression lines. The monthly mean rate of spine x-rays within 5 days of initial visit per new patient exams decreased by 10 per 1000, a 5.26% relative decrease after guideline dissemination. Controlling for 2 quality improvement strategies did not change the results. **Conclusions:** Web-based guideline dissemination was associated with a stepwise reduction in spine x-ray claims. Sensitivity analysis suggests our results are robust. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Ethnicity differences in serum levels of 25-hydroxyvitamin D and parathyroid hormone and bone mineral density among healthy individuals

*Weiwen Chai, Robert Davidson, Martha Kaeser, Norman Kettner, Logan College of Chiropractic and University Programs*

**Introduction:** Vitamin D is suggested to be beneficial to bone health, cancer, cardiovascular disease, and immune function. The objective of this pilot study was to assess the differences in serum levels of 25-hydroxyvitamin D [25(OH)D] and parathyroid hormone (PTH), and bone mineral density between African Americans and whites in healthy individuals from a college community. **Methods:** Serum levels of 25(OH)D and PTH were assessed in 18 African Americans and 19 whites aged 21 to 52; BMD was measured in 33 subjects (15 African Americans, 18 whites). **Results:** African Americans had significantly lower mean serum 25(OH)D levels compared to whites (50.6 nM vs 78.1 nM, $p = .0004$). Serum PTH levels ($p = .006$) and total hip ($p = .01$) and total body BMD ($p = .03$) were significantly higher in African Americans than in whites. Body mass index was significantly correlated to lumbar spine vertebrae, dual femoral neck, and total body BMD. **Conclusions:** Consistent with literature, we observed that African Americans had significantly lower serum 25(OH)D and higher PTH levels, and had higher BMD compared to whites in the current sample of healthy individuals. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Complying with Council on Chiropractic Education meta-competencies 6 and 7 through the development of an evidence-based clinical practice educational module with an emphasis on a comparative analysis of 2 systematic reviews

*Gregory Cofano, Kimberly Keene, Heather Bowyer, Edward Pappagallo, Jacqueline Beres, Palmer College of Chiropractic*

**Introduction:** A faculty committee introduced evidence-based clinical practice (EBCP) principles into the chiropractic college clinic curriculum. The committee critically appraised 2 systematic reviews with opposing conclusions and developed an educational module based on their appraisal that would assist students in the application of EBCP principles, thereby complying with the Council on Chiropractic Education's (CCE) accreditation standards, specifically meta-competencies 6 (Information and Technology Literacy) and 7 (Intellectual and Professional Development). **Methods:** These meta-competencies were reviewed and served as

the basis for the educational module. A critical appraisal was performed on 2 articles with opposing conclusions concerning the effectiveness of manual and manipulative treatments with the purpose of evaluating research strategy, inclusion/exclusion criteria, presence of research bias, and interpretation of data bias. **Results and Conclusion:** This module was implemented over the course of 1 curricular quarter. The students were guided to ask, acquire, and appraise the research, including an in-depth discussion on the comparative analysis of the above-mentioned articles. Furthermore, the students have been taught to apply this research to patient management, thereby demonstrating compliance with CCE meta-competencies 6 and 7. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Using learner response systems to enhance student learning and retention in the basic science classroom

*Alena Coleman, Shahla Abghari, Life University*

**Introduction:** The implementation of active learning strategies is on the rise in higher education. One active learning strategy, the learner response system (LRS), was used in this study to collect data on student learning and retention in a basic science course. **Methods:** A comparison study was performed in a microbiology course comparing LRS responses to the same or similar questions on written examinations. A group assignment requiring students to use the LRS system in a presentation was also studied and comparison data from course final exam scores were analyzed. **Results:** There was an increase in final examination scores in the academic terms studied, and there was an average 23.78% change in the fall 2011 term and a 50.76% change in the spring 2012 term. The mean scores for the final examinations show minor improvement. **Discussion:** TheLRS allowed the instructor to assess student responses and immediately address course concepts that needed further explanation. The findings suggest that students had increased retention of information reviewed with the LRS technology. **Conclusion:** Overall, the introduction of the LRS active learning strategy in this basic science course had a significant impact on student retention and engagement. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### How reliable are manual therapists' procedures in detecting positional asymmetry of the posterior superior iliac spines?

*Robert Cooperstein, Palmer College of Chiropractic West*

**Introduction:** Pelvic structures that are routinely palpated for symmetry and proper alignment include the posterior superior iliac spines (PSISs). They may help diagnose pelvic torsion and are palpated in other static and dynamic pelvic palpatory procedures. Our goal was to review the interexaminer reliability of PSIS palpation. **Methods:** The inclusion criterion for an article was that it concerned the interexaminer reliability of palpation for PSIS locations. Both Google and PubMed searches were conducted using the "related citations" function, and secondary searches of article bibliographies were conducted. **Results:** Nine studies were retrieved, with an average Stockendahl index quality score of 4. Moreover, none achieved the $\kappa = .41$ level that defines "moderate" agreement. **Discussion:** Because palpation of the PSISs is the starting point for other pelvic examination procedures, such as the step test and the sitting flexion test, examiner inability to agree on PSIS locations may negatively impact their ability to perform other manual pelvic examination procedures. **Conclusion:** The evidence does not support clinical utility of manual PSIS palpation as a self-contained assessment or as a component of other pelvic examination methods. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Intraexaminer reliability of compressive leg checking and correlation with the sit-stand test for anatomical leg length inequality

*Robert Cooperstein, Morgan Young, Baljinder Gill, Palmer College of Chiropractic West*

**Introduction:** Most forms of leg checking are for functional short leg, believed related to a treatable clinical entity, such as pelvic subluxation. However, a short leg may be anatomical in nature, which could lead to different treatment procedures. A variant termed "compressive leg checking" has been proposed to identify an anatomical short leg. This study addresses its interexaminer reliability. **Methods:** A convenience sample of 20 asymptomatic chiropractic college students was recruited. Each wore modified surgical boots capable of measuring leg length inequality (LLI) to the nearest millimeter, prone. Each participant was measured 3 times, at 5-minute intervals. One year later, a subset of 11 was examined with the sit-stand test for anatomical LLI. **Results:** Using compressive leg checking, 13 of 20 participants exhibited a right short leg (mean of 3 measurements), whereas 7 of 20 exhibited LLI $\geq$ 5 mm; the intraclass correlation coefficient was ICC(2,2) = 0.840 (0.660, 0.931). In comparing compressive leg checking and the sit-stand test, Cohen's kappa = .607, with agreement in 9 of 11 (81.8%) of cases. **Discussion and Conclusion:** Compressive leg checking has good intraexaminer reliability and correlates with the sit-stand test. Studying its interexaminer reliability is warranted. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### The correlation of the arm-fossa test with other sacroiliac findings: A feasibility study

*Robert Cooperstein, Palmer College of Chiropractic West, Charles Blum, SOTO-USA, Elaine Cooperstein, private practice*

**Introduction:** The arm-fossa test (AFT) is a sacroiliac test used by practitioners of Sacro-Occipital Technique (SOT). A positive test is thought to correlate with sacroiliac hypermobility and a negative AFT with either normal sacroiliac mobility or sacroiliac hypomobility. We hypothesized that the finding of fixation using the Gillet test would predict a negative AFT. **Methods:** A convenience sample of college students enrolled in a weekend SOT seminar received the AFT from 2 examiners and a battery of orthopedic and motion tests from another examiner, including the Gillet test for sacroiliac motion. Kappa values were computed among the pairwise combinations of tests given. **Results:** Highest kappa value was for the AFT of examiner 1 and the Gillet test: $\kappa = .55$, which corresponds to "moderate agreement." Sensitivity of a negative AFT for fixation = 0.88, specificity= 0.67, diagnostic accuracy=0.79. **Discussion and Conclusion:** Pilot data support the hypothesis that a positive AFT is consistent with (but does confirm) sacroiliac ligamentous laxity. This prelude to future full study suggests it should include a greater mix of symptomatic and asymptomatic participants, examiner training, and a more selective inclusion of orthopedic exams. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Impact of the implementation of evidence-based guideline in a university outpatient chiropractic clinic

*Genevieve Cote, Jean-Daniel Dubois, Alexandra Ladouceur, Martin Descarreaux, Université du Quebec à Trois-Rivières*

**Introduction:** Evidence-based guidelines are recommendations intended to optimize patient care based on a systematic review of scientific evidence and assessment of alternative care options. This study aimed at evaluating the effectiveness of a training session attended by 5th year chiropractic interns in the implementation of the Management of Headache Disorders in Adults guideline. **Methods:** Forty-nine interns participated in this study and received the guideline. The experimental group attended a presentation where the guideline was explained. Assessments of the interns' knowledge, competencies, and attitudes toward the treatment of patients with headache and the use of the guideline were conducted by pretraining and postproject evaluations, retrospective file studies, and focus group discussions, respectively. **Results:** The results of the study did not yield great differences in the use of the guideline between the interns of the control group and those who received specific training related to the guideline, except for a slight difference in attitudes toward the guideline. **Conclusion:** Interns from the experimental group better understood the guidelines and demonstrated a greater openness to it, which suggests that passive dissemination of guidelines is not sufficient to foster behavior changes and active interventions are needed to ensure adherence by chiropractors. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Zygapophyseal joint space gapping in low back pain patients following spinal manipulation

*Gregory Cramer, National University of Health Sciences, Jerrilyn Cambron, National University of Health Sciences, Joe Cantu, Radiological Consultant, Charlottesville, VA, Jennifer Dexheimer, National University of Health Sciences, Judith Pocius, National University of Health Sciences, Douglas Gregerson, National University of Health Sciences, Michael Fergus, National University of Health Sciences, Ray McKinnis, Statistical Consultant, Winfield, IL, Thomas Grieve, National University of Health Sciences*

**Introduction:** This study quantified lumbar zygapophyseal (Z) joint space separation (gapping) in low back pain (LBP) subjects after spinal manipulative therapy (SMT) or side-posture positioning (SPP). **Methods:** This institutional review board–approved project enrolled 112 LBP subjects. Each subject had 2 MRI appointments (initial enrollment, M1; and after 2 weeks of standardized chiropractic treatment, M2); receiving 2 MRI scans of the L4/L5 and L5/S1 Z joints at each appointment. Following the first (supine) MRI, subjects were randomized into SPP (nonmanipulation) or SMT (manipulation) groups. After SMT or SPP, a 2nd MRI was taken. The central anterior-posterior (A-P) joint space was measured. Gapping differences (postintervention minus preintervention measurements) were compared (analysis of variance, ANOVA). Secondary measures of pain (visual analogue scale, VAS; verbal numeric pain rating scale, VNPRS) and function (Bournemouth questionnaire, BQ) were assessed. **Results:** Gapping differences were significant at M1 (adjusted, $p = .01$), with SPP gapping most, and M2 (adjusted, $p = .0005$), with SMT gapping most. VNPRS differences were significant at M1 ($p = .04$), with SMT showing the greatest improvement. VAS and BQ improved after 2 weeks of care in all groups (both $p < .0001$). **Discussion and Conclusion:** SPP showed greatest gapping at baseline. After 2 weeks, SMT resulted in the greatest gapping. NIH/NCCAM Grant#:2R01AT000123. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Muscle activation onset timing recorded during high-velocity, low-amplitude spinal manipulation—A methodological comparison

*Stuart Currie, University of Denver, Casey Myers, University of Denver, Brian Enebo, University of Colorado Hospital, Bradley Davidson, University of Denver*

Currently much is unknown about the mechanisms behind the neuromuscular response to spinal manipulation. Muscle activity onset timing is a primary measure helpful in the quantification of this response.

There are no known methodological comparisons of timing detection methods with regard to the manipulation reflex. The purpose of this investigation was to compare 2 methods that detect onset delay: threshold method and cross-correlation method. Surface and indwelling electromyography (EMG) were recorded during 2 lumbar diversified side-lying manipulations (L3 and SI) in a female participant. Patient consent and institutional review board (IRB) approval were obtained. EMG onset delays were compared across methods and manipulations. Activity delay after force production ranged from 2 to 397 msec. Detection methods were different in the SI manipulation (263.8 ± 90.5 msec, 112.39 ± 68.6 msec, $p = .006$), but not in the L3 manipulation (125.9 ± 100.5 msec, 97.9 ± 26.0 msec, $p = .2$). Reliability and signal-processing advantages were apparent in the cross-correlation method; however, caution must be exercised when signal-to-noise ratios are low. These results may help standardize methods when recording neuromuscular responses of spinal manipulation, and improve comparisons within and across investigations. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Utilization of nonsurgical spinal decompression therapy in a chiropractic college outpatient teaching clinic

*Dwain Daniel, Michael Ramcharam, Amy Wright, Texas Chiropractic College*

**Introduction:** Nonsurgical spinal decompression therapy (NSDT) is a form of traction therapy that, according to its adherents, is superior to traditional traction therapy. This study will examine the utilization and patient characteristics of NSDT in an outpatient teaching clinic. **Methods:** This is a retrospective file review collecting demographic and patient characteristics on all 71 patients selected for NSDT between May 2010 and August 2012. **Results:** Of the patients, 71.7% were overweight or obese, 45.1% suffered from low back pain and leg pain, and 87.3% also received spinal manipulative therapy. **Discussion:** It is not the purpose of this study to interpret the findings of the data gathered but rather to present the data as possible avenues of future research. Just a few of the areas that require additional research include the effect of BMI on NSDT, the effectiveness of cervical as well as lumbar decompression, and the value of adjunctive therapy in combination with NSDT. **Conclusion:** Significant effort must be made to further investigate the effectiveness of NSDT. Investigation of treatment protocols and patient selection guidelines should receive high priority. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## A pilot survey of chiropractors' attitudes toward and use of radiography in clinical practice

*Lydia Dever, Michael Tomasello, Rueben Carter, Life University*

**Objective:** This preliminary study sought to understand whether the information gained from radiographs influence clinical case management and the delivery of care among chiropractors. **Method:** Chiropractors at a continuing education conference voluntarily elected to participate in a brief survey. Study approval was obtained by an institutional review board, and informed consent was obtained from all respondents. SPSS predictive analytics software was used to derive descriptive statistics, including the frequencies and percentages of each response outcome. **Results:** A total of 104 practitioners elected to take the survey. Seventy-five percent of chiropractors indicated that they use radiographs in their practice. Information gained from radiography influences patient case management for 87.4% of the chiropractors and influences how adjustments are delivered for 81.6% of chiropractors. When asked if radiographs are a necessary tool for chiropractors, 90.8% of respondents indicated that they are necessary. **Conclusion:** Restrictions on chiropractors' access to and use of radiography should be evaluated in the context of its perceived importance in the performance of clinical duties. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## School bags and musculoskeletal health in secondary school children: A cross-sectional cohort study

*Morna Dodd, James O'Dell, Adrian Hunnisett, Christina Cunliffe, Mctimoney College of Chiropractic*

**Introduction:** This study investigated the relationship between musculoskeletal pain (in the shoulders, neck, and spine) and the relative weight of the schoolbag in secondary schoolchildren, and to discover whether the height of the child is significant. It also investigated the relevance of the type of schoolbag in relation to musculoskeletal pain. **Method:** A cross-sectional survey was conducted of 100 children between ages 11 and 18 who were attending secondary school. The study comprised a questionnaire regarding any musculoskeletal pain experienced in the preceding month and year, height and weight measurements, and a 2nd questionnaire regarding details of their individual schoolbags. **Results:** The majority (56%) of the sample had experienced musculoskeletal pain in the last month. There was no significant difference between the use of a backpack or a shoulder bag. There was a significant association of pain with relative schoolbag weight ($p < .027$), especially in girls ($p = .05$). There was a highly significant association between height and pain ($p < .01$), especially in boys ($p < .05$). **Conclusion:** A number of statistically significant findings were made linking height, bag weight, and gender in schoolchildren. Follow-up studies would be useful to confirm the trends and to make recommendations for suitable bag weights for schoolchildren. (This is an abstract from a

conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Surveys as a method for informing a chiropractic technology program curriculum

*Cathy Eberhart, Stacie Martel, Palmer College of Chiropractic*

**Introduction:** The purpose of this study is to determine attitudes of doctors of chiropractic regarding the importance of staff training in specific skill areas through the use of a survey to inform the curriculum of a chiropractic technology program. **Methods:** Registrants of a chiropractic college homecoming event were given a survey consisting of Likert scale items regarding staff training. Descriptive statistics were derived and analysis of variance was used to test differences between groups based on years in practice and level of staff training. **Results:** Doctors place the highest level of importance on oral communication skills, with 97.5% of doctors rating this skill as important or very important, and knowledge of nutrition scored the lowest with a rating of 45.7%. Overall, doctors who have been in practice for fewer than 6 years placed a higher degree of importance on staff training in areas commonly regulated. **Conclusion:** An employer survey was found to be a useful tool in the curricular management process. Survey results, along with regulatory requirements and accreditation standards, were used in the revision of the curriculum of a chiropractic technology program. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Mechanical behavior of sacral and iliac cartilage under compression

*Dennis Enix, Logan College of Chiropractic, Douglas Smith, University of Missouri at Columbia*

**Introduction:** Articular cartilage is a complex viscoelastic macromolecular material that acts as a low-friction surface to absorb and distribute the shearing forces that cross the sacroiliac joint under axial loading. **Methods:** A finite element model of sacral and iliac cartilage was developed from a cadaveric specimen to examine compressive shearing forces on sacroiliac joint cartilage during angular rotation. A 1.81 mm and 0.80 mm layer of sacral and iliac cartilage was modeled as linear elastic material with 1.2 MPa Young's modulus and Poisson's ratio of 0.049. A 445 N vertical load was placed across the sacroiliac joint, compressing layers of sacral and iliac cartilage against nondeformable sacral bone. **Results:** Axial loading creates a lateral displacement of the sacrum and high shearing stresses at the sacral/iliac cartilage and cartilage/bone borders. Angular rotation from 11.4° to 21.0° created Poisson effect deformation of 0.08 MPa for sacral cartilage and 0.010 MPa for iliac cartilage. **Discussion:** These angular stresses create irregular changes in cartilage that follow the geometric articular surface topography. **Conclusions:** As the pelvis rotates anteriorly, sacral cartilage contact stresses decrease and iliac cartilage increases. Von Mises stresses, however, increase on both sacral and iliac cartilage during rotation. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Lumbar spine analogues data repeatability under biomechanical testing

*Martha Funabashi, University of Alberta, Gregory Kawchuk, University of Alberta, Mojtaba Azadi, Massachusetts Institute of Technology*

**Introduction**: In vitro biomechanical studies have contributed greatly to the understanding of spinal manipulation. Because human cadaveric tissues have limited availability, high costs, and heterogeneous tissue quality, spine analogues may provide an important alternative when investigating spinal manipulation. Prior to comparing the behavior of analogues to human tissue, it is necessary to determine within-analogue and between-analogue variability. **Methods:** Analogues consisted of 4 L4-L5 spinal units manufactured by Dynamic Disc Designs, Canada. All analogues underwent standardized preparation prior to robotic biomechanical testing. In each analogue, the center of rotation was set as the posterior one-third of the intervertebral disc followed by robotic application of pure rotations about 3 Cartesian axes. Each rotation was performed 3 times per analogue while the applied angle and resulting movement were acquired at 200 Hz. Nonparametric statistics were used to analyze repeatability. **Results:** The Friedman statistic revealed no significant within-analogue difference ($p > .05$) and Kruskal-Wallis analysis also demonstrated no significant difference between analogues ($p > .05$). **Discussion and Conclusions:** Given potential variability in analogue manufacturing, preparation, and testing, the biomechanical performance of spine analogues can be very similar. These results suggest that spine analogues may be a promising alternative for investigations of spinal manipulation when tissue specimens are unavailable or impractical. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### The effect of single session of muscle-biased therapy on pain sensitivity: A systematic review of randomized controlled trials

*Charles Gay, Meryl Alappattu, Mark Bishop, University of Florida*

**Study Design:** Systematic review. **Objectives:** To assess the effects of a single dose of muscle-biased therapy (MBT) on pain sensitivity compared to (1) other active agents, (2) sham/inert treatments, (3) no treatment. **Background:** The clinical effectiveness of MBT may be related to a reduction in pain sensitivity. **Methods:** A systematic search for articles using CINAHL and

MEDLINE from each database's inception until July 2012 was conducted in accordance with guidelines from the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). **Results:** Twenty-three randomized controlled trials were identified. The effects of MBT were compared to 10 groups receiving active agents (3 joint-biased therapies, 6 multimodality treatments, and(1 ultrasound), 11 groups receiving sham/inert treatments, and 8 groups receiving no treatment. Of the 36 groups receiving a MBT, 21 provoked tolerable pain during treatment. Twenty-six of the treatments lasted between 0 and 8 minutes, 0 lasted between 8 and 16 minutes, and 10 lasted greater than 16 minutes. Despite inconsistent results across studies, MBT was superior to no treatment and as effective as other interventions in reducing pain sensitivity, **Conclusions:** MBT is a viable treatment option for reducing pain sensitivity; certain parameters of the intervention may be important. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Feasibility study evaluating a checklist tool for simulation

*Dominic Giuliano, Marion McGregor, Canadian Memorial Chiropractic College*

**Purpose:** This study investigated the feasibility of using a checklist tool to score performance of interns involved in a simulated clinical event and evaluate the relationship between scores associated with 2 groups of 3 judges. **Methods:** Six judges of differing levels of expertise scored 9 videos of interns managing a simulated cardiac event. Judges were divided into 2 groups of 3. For 1 group of judges, instructions and training were provided individually, and the videos were viewed and scored in isolation. The 2nd group of judges were trained as a group. This 2nd group viewed and scored videos at the same time, but were separated by a curtain to blind them from one another's assessment. **Results:** Results revealed strong correlation, with an $r$ value of 0.93 and a $p$ value of .0003, between the 2 groups of judges. Analysis of variance (ANOVA) revealed strong, statistically significant difference between the videos when grouped according to student simulation experience ($F = 14.39$, $p = .0004$). **Conclusions:** Results obtained in this feasibility study provide optimism for a further use of this tool to evaluate clinical performance and learning retention in simulated events. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Frequency of use of diagnostic and manual therapeutic procedures of the spine taught at the Canadian Memorial Chiropractic College: A preliminary survey of chiropractors. Part 2—Procedure usage rates

*Brian Gleberzon, Kent Stuber, Canadian Memorial Chiropractic College*

**Objective:** The purpose of this study was to investigate the utilization rates of diagnostic and therapeutic procedures of the spine by Canadian chiropractors. **Methods:** The study consisted of a paper-based survey that was sent to 500 pseudo-randomly selected Ontario chiropractors who responded confidentially. The procedures listed in the survey were identified by auditing course outlines, syllabi, and laboratory manuals from the orthopedic and technique courses taught at Canadian Memorial Chiropractic College. **Results:** There were 108 respondents to the survey, giving a response rate of 22.4%. Frequency of use of diagnostic procedures fell into 3 broad categories: (1) those tests that are almost always performed, (2) those tests that are used on two-thirds to one-half of patients, and (3) those tests that are virtually never used. By comparison, respondents used the same therapeutic procedures for patients' care less consistently. **Conclusions:** Despite a low response rate, respondents reported mostly relying on static and motion palpation, joint play, and ranges of motion when assessing their patients. This data may assist curricular planners, and it may highlight challenges in knowledge transfer to chiropractors after they graduate from chiropractic college. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## The effect of a semicustomized, dual-contoured pillow on muscle activation, posture, and contact pressures of the head and neck

*Diane Grondin, John J. Triano, Steven Tran, Canadian Memorial Chiropractic College*

**Introduction:** Neck pain is a common complaint in the population. Numerous studies have investigated the effects of cervical pillows on pain scores; however, few have quantified their biomechanical outcomes. The present study tested the biomechanical effects of a semicustomized, dual-contoured pillow in 2 lying positions. **Methods:** Thirty-four healthy female participants engaged in 4 conditions (2 pillows, contoured and standard, in 2 positions, side-lying and supine). Root mean square electromyography (EMG) was calculated for muscles of the head, neck, and upper back, and electromagnetic markers determined the relative positions of these segments. A thin sensing mat measured the average and peak pressures and contact area. Two-factor repeated-measures analyses of variance tested for differences between pillows. Significant interactions were analyzed post-hoc ($t$ tests with Bonferroni adjustment, $p < .05$). The study was approved by the institution's Research Ethics Board. **Results and Discussion:** Peak pressure was significantly lower with the contoured pillow versus the standard pillow ($p = .0001$). Contact area was also greater with the specialized pillow in supine position ($p < .0001$). There were no significant effects of the pillow on muscle activations or postures. The reduction in peak pressure

with the contoured pillow has the potential to mitigate neck pain symptoms and assist with healing in patients. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Assessing critical thought in a chiropractic program

*Joseph Guagliardo, Life Univeristy*

**Introduction:** The literature has shown that critical thinking has been a goal of education throughout most of this century, although most college faculty have difficulty defining and implementing critical thought assessment in the classroom. The purpose of this paper is to report on the strategy developed to assess critical thought in a clinical course utilizing simulated patient interview scores. **Methods:** A retrospective comparison of student performances ($n = 283$) over 3 academic calendar sessions was approved by the institutional review board for human subjects. Comparison was made of students' scores between data gathering and critical thought . Pearson's correlation coefficient ($r =$ .028, .186, and .256, respectively) was calculated. A 1-way analysis of variance (ANOVA) was used to determine whether the subgroups of each cohort were similar as well as Tukey's honestly significant difference (HSD) evaluation for homogeneity among subgroups. Effectiveness of the intervention was assessed through the use of Cohen's $d$ analysis ($d = 0.286$). **Results:** A comparison of premeans and postmeans and pass rates indicates that the students performed better in the critical thought poststation than in the data gathering prestation and that there was a positive correlation between groups. **Conclusions:** This study suggests that a systematic process can be developed to assess critical thought in the classroom. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Instantaneous rate of loading during manual high-velocity low-amplitude spinal manipulations

*Maruti Ram Gudavalli, Palmer Center for Chiropractic Research*

**Introduction:** The high-velocity, low-amplitude spinal manipulation (HVLA SM) is a typical procedure delivered by chiropractors. The objective of this study was to determine the instantaneous rate of loading during HVLA SM in the lumbar and thoracic regions. **Methods:** Palmer College institutional review board approved this study, and the participants signed the informed consent documents. Three clinicians performed lumbar HVLA SM thrusts on 5 volunteers. Doctors also delivered posterior-to-anterior thoracic manipulations on a mannequin. Force-time profiles were recorded using a miniature force transducer placed on the participants' back and the doctor's hand. Data recordings were made using a Motion Monitor software data acquisition system. Descriptive analyses were performed on the maximum instantaneous rate of loading, instantaneous rate of unloading, and lag times compared to peak load. **Results and Conclusions:** The instantaneous rates of loading were 1.7–1.8 times higher than average rates of loading, and instantaneous rates of unloading were 2.1–2.6 times the average rates of unloading during HVLA SM. Maximum instantaneous rates of loading occurred 102–111 msec prior to peak load. Maximum instantaneous rates of unloading occurred 121–154 msec after the peak load. This data may be useful for further understanding of HVLA SM. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Sonography of the injured anterior talofibular ligament

*Daniel Haun, Eve Bonic, Norman Kettner, Logan College of Chiropractic*

**Introduction:** The purpose of this study was to measure the thickness of the anterior talofibular ligament (ATFL) using ultrasound (US) in subjects with suspected ATFL injury, compare these measurements with previously obtained normative data, and correlate ligament thickness with Karlsson Ankle Joint Functional Survey (KAJFS) and visual analogue scale (VAS) scores. Interexaminer reliability of the ATFL thickness measurements was assessed. **Methods:** A total of 40 ATFLs were scanned in 32 subjects (18 male) by a single examiner. The intraclass correlation coefficient (ICC) was used to measure interexaminer reliability. **Results:** The mean age of the subjects was 27.3 years (range 21–42 years). The mean thickness of the proximal ATFL was 2.9 ± 1.4 mm and the mid-ATFL was 2.9 ± 1.5 mm. Significant differences ($p < .005$) were demonstrated between thickness measurements. No significant correlation was found with the total KAJFS scores or VAS scores. The ICC for the proximal ATFL was 0.644 and for the mid-ATFL was 0.542. **Conclusions:** There was a significant difference in the thickness of the ATFL between symptomatic and asymptomatic subjects. There was no correlation between ligament thickness and pain and functional status. Measurement reliability between examiners of different experience levels was fair. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Rubric referenced self-assessment vs traditional way in students' anatomy laboratory learning

*Xiaohua He, Ali Rabatsky, Palmer College of Chiropractic*

**Objective:** We compared the efficacy of the rubric referenced self-assessment to traditional learning in 2 groups of students who studied the same laboratory subjects. **Methods:** Ninety-two 1st-quarter students at Palmer College of Chiropractic, Florida Campus, participated in the study and were divided into a self-assessment group and a traditional group based on the

means they used for their learning. We measured the scores of laboratory exams as a result of these two different learning methods between two groups. This study was approved by the institutional review board of our school. **Results:** The mean scores of the laboratory examination were 94 (±12) for the self-assessment group, with corresponding scores of 92 (±18) for the traditional group. There was no significant difference in the mean scores between the 2 groups ($p > .05$). **Conclusions:** Rubric-referenced self-assessment did not yield significantly higher test scores when compared with a traditional learning method, suggesting hands-on laboratory experience might play a critical role in students' laboratory learning. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Grade point average as a predictor of performance on a high stakes comprehensive competency assessment

*Glori Hinck, Thomas Bergmann, Brent Leininger, Northwestern Health Sciences University*

**Introduction:** Is grade point average (GPA) related to performance on a high stakes comprehensive competency assessment (CCA)? This research describes student performance on the CCA related to past and current academic performance. **Methods:** Pass rates for 6 cohorts of students ($n = 466$) taking the CCA examination for the first time were compared to incoming and current GPAs. Study design was approved by the university's institutional review board process. **Results:** Average incoming GPA for those passing the examination was 3.34 and for those who did not pass was 3.13. Average Trimestar 6 GPA for those passing was 3.41 and for those not passing was 2.98. **Discussion:** In-program GPA was more related to CCA performance than incoming GPA. The cohort with the highest pass rate also had the highest average GPA. A higher GPA suggests students have better prepared themselves throughout the program and are therefore better prepared for a high stakes examination. Future studies will look at the relationship of CCA performance to Part IV National Board of Chiropractic Examiners (NBCE) test results. **Conclusions:** Results suggest that a higher GPA, especially in-program GPA, is related to higher pass rates on a high stake examination. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Altered brain morphometry in carpal tunnel syndrome is associated with peripheral nerve pathology

*Norman Kettner, Logan College of Chiropractic/University Programs, Yumi Maeda, Logan College of Chiropractic/University Programs, and Massachusetts General Hospital, James Sheehan, Massachusetts General Hospital, Jieun Kim, Massachusetts General Hospital, Steve Cina, Massachusetts General Hospital, Christina Malatesta, Spaulding Rehabilitation Hospital, Jessica Gerber, Massachusetts General Hospital, Claire McManus, Spaulding Rehabilitation Hospital, Pia Hugus, Massachusetts General Hospital*

**Introduction:** Carpal tunnel syndrome (CTS) is a neuropathy of the median nerve that is accompanied by functional brain neuroplasticity. We investigated brain gray matter (GM) and white (WM) matter in CTS for structural brain neuroplasticity. **Methods:** Twenty-eight CTS and 28 age-matched healthy controls (HCs) were consented and evaluated with clinical testing, median nerve conduction velocity (NCV), and multimodal brain MRI, including T1 structural, diffusion tensor imaging (DTI), and voxel-based morphometry (VBM). GM volume in CTS was compared with HCs and correlated with NCV and symptomatology. Significant VBM clusters defined associated WM tracts using DTI data and tractography. DTI metrics of fractional anisotropy (FA) and axial and radial diffusivity evaluated group differences. **Results:** CTS GM volume was reduced in contralateral S1, right pulvinar and right orbitofrontal cortex. GM volume in S1 correlated with median NCV ($r = .45$), but not CTS symptoms. DTI regression analysis revealed median NCV correlated with radial diffusivity ($r = .72$) and anticorrelated with FA ($r = -.65$) in a WM corticocortical association tract. **Discussion:** CTS, a peripheral neuropathy, results in remodeling and neuroplasticity in GM and WM of cortical and subcortical brain regions. **Conclusions:** Brain morphometric changes in CTS are likely driven by the peripheral neuropathy, not symptomatology. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## A proposed bioethics curriculum for accredited chiropractic colleges

*Stuart Kinsinger, Canadian Memorial Chiropractic College*

**Introduction:** The Council on Chiropractic Education (CCE) mandates that all accredited colleges teach ethics as a core part of the curriculum. Included in this mandate are professional behaviors, doctor–patient power differential, boundaries, risk management, social responsibility, commitment to lifelong learning, veracity, sound business practices, and more. **Methods:** In 2009 a survey was undertaken of all of the US and Canadian accredited chiropractic colleges regarding their ethics curricula. The results revealed a paucity of standardization or similarity in the domains studied. Total time spent in contact with students on ethics instruction varied from a minimum of 2 up to 46 hours. **Discussion:** This proposed bioethics term course is intended to satisfy the CCE's general mandate but focuses on content that features clinical issues related to the practice of chiropractic. Content includes jurisdictional codes of conduct, professionalism, responsibility, ethics and virtues of health care, boundary setting, resolution of ethical dilemmas, optimal patient communication, and patient abuse prevention strategies.

Also included is bioethics "life and death" content not customarily associated with manual care, including advanced directives and futility of care. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Continuing education for professionals on ethics and boundaries: A survey of the chiropractic profession

*Stuart Kinsinger, Canadian Memorial Chiropractic College*

**Introduction:** Although all jurisdictions require chiropractors to undergo continuing education to maintain licensure, no study has reported what specific content is mandated. **Methods:** All US states' and Canadian provinces' chiropractic regulatory bodies (61 in total) were contacted to gather such information. Regulators provided specific details on their continuing licensure requirements for ethics instruction. **Results:** Of the 51 US jurisdictions, 6 states had a continuing educational requirement generalized as ethics, with 12 using the term *boundaries* and 11 specifying the prevention of sexual abuse. Thirty-three states have no stated requirements. In Canada, 2 provinces mandate continuing education in the area of boundaries, with 1 specifying the prevention of sexual abuse. Eight provinces have no mandated continuing educational requirement in the domain of ethics and boundaries for continued licensure. **Discussion:** Anecdotal evidence suggests that all jurisdictions routinely discipline some chiropractors for serious boundary violations. A requirement for mandatory continuing education to prevent sexual abuse of patients might be considered by regulators. **Conclusions:** Only a small minority of US and Canadian jurisdictions require chiropractors to participate in post-graduate continuing education for training on ethics, boundaries, and the prevention of sexual abuse. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Promoting health in the 3rd world through very low-cost, open-access, online education: An innovative learning methodology

*Ron Kirk, Life University*

**Introduction:** Delineating course development, structure, and learning methodologies, this institutional review board–exempt study describes an open-access, online health promotion module designed to build public health capacity in developing nations facing severe health challenges. Open-access learning resources offer a potential solution to assist developing nations in building public health capacity. **Methods:** Working collaboratively, volunteer mentors developed a time-sequenced, 5-topic, educational module, employing open-access learning resources and interactive discussion forums using a Moodle platform. Learners' 3500-word final assignments included well-delineated health promotion interventions. **Results:** Learners' planned interventions included increasing exercise, improving dietary choices, reducing weight and curtailing alcohol consumption, and prevention of vitamin A deficiency/growth stunting, diabetes, cervical cancer, HIV/AIDS, malaria, chlamydial infections, tuberculosis, infant diarrhea, and guinea worms. Plans also included community gardens, hand-washing, and adult male circumcision campaigns. **Discussion:** Learners' final assignment projects inspired mentors. Module feedback respondents reported learning more than in a traditional course. **Conclusions:** Professionals from poverty-stricken areas are building health promotion skills to empower their communities in improved health. This experience has been transformational. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Development and implementation of a Web-based learning management system at a complementary and alternative health sciences university

*Anupama Kizhakkeveettil, Kevin Rose, Michael Rocke, Southern California University of Health Sciences*

**Introduction:** A growing number of educational institutions have implemented Web-based leaning management system (LMS) to help improve student learning outcomes. LMS enables students to view announcements, download and print lecture notes, participate in discussions, and access course materials and helps faculty with posting videos, online exam scoring, tracking attendance, and calculating course grades. The purpose of this paper is to describe the process adopted by a complementary and alternative medicine (CAM) educational institution in the establishment of a LMS. **Methods:** Jenzabar Internet Campus Solution (JICS) and eRacer were chosen based on the available features and their integration with the university's existing student information system, Jenzabar CX. A group of faculty champions was created to facilitate the transition to eRacer by all faculty. **Results:** Faculty and students have reported high satisfaction after the first term of using eRacer, with 133 courses posted and over 250,000 student page views. The most popular pages for students were Coursework and Gradebook. **Discussion**: Student instruction has benefited from the introduction of the eRacer LMS. **Conclusion:** This CAM university successfully implemented a LMS. Future studies should be conducted to determine if student learning outcomes have improved as a result. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### An ultrasound-kinematic–based system for spinal deformity assessment

*Terry Koo, Jingyi Guo, New York Chiropractic College*

**Introduction:** Cobb angle measurement, although a gold standard for scoliotic assessment, predisposes patients

to excessive radiation. We developed a radiation-free ultrasound-kinematic–based system to quantify spinal deformity and evaluate its accuracy and test-retest reliability. **Methods:** The system consists of an ultrasound scanner with a linear transducer to image spinous processes, a kinematic measurement system with infrared diodes adhered to the transducer to determine its pose, and a data acquisition system to synchronize ultrasound images and pose data. Custom-made software curve-fits spinous processes using locally weighted polynomial regression and calculates the spinal process angle (SPA)—an angle between the most positive and negative normal vectors of the spinal curve. A spinal column specimen was configured to 10 different deformities, and SPAs were measured by the system and a 3D digitizer (gold standard). **Results:** Difference from the gold standard ranged between −2.3° and 2.1° with mean (± standard deviation) equaling −0.6° ± 1.5°. The intraclass correlation coefficient was 0.991. **Discussion:** The ultrasound-kinematic–based measurement system offers a reliable and accurate way to measure SPA. Future study will correlate Cobb angles and SPAs measured by x-ray and our system, respectively, using human subjects to fully validate the system. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Perspectives on complementary therapies on sports injuries: A retrospective survey of UK triathletes

*Linda Kuhlmann, Adrian Hunnisett, Christina Cunliffe, McTimoney College of Chiropractic*

**Introduction:** Triathlon is one of the fastest growing sports in the UK. Although the various health benefits are well documented, there are significant injury statistics in the sport. This study sought to gather information on the type and frequency of triathlon injuries and investigate the experiences and opinions of triathletes on health care choices in the management of their injuries. **Method:** Study design was a retrospective cross-sectional survey using an electronic data collection method. A self-administered questionnaire was sent out to members of a number of triathlon clubs and website members. **Results:** A response rate of 78% was achieved (155 of 200 expected respondents). A 1-year prevalence for triathlon-related injuries was 75%, with knee and leg injuries predominating. The most common treatment choice was a primary care physician visit. Complementary therapies, including chiropractic, were chosen by 38% of all injured triathletes. For the future health care provision, 54% of all participants would like to see such therapies available by a free-at-point-of-delivery service. **Conclusion:** In contrast to the general population in the UK, triathletes appear to have positive health care attitudes and a higher utilization level of complementary therapies. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## iPilots, digital natives, and digital immigrants: A pilot project using iPads in a chiropractic college setting

*Dana Lawrence, Rita Nafziger, Dan Weinert, Palmer College of Chiropractic*

**Objective:** To describe the implementation of a pilot project providing iPad table technology to a group of faculty early adopters. **Methods:** We created, with administrative support, a grant-style program in which faculty were invited to submit applications in which they described their approach in using this technology in the classroom or clinical setting. Faculty attended resource-sharing meetings, in which faculty described applications they found and used in class, other applications of the technology in classroom and clinical settings, student responses to new methodologies, and development of iBooks. **Results:** Fifteen proposals were accepted and grants provided to those faculty to reimburse them for purchase price of the device. During our regular meetings, faculty spoke of great satisfaction in the use of the technology. Initially, there was a modicum of confusion related to the initial learning curve in using the iPad. Over the course of several meetings, a log was developed that listed all the applications faculty had found and were using. **Conclusion:** This initial project demonstrated that the technology can be implemented easily in the classroom setting, can anecdotally enhance faculty enjoyment of teaching, and can engage students. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Differences in clinical approach between dentists and chiropractors analyzing the same set of temporomandibular joint dysfunction cases

*Alexander Lee, Wendy Mok, Katherine Siu, Hilary Kwan, Linda Li, Canadian Memorial Chiropractic College*

**Objective:** To evaluate the similarities and differences of a dental vs chiropractic approach in the management of 2 temporomandibular joint dysfunction (TMD) cases. **Methods:** Following research ethics board approval, 10 dentists and 10 chiropractors agreed to review 2 TMD cases retrieved from the peer-reviewed literature. Subjects were interviewed using standardized questions relating to the clinical management of each case, and their responses were recorded and transcribed. Cluster analysis and centering resonance analysis were performed on the transcribed responses using Crawdad Analysis Software (version 2.0) to determine if consistency existed within or across professions and to identify influential words and word pairings. **Results:** The responses analyzed clustered by profession and not by the management of the 2 cases. The main distinctions in clinical approach between professions were the treatment methods employed and referral/

comanagement practices. The dentists interviewed reported that they would comanage TMD with oral surgeons whereas the chiropractors considered collaboration with dentists. **Conclusion:** The 2 professions were able to identify the problem associated with the TMJ in both cases. Although each profession differed in their approach to each case, the management was similar among their peers within the same group. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Predictors of National Board of Chiropractic Examiners (NBCE) test performance

*Angela Reeves McCall, Logan College of Chiropractic/ University Programs, Richard Harvey, Saint Louis University*

**Introduction:** The purpose of this study was to examine predictors for success on the National Board of Chiropractic Examiners (NBCE) test. We sought to validate the in-house practice test created for Part I of the exam. **Methods:** This study consisted of a longitudinal design to examine the validity of prechiropractic grade point average (GPA), in-program chiropractic course content and GPA, and an institutional practice exam on Parts I and II of the NBCE. The archived data for 6 cohort groups with an overall sample size of 528 students was analyzed. **Results:** Part 1 GPA and practice exam scores combined accounted for 72% of variance within NBCE scores. The in-house practice exam accounted for 65% of the variance in NBCE scores. Analysis revealed that every subtest of the Part I and II NBCE could be reliably predicted by course performance. **Discussion:** The results from both the content and criterion validity analyses demonstrated that the curriculum was well aligned with both Part I and Part II of the NBCE. **Conclusion:** Even though students may have entered the institution at different levels of preparedness, it is ultimately their performance within the institution that determines their success on the NBCE. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Impact of provincial subsidy changes on chiropractic utilization in Canada

*Emily McManus, Silvano Mior, Canadian Memorial Chiropractic College*

**Introduction:** There is considerable variation in the public payment for chiropractic services in Canada. Little is known about how changes in public funding influence service utilization. **Purpose:** To describe how changes in public funding has impacted utilization, nationally and provincially, of chiropractic services. **Method:** Biennial national cross-sectional health survey data from 1994 to 2009 was used to examine utilization rates and patient demographics. A weighted population sample 12 years old and older was used. Data were descriptively analyzed. **Results:** National utilization of chiropractic services has remained relatively stable over the study period at about 11%. Utilization is higher in provinces where public funding was or continues to be available. In 2009, Alberta, Saskatchewan, and Manitoba had highest utilization rates and also had more favorable public funding models. Utilization is higher among females and those between the ages of 30 and 60. **Discussion:** In general, utilization of chiropractic services in Canada has remained relatively steady over the last 10 years. Provinces having received or still receiving public funding tend to have higher utilization of services; however, the short-term influence of changes in public funding varied but became relatively stable over time. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Management of patients with sacroiliac joint pain: A prospective observational cohort study

*Donald Murphy, Alpert Medical School of Brown University and New York Chiropractic College, Eric Hurwitz, John A. Burns School of Medicine, University of Hawaii*

**Introduction:** The sacroiliac joint (SIJ) is a common source of low back pain; however, little is known about how to best treat this condition. **Methods:** The study protocol was approved by the Institutional Review Board of New York Chiropractic College. Fifty-eight patients with SIJ pain were treated according to a diagnosis-based clinical decision guide. Primary outcome measures were the Bournemouth Disability Questionnaire (BDQ), numerical rating scale for pain, verbal self-rating of outcome, and perceived percentage improvement. Additional measures of fear beliefs, coping, depression, and anxiety were recorded. **Results:** Outcome data were available for 49 patients. The mean self-rated improvement was 73.4%. Seventy-seven percent of patients self-rated their improvement as excellent or good. The mean percentage improvement in BDQ was 52.4%. The mean improvement in pain intensity was 3.33 points. Transient pain was noted in 4 patients (8.2%), and no major complications of treatment were seen. **Discussion and Conclusion:** Treatment of SIJ patients according to a diagnosis-based clinical decision guide may be safe and beneficial. Further studies are warranted to further evaluate these findings. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### The use of cervical manipulative therapy in the presence of spinal cord compression: A case series

*Donald Murphy, Alpert Medical School of Brown University, Eric Hurwitz, John A. Burns School of Medicine, University of Hawaii, Rick Morris, Morris Disc and Spinal Stenosis Center*

**Introduction:** Cervical manipulative therapy (CMT) is used by chiropractic physicians and others for the treatment of cervical disorders. Research has demon-

strated its effectiveness. Not a great deal has been published regarding those situations in which CMT is safe, when it should be modified, and when it should be avoided. Controversy exists regarding CMT as a cause of radiculopathy and/or myelopathy. **Methods:** Protocol was approved by the New York Chiropractic College Institutional Review Board. Case series of 19 patients with MRI findings of compression of the cervical spinal cord treated with CMT. Outcome measures were Neck Disability Index (NDI), Bournemouth Disability Questionnaire (BDQ) and a numerical rating scale. Adverse reactions were documented. **Results:** Mean percentage improvement in BDQ was 40.5%, mean improvement in NDI was 23 points, and mean improvement in pain was 3.5 points. These were clinically meaningful. Clinically meaningful improvement in disability occurred in 75%, and clinically meaningful improvement in pain occurred in 72% of patients. One patient reported transient increase in pain and paresthesia after one treatment. No major complications occurred. **Discussion and Conclusion:** Although larger samples of patients are needed to draw firm conclusions, these data suggest that CMT can be used effectively and safely in patients who have preexisting spinal cord compression. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## A case-based approach to pharmacology using wikis as a collaborative tool

*Lia Nightingale, Palmer College of Chiropractic*

**Introduction:** Use of clinical scenarios and collaborative assignments has been shown to independently improve critical thinking and clinical reasoning skills. As a new instructor to the course, a major learning outcome was developed that shifted the focus from memorizing medications to being resourceful about finding and utilizing information. Therefore, the objective of this project was to give clinically relevant clinical scenarios and use a wiki to write and edit the group assignment. **Methods:** Deidentified cases were written into clinical scenarios and 27 wikis were developed and managed. Students were trained on the wiki and randomly assigned to a case to which they were to find information on drug mechanisms, pharmacokinetics, possible interactions, and patient recommendations using the wiki for writing and editing the group project. Following completion of the project, students were asked to anonymously complete a 15-question survey that garnered quantitative and qualitative feedback. **Results and Discussion:** Students expressed that this single project improved collaboration efficiency, writing skills, critical thinking, clinical reasoning, increased confidence in finding and using evidence, effectively demonstrated pharmacology and toxicology concepts, and learned concepts they would use in practice. Qualitative feedback reiterated the need for similar clinically relevant projects throughout the curriculum. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Utilization of an iPad throughout a nutrition curriculum

*Lia Nightingale, Palmer College of Chiropractic*

**Introduction:** Traditional lecture-based education is commonly employed in basic science courses. Research in the last few decades has shifted focus from this traditional view to electronic learning (e-learning) or Web-based learning combined with lecture-based courses, termed *technology-assisted learning*. Recently, our institution has begun an initiative to incorporate iPads into the classroom and clinic. The goal of this project was to describe this initial effort in the continuum of courses from Biochemistry 1 (1st trimester), Nutrition (4th trimester), and Clinical Nutrition (6th trimester). **Methods:** Thus far, 3D Molecules, Visible Body 3D, Gastroenterology Miniatlas, Animated Pocket Dictionary of Cholesterol, MyFood, Medscape, Lab Values, iThoughts, and Educreation have been used extensively throughout the nutrition curriculum. **Results:** Informal feedback from students has been very positive, with 90% agreeing that the iPad has enhanced their learning. **Conclusion:** More research is needed to determine the impact of blending the use of this technology with traditional lecture-based learning on student learning and satisfaction in a nutrition curriculum. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Physiological responses to spinal manipulation therapy: Are electromyographic responses related to peak force?

*François Nougarou, Constance Deslauriers, Claude Dugas, Martin Descarreaux, Université du Québec à Trois-Rivières*

**Introduction:** Biomechanical features of spinal manipulative therapy (SMT) have been frequently studied, and parameters such as peak force, preload force, and time-to-peak force have been suggested as important features of SMT skillful execution. Systematic modulation of these parameters should yield varying levels of physiological responses and, eventually, a range of clinical responses. However, investigation of SMT physiological dose-response relationship is recent and has mostly been conducted using animal or cadaveric models. Therefore, the main objective of the present study is to investigate the SMT dose-physiological response relation in humans by determining how different levels of force can modify EMG responses to spinal manipulation. **Methods:** Seventeen healthy participants were subjected to 2 trials of 4 different SMT force-time profiles using a servo-controlled linear actuator motor. Electromyographic (EMG) activity of paraspinal muscles was recorded during and following SMT, and EMG values were compared across the varying levels of force. **Results:** Increasing the level of force yielded an increased EMG activity for all 4 recording sites, and

polynomial contrasts confirmed the significant linear trend. **Conclusion:** The study confirmed the presence of a local paraspinal EMG response following SMT and highlighted the linear relationship between the SMT peak force and paraspinal muscle activation. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Using educational videos to teach spinal manipulation

*Karen Numeroff, Linda Mullin, Susan Esposito, Life University*

**Introduction:** Manual adjusting has traditionally been taught with static set-ups demonstrated by the instructor and mirrored by the student. To improve competency of skill and consistency among faculty, an at-home video-based instructional method was developed to teach foundation knowledge of chiropractic adjusting. **Methods:** Instructional videos were produced by the faculty and accessed on YouTube. Students were assigned weekly videos demonstrating the steps for setting up chiropractic adjustments. The students practiced on dry spines at home and completed a weekly multiple choice online assessment. A mini practical exam was given at the beginning of each lab. With ethics committee approval, data were collected over 4 quarters with 378 student participants. **Results:** Class averages for 1 year prior and 1 year after implementation remained unchanged. This lab format shifted learning from static posing to active spinal analysis and adjusting with faculty feedback, and iPads were used to record the adjustments for formative feedback. The video was e-mailed from the classroom to the student to create an adjusting portfolio. Students had an overwhelmingly positive response to this educational format. **Conclusion:** Using videos to teach manual adjusting skills supports the classroom learning objectives and promotes consistency throughout the curriculum. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### What happened to the DREEM?—A follow-up of the educational environment

*Per J. Palmgren, Karolinska Institutet and Scandinavian College of Chiropractic, Gunnar Nilsson, Karolinska Institutet, Klara Bolander Laksov, Karolinska Institutet*

**Introduction:** The impact of educational environment in student learning is well documented. However, there is a scarcity in the literature exploring the educational environment in chiropractic training institutions. In this study, we attempted to compare the educational environment as perceived by undergraduate students from a chiropractic training institution in 2009 and 2012. **Methods:** The perceived educational environment was surveyed using Dundee Ready Education Environment (DREEM), which is a validated, self-administered Likert-type inventory. DREEM items focus on sub-domains related to learning, teachers, self-confidence, academic atmosphere, and social environment. **Results:** In 2009 the overall DREEM score was very high, 156.1/200 (78%), and in 2012 was 153.4/200 (77%). The subscale scores in both 2009 and 2012 were high. However, students' perception of teachers dropped significantly in 2012. On a demographic level, students perceptions of teachers in 2009 was significantly higher for males, younger students, students with Scandinavian ethnic background, and students with no experience of higher education compared to 2012 data. **Conclusion:** The DREEM scores from the chiropractic training institution are indicative of an excellent overall educational environment both in 2009 and in 2012. However, certain specific aspects of educational process may need attention. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### The impact of lumbar spinal stenosis on lower extremity motor control: Using movement to measure function

*Steven Passmore, University of Manitoba/New York Chiropractic College, Valerie Pelleck, University of Manitoba, Alyson Gysel, University of Manitoba, Michael Johnson, University of Manitoba, Dean Kriellaars, University of Manitoba, Cheryl Glazebrook, University of Manitoba*

**Introduction:** Objective outcome measures are lacking for monitoring the progression and management of degenerative lumbar spinal stenosis (LSS). Fitts' law is an established motor paradigm that may provide a novel approach to outcome measurement because task difficulty is manipulated easily and performance is resistant to learning. **Methods:** Participants with degenerative LSS ($n = 12$) and healthy controls ($n = 12$) performed pointing movements with their great toe to a series of squares that appeared on a monitor. Movements were recorded using 3D motion analysis. Behavioral measures of reaction time and movement time (MT), as well as kinematic measures, were evaluated. The Health Research Ethics Board approved all procedures. **Results:** Significant interactions for MT [$F(5,110) = 3.17$, $p < .05$], time to peak velocity [$F(5,110) = 5.51$, $p < .05$], and peak velocity [$F(5,110) = 9.61$, $p < .05$] revealed that the LSS group's movements were more adversely impacted as task difficulty increased. **Discussion:** Movement time and related kinematic variables increased as predicted by Fitts' law. Group differences were also more pronounced as movement amplitude increased. **Conclusions:** A lower extremity Fitts' law task effectively captured movement differences between healthy and LSS populations. Future clinical intervention studies may wish to consider motor performance measurement as a useful quantitative outcome measure. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Long-term study of chiropractic care for older adults: A report on feasibility and baseline characteristics

*Mark Pfefer, Richard Strunk, Stephan Cooper, Derrick Dube, Cleveland Chiropractic College*

**Introduction:** Fall prevention and impaired mobility among older adults are significant health care issues that providers who serve this population must address. At this time, chiropractors have not been systematically involved in either interventions for or research related to fall prevention and risk factor reduction. **Methods:** This project is a 5-year prospective cohort study of outcomes of chiropractic care among patients age 65 and older. This study was reviewed and approved by the Cleveland Chiropractic College Institutional Review Board. **Results:** To date, 285 patients were examined and enrolled in the study. Spinal complaints made up the majority of the musculoskeletal problems. Fifty-eight percent of the patients had musculoskeletal complaints lasting more than 1 year, and of those patients, their chief complaint lasted, on average, 11 years. The majority (89%) of patients reported at least 1 fall within the last month. **Conclusion:** Older adult patients presenting for chiropractic care have a high level of chronicity and disability and are at heightened risk for falls. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Changes in vertebral artery blood flow following various head positions and manipulation

*Jairus Quesnele, Canadian Memorial Chiropractic College, John Triano, Canadian Memorial Chiropractic College, Greg Wells, University of Toronto*

**Objectives:** To extend the understanding of the cerebrovascular hemodynamic consequences of cervical spine positions and manipulation in vivo, under clinically relevant circumstances using MRI technology on the vertebral artery. **Methods:** This is a pilot blinded-examiner cohort with 4 randomized clinical tasks. Two local ethics committees approved this study. Ten healthy male participants aged 24–30 volunteered for participation in the study. Vertebral artery blood flow and velocity at the C1–2 spinal level were obtained using phase-contrast MRI in 3 different head positions and after an upper cervical spinal manipulation. Multiple MRI sequences were collected in each of the 4 conditions and were averaged to provide a blood flow profile for 1 complete cardiac cycle. Differences between flow and velocity variables were evaluated using repeated measures analysis of variance. **Results:** There were no significant changes following various head positions and manipulation on blood flow and velocity in the vertebral arteries of healthy young male adults. **Conclusions:** This study contributes to a limited body of knowledge regarding the vascular impacts of head position and cervical manipulation and is the first to obtain direct flow and velocity data across a range of mechanical challenges to the cervical spine. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## The Chiropractic Hospital-based Interventions Research Outcomes (CHIRO) study—Part 2: The consistency of outcomes between chiropractors treating patients with acute lower back pain

*Jeffrey Quon, Paul Bishop, Brian Arthur, Vancouver General Hospital and University of British Columbia*

**Introduction:** Spinal manipulative therapy (SMT) is not administered by chiropractors in a consistent, evidence-based manner. Variations in practice style fuel public uncertainty about the consistency of benefits between different practitioners. **Objective:** To investigate the consistency of outcomes generated by different chiropractors treating acute low back pain (ALBP). **Methods:** Prospective trial; nonrandom allocation to 4 attending chiropractors. **Patients:** Quebec Task Force category <3; ALBP 2–4 weeks' duration. **Interventions:** CPG-based care including high-velocity, low-amplitude (HVLA) SMT. **Outcomes:** Changes in modified Roland Disability Questionnaire (RDQ), SF-36 bodily pain (BP), and physical functioning (PF) scores at 8, 16, and 24 weeks. **Results:** Adjusted differences in RDQ change scores between groups overall were nonsignificant at 24 weeks (primary outcome, $p = .10$), but were significant at 8 weeks ($p = .02$). On other outcomes, no differences were observed between groups overall at any time-points. Within groups, time-related improvements on all outcomes were observed except in group C, for whom RDQ scores did not improve. **Conclusions:** Improvements in pain and general functioning are consistent between groups treated by different chiropractors administering standardized HVLA-SMT. Improvements in back pain–specific disability were not consistent. Studies are encouraged to define clinically influential components of SMT practice style. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## The effect of prolonged waiting times on improvement after operative treatment of sciatica due to acute lumbar disc herniation

*Jeffrey Quon, University of British Columbia, Boris Sobolev, Vancouver Coastal Health Research Institute, Adrian Levy, Dalhousie University, Charles Fisher, University of British Columbia, Jacek Kopec, Arthritis Research Centre of Canada, Marcel Dvorak, University of British Columbia, Martin Schechter, University of British Columbia*

**Introduction:** Chiropractors have a potential role in managing patients awaiting surgery or surgical consultations, more so if wait times for surgery genuinely worsen the outcome of eventual treatment. **Objective:** To determine if longer wait times for elective surgical lumbar discectomy (ESLD) are associated with worse improvement. **Methods:** This was a 5-year ambi-directional cohort study. **Setting:** Prominent hospital

in large Canadian center. **Patients:** Aged >15 years, sciatica from herniated lumbar disc, recruited at wait list enrollment. **Outcome:** Intensity of worst symptom (back/leg pain) on 11-point numerical rating scale (NRS-11) at 6 months postoperatively. **Analysis:** Wait time was dichotomized at 2 weeks. NRS-11 scores were placed into 4 ordinal categories, and ordinal regression compared the odds of higher pain intensity between groups. **Results:** In adjusted analyses, patients waiting 12 weeks were 80% more likely to report worse pain; adjusted POR = 1.8 (95% confidence interval [*CI*]: 1.1–2.9). **Conclusions:** Waiting 12 or more weeks for ESLD is associated with a worse outcome. Studies are encouraged to determine if chiropractors, as screening clinicians, can help alleviate wait times through effective management and diversion of patients away from the queue. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Pain assessment preference among Latinos

*Michael Ramcharan, Texas Chiropractic College*

**Introduction:** As minorities culturally shift the demographics of this country, practitioners need to be culturally competent and understand the complexities of the populations for which they provide patient care. The purpose of this study was to identify a pain scale preference among Latino patients when conducting a musculoskeletal pain assessment. **Methods:** The study was based on a convenience sample of 80 patients of Latino origin that presented with musculoskeletal pain. Each patient was asked to rate pain intensity using the numeric rating scale (NRS), word descriptor scale (WDS), and faces pain scale (FPS) and to complete a 20-item survey. **Results:** The study revealed evidence that Latinos preferred the image-based visual pain scale (FPS) over the visual numeric rating scale (NRS). Females had a higher preference toward the FPS and males toward the WDS when measuring pain intensity. **Discussion:** The study suggests that the preferred pain assessment measure among Latinos is the FPS and supports the need for further research on pain and culture, health disparities, and the need for providers to become more culturally sensitive when assessing musculoskeletal pain. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Appropriate ordering of diagnostic imaging studies for specific conditions among doctors of chiropractic: A pilot study

*Joshua Rhodes, Kathleen Linaker, D'Youville College*

**Introduction:** Appropriate imaging is vital to correct diagnosis, decrease exposure risk, reduce health care costs, and provide efficacious treatment. The purpose of this study was to examine the imaging ordering among doctors of chiropractic (DCs) to assess what they are ordering, to determine if what is being ordered matches what is appropriate according to current treatment guidelines and protocols, and to assess DCs' ability to manage and co-manage common conditions and complex cases. **Methods:** A case approach survey with diagnostically relevant case histories was used and sent to 368 DCs in Illinois. **Results:** The overall percentage of appropriate ordering for all 11 questions was 81.82%. Musculoskeletal cases were referred 93.20% correctly and nonmusculoskeletal cases were referred 70% correctly. **Discussion:** In this study DCs demonstrated appropriate case management skills and overall good to excellent adherence to American College of Radiology (ACR) protocols and imaging guidelines. **Conclusion:** Quality chiropractic care should be the focus of students, chiropractic universities, and current chiropractic physicians. As such, possessing the ability to refer for appropriate imaging when managing patients with nonmusculoskeletal conditions is paramount, as is continued competence regarding musculoskeletal cases. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## The use of debate as an active learning strategy in a chiropractic classroom

*Drew Rubin, Lisa Rubin, Life University*

**Introduction:** Debate has been used recently in dental as well as medical schools to cover controversial topics. This research study looked at the usefulness of debate as an active learning strategy in chiropractic education. **Methods:** A debate was held in 2 senior level pediatric elective classes. The students had 2 weeks to prepare their remarks. A 9-question, Likert-type survey was given to the students after the debate. **Results:** Almost 94% of students thought that the debate was a unique and engaging activity for the classroom. One hundred percent enjoyed the in-class debate and 73% enjoyed the in-class debate very much. **Conclusion:** A debate is an entertaining and novel way of using an active learning strategy. Debate can be an avenue to use to increase student learning and satisfaction. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Maintaining significant partnered relationships in a chiropractic educational setting

*Lisa Rubin, Life University*

**Introduction:** The purpose of this research study is to observe significant intimate relationships while students are in chiropractic school. No research was identified on the topic of chiropractic relationships, and little research exists across the health fields. This study questioned both chiropractic students in the middle of their educational course work and alumni (in reference to when they were in chiropractic school) regarding experiences with their relationships. **Method:** Questionnaires were distributed in chiropractic classroom

settings as well as sent to university alumni electronically. **Results:** Academic stress and financial stressors appeared to be the 2 most impactful and disruptive stressors in relationships for students. In comparison, alumni reported that while in school, the greatest stressor was financial. **Conclusion:** This is just a preliminary look at this question, and further research is warranted to further assess significant relationships in a chiropractic educational setting. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Asymmetry of vertical ground reaction forces during walking in adults with chronic low back pain, before and after chiropractic care

*Brent Russell, Life University, Mark Geil, Georgia State University, Jianhua Wu, Georgia State University, Kathryn Hoiriis, Life University*

**Introduction:** There has been little research regarding the effect of chiropractic spinal manipulation (SM) on gait. This pilot study evaluated the effects of SM on symmetry of vertical forces of foot contact while walking. **Methods:** Participants walked on an instrumented treadmill at their preferred walking speed. Stance phase forces and angle of foot rotation were evaluated using a symmetry index (SI). Participants with chronic low back pain (CLBP) were evaluated before and after a session of SM. Study procedures received institutional review board approval. **Results:** There were no statistically significant differences between CLBP and control groups, nor between CLBP precare and postcare values. There were no individuals for whom all variables became either more or less symmetrical. **Discussion:** It isn't clear whether symmetry analysis could be useful for participants such as those in this study who had low levels of pain and disability and little unilateral pathology or dysfunction. **Conclusions:** This pilot study found no significant differences in selected aspects of gait symmetry. The procedures used will serve as a guide to more research, with larger groups and improved participant selection, in the evaluation of measures that could be useful for quantifying the effects of spinal and extremity manipulation. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Doctors of chiropractic self-reported practice patterns and attitudes toward interdisciplinary comanagement of older adults with back pain

*Stacie Salsbury, Palmer Center for Chiropractic Research, Kevin Lyons, Thomas Jefferson University, Cynthia Long, Palmer Center for Chiropractic Research, Maria Hondras, Palmer Center for Chiropractic Research, Robert Vining, Palmer Center for Chiropractic Research, Lisa Killinger, Palmer College of Chiropractic, Christine Goertz, Palmer Center for Chiropractic Research*

**Introduction:** Doctors of chiropractic (DCs) may refer and co-manage older adults with low back pain (LBP) with other health care providers. However, DC practice patterns and attitudes toward co-management of these patients are not established. **Methods:** Following ethics approval, 199 DCs were invited to complete a 53-item mailed survey on self-reported geriatric practice patterns and co-management attitudes. **Results:** Response rate was 29%. Weekly percentage of older patients was 0–49% (86%) and 50–100% (14%). DCs reported co-management with family physicians (63%), physical therapists (56%), massage therapists (51%), orthopedists (39%), neurologists (33%), DCs (32%), pain specialists (26%), acupuncturists (23%), osteopaths (18%), and other providers (15%). DCs were somewhat confident (4%), confident (18%), very confident (39%), and extremely confident (35%) in treating LBP in older adults. DCs were confident with LBP treatments from other DCs (95%), massage therapists (66%), acupuncturists (64%), osteopathic physicians (60%), physical therapists (58%), pain specialists (55%), neurologists (53%), orthopedists (50%), and occupational therapists (50%). **Conclusions:** Although DCs co-manage older adults with various health care professionals, they are most confident in the LBP treatment of other manual therapists. DCs may benefit from continuing education on interdisciplinary co-management with biomedical providers to improve collaborative care for older adults with LBP. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Is an interview enough? Using competency-based assessment as part of faculty clinician selection at a chiropractic college

*David J Schimp, Barry C Wiese, Texas Chiropractic College*

**Introduction:** Competency-based assessment (CBA) represents a growing trend in chiropractic education. CBA may also be used as a tool for clinician candidate selection. The current paper reports on use of video-based evaluation as a preemployment tool assessing the clinical competency of potential faculty clinicians at a chiropractic college. **Methods:** Candidates for available clinician positions at a chiropractic college were prescreened by analysis of submitted curricula vitae. The interview process consisted of 2 parts: Interview sessions were held with clinical faculty and staff, and candidates were subjected to a 4-station objective structured clinical examination (OSCE) in a state-of-the-art assessment center. **Discussion:** Testing clinical competency is elemental to hiring competent clinical faculty, and the authors believe it to be superior to interview alone when selecting from among faculty employee candidates. Return on investment is improved when the right candidate is chosen to fill a particular vacancy—a process that is enhanced by skill tests that mimic the responsibilities of that position. **Conclusion:** We present a novel strategy to effectively evaluate candidates for clinical faculty positions at a chiropractic

college. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Predictors of performance of students in biochemistry in the doctor of chiropractic program

*Kathryn Shaw, Christopher Meseke, Veronica Dishman, Palmer College of Chiropractic*

**Introduction:** This study investigated the effect of completion of course prerequisites, undergraduate grade point average (GPA), undergraduate degree, and study habits on the performance of students in the Biochemistry course at Palmer College of Chiropractic Florida. **Methods:** This study was exempted from the Palmer College of Chiropractic Institutional Review Board. Questionnaires were administered at the beginning and end of the course. A pretest, which was identical to the final examination, was administered. The information gathered was compared to final grades in the course. **Results:** When final grades were compared to the aforementioned variables, the only positive significant correlation was between final grade and final examination score. Paradoxically, several negative significant relationships ($p < .05$) were noted when comparing the final grade to undergraduate degree, undergraduate GPA, and time invested in studying. **Discussion:** Although no one variable was determined to be the single factor that determines a student's success in biochemistry, it is most likely a combination of all of the factors examined. **Conclusion:** The interrelationship between the factors examined warrants further investigation to fully understand how to predict the success of a student in the biochemistry course. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Patient and payment sources of Palmer College of Chiropractic's teaching clinics

*Gregory Snow, Makani Lew, Palmer College of Chiropractic*

**Introduction:** A descriptive report of outpatient clinical educational experience settings is presented. It has been suggested that college teaching clinics are not reflective of "real world" practice; however, no current data exist. **Methods:** The study received institutional review board exemption. Aggregate data of patient and payment sources was obtained and categorized. Analysis of patient visits by payment source, patient source, location, and payment expectation was performed. **Results:** Data showed 63% of visits occurred on-campus and 37% occurred off-site; 35% were fee-for-service, 65% were complimentary. Major sources of fee-for-service care were cash, federal entitlement, and insurance; and for non-fee-for-service patients were nominally categorized as Clinic Abroad, Friends and Family, and Outreach . **Discussion:** The data represent 21% of current US interns. The average intern experiences a variety of patient payment sources at multiple venues. No single payment source exceeded 25% of the overall experience. Fee-for-service visits were somewhat similar to private practice. Non-fee-for-service care may develop important educational goals. **Conclusion:** Calls for improvement in chiropractic clinical education have been ongoing. The clinical education experience at a chiropractic college demonstrates exposure to a variety of different patient payment sources and clinical settings. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### The impact of the 2012 Arctic Winter Games on athletes' health behaviors: A cross-sectional survey

*Brynne Stainsby, Steven Piper, Canadian Memorial Chiropractic College*

**Introduction:** Physical activity and lack of access to nutritious foods are well-documented barriers to health in northern communities. Considering increases in lifestyle-related disease have been linked to inactivity and poor dietary choices, there is a clear need for strategies to counter this. A viable strategy includes participation in sport, such as the Arctic Winter Games (AWG). AWG are an international, circumpolar event with documented positive social and economic impacts on participating communities. **Objective:** To examine the impact of sport on health behaviors in those participating in the 2012 AWG. **Methods:** Cross-sectional study design was used. A convenience sample of 2012 AWG athletes completed a survey regarding health behaviors. Primary outcome data were analyzed using difference of proportions tests. This study was approved by the Research Ethics Board of the Canadian Memorial Chiropractic College. **Results:** Completing the study were 315 subjects. Subjects demonstrated significantly greater levels of physical activity, but significantly lower consumption of fruit and vegetables. **Conclusion:** Subjects demonstrated increased physical activity levels; however, this finding did not translate into improved nutritional choices. As such, this study highlights the need for strategies to improve the nutritional status of circumpolar athletes. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Does muscular strength and power of 2nd-year chiropractic students correlate with peak force production during a maximal effort bilateral hypothenar contact manipulation? A pilot study

*David Starmer, Robert Morano, Ashley Sweeney, Peter Miele, Sean Netley, Canadian Memorial Chiropractic College*

**Purpose:** This study aims to determine if fitness characteristics influence peak force production on a force-sensing table (FST) during a maximal effort,

bilateral hypothenar contact (BHC) manipulation. **Methods:** Seventy 2nd-year chiropractic students performed 5 physical fitness tests—grip strength, vertical jump, seated medicine ball toss, sit-ups, and pushups—followed by a maximal effort BHC manipulation on a FST. A sequential linear regression analysis was conducted to assess relationships between peak force measurement and fitness test scores. **Results:** Grip strength and sit-ups independently explained a significant amount of additional variability in peak force after adjusting for height, weight, and gender (multiple $R^2$ delta 0.067, $p = .003$; multiple $R^2$ delta .038, $p = .029$). Vertical jump, push-ups, and seated medicine ball toss were not able to explain any significant amount of variability in peak force. When adding multiple exercise variables together, no significant improvement in $R^2$ delta was seen beyond the grip strength variable independently. **Conclusion:** Grip strength may be a possible predictive factor for maximum peak force during a maximal effort BHC manipulation. It may be beneficial to develop grip strength if the production of higher peak forces is desired. Further research is warranted. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Participation strategies and student performance: A case study

*David Starmer, Sean Duquette, Loretta Howard, Canadian Memorial Chiropractic College*

**Purpose:** This research explores participatory evidence-based teaching (EBT) methods and their impact on student performance at the Canadian Memorial Chiropractic College, a professional college seeking to transition to a learning-centered framework of teaching practice. **Method:** A case study method was used to retrospectively explore student participation within and beyond the classroom. The type of participation (in class or out) was compared to academic performance and levels of demonstrated learning. In examining this case, the authors sought to determine if a relationship emerged between the (1) type of participation (in class or out) and course performance; (2) amount of participation and course performance; and (3) amount of participation, course performance, and level of demonstrated learning. **Results:** Findings demonstrate that higher levels of student participation relate positively to exam performance and the achievement of higher levels of learning regardless of the type of participation. **Conclusion:** The implications for faculty include shifting thinking from a traditional transmittal approach to include alternative means for student participation and engagement with course materials. Further research and practice related to enhancing student learning through EBT strategies is warranted. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Does soft tissue compliance of thoracic paraspinal musculature change based on body type?

*David Starmer, Sean Duquette, Brynne Stainsby, Canadian Memorial Chiropractic College*

**Purpose:** To determine if the soft tissue compliance of the thoracic paraspinal musculature changed based on gender and body type to help create a high-fidelity manikin on which to practice manual therapies. **Methods:** The study population comprised 54 patients volunteers and were grouped based on their gender and by visual approximation of their body types. They were then laid down in a prone position, their T1, 3, 5, 7, 9, and 12 were located through palpation, and the soft tissue displacement of the paraspinal musculature was measured bilaterally at each site using a tissue compliance pressure meter. **Results:** The data showed that there is no significant difference when comparing the genders except at T1 ($p = .041$). However, when comparing body types, a significant difference was found between endomorphs and mesomorphs ($p \leq .0039$) as well as endomorphs and ectomorphs ($p \leq .0207$). No significant difference was found between ectomorphs and mesomorphs ($p \geq .6783$). The compliance was found to range from 0.122324 mm/N to a maximum of 0.420489 mm/N. **Conclusion:** When creating a practice manikin, the soft tissue compliance should range from 0.122324 to 0.420489 mm/N, and there should be consideration for making multiple versions to simulate variations among different body types. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Clinical, demographic, and geographic determinants of variation in chiropractic episodes of care for adults using the 2005–2008 Medical Expenditure Panel Survey

*Joel Stevans, University of Pittsburgh, Marc Zodet, Agency for Healthcare Research and Quality*

**Introduction:** Our primary aim was to report nationally representative estimates of visit utilization, per visit expenditures, and total expenditures for chiropractic episodes of care in the US adult population. Secondarily, we sought to identify factors associated with variation in the levels of utilization and expenditures. **Methods:** Data from the Medical Expenditure Panel Survey was used to construct complete episodes of care. Descriptive statistics were calculated for visit utilization, per visit expenditures, and total expenditures per episode by clinical, demographic, geographic, and payment variables. Multivariable regression models were used to evaluate the effects of the independent variables on each dependent variable. **Results:** The unadjusted mean number of visits per episode was 5.8 and varied significantly by race and ethnicity, perceived mental health, urban vs rural location, and payment source. The mean total expenditures per visit were estimated to be $69. There was variation associated with the Census region, urban vs rural location, and

source of payment variables. Total expenditures for an episode were estimated to be $424, with variation according to urban vs rural location and payment source. During 29% of the episodes, all expenditures were paid out of pocket. **Conclusions:** Variation in the utilization and expenditures during chiropractic episodes of care are primarily associated with payment source and geographic factors. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Student perceptions on the effectiveness of clinical reasoning teaching strategies

*Dorrie Talmage, Nancy Peterson, Steve Foster, Texas Chiropractic College*

**Introduction:** To foster the development of clinical reasoning skills by students in a doctor of chiropractic program, instructional enhancements to some courses were made. These enhancements included the utilization of teaching strategies aimed at developing clinical reasoning skills. To ensure the effectiveness of the teaching strategies, direct and indirect evaluation tools were used. One indirect method was the Student Course Evaluation (SCE) tool, which included 5 items about the effectiveness of instruction related to clinical reasoning as perceived by the student. **Methods:** SCEs were given to students at the end of the enhanced and nonenhanced courses to evaluate their perception of the attainment of clinical reasoning skills. The results of the student feedback were analyzed for trends and statistical significance. Descriptive statistics as well as 2 nonhierarchical approaches were used to assess the impact of the correlation. Changes to courses received institutional review board approval prior to implementation. **Results:** For all 5 items, the enhanced courses demonstrated a higher rating than the nonenhanced courses, but only 2 of the items showed statistically significant differences. **Conclusion:** Although multiple factors can influence the reliability of student reported evaluations of learning, they can provide insight into instructional effectiveness. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Modification of a computer-based patient simulation program: Expanding case learning options in a chiropractic curriculum

*Dorrie Talmage, Jeffrey Weiss, John Mrozek, Texas Chiropractic College*

**Introduction:** Computer-based patient simulation plays a useful role in expanding the opportunities for students to engage in the process of clinical reasoning. These programs provide a nearly ready-made platform for developing clinical cases. Many such cases are designed to fit the context of medical education. This presents a challenge to the profession-specific needs of nonmedical users. The modification of the commercially available product DxR Clinician® to VirtualChiro is described. **Methods:** A panel of chiropractic college faculty reviewed the DxR Clinician® template to identify areas in need of chiropractic curriculum–appropriate content. Content in template categories was addressed. Category weighting was modified to correspond with content emphasis. Weighting criteria was modified to correspond with curriculum content emphasis. **Results:** A modified template entitled VirtualChiro was created that includes additional content compared to the commercially available DxR Clinician® and related suite of programs. **Discussion:** Computer-based patient simulation adds another dimension to the development of clinical reasoning to our chiropractic program; 13 cases are being modified for our VirtualChiro software. Working with the commercial provider, we plan to market these cases to the wider chiropractic education community. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Differences between Learning and Study Strategies Inventory subtest and factor scores and grade point averages for chiropractic students tested in trimesters 1 and 7

*Rodger Tepe, Christine Schutz, Leanne Dalton, Logan College of Chiropractic/University Programs*

**Objective:** To extend research on learning and study strategies and academic performance in chiropractic education. To our knowledge, this was the first longitudinal study of learning and study strategies in the chiropractic literature. **Methods:** This institutional review board–approved study evaluated the relationship between Learning and Study Strategies Inventory (LASSI) performance and cumulative basic science grade point average (BSGPA) in a convenience sample of 164 consenting students who completed the LASSI in trimesters 1 and 7. **Results:** Paired *t* tests showed significant differences in 7 of the 10 LASSI subtests and all 3 of the LASSI factors between trimesters 1 and 7. Five subtest and 2 factor scores were significantly higher in the higher BSGPA group for trimesters 1 and 7. Subtest attitude increased significantly from tertile 1 to 3 in trimester 7 but not in trimester 1. **Conclusion:** The primary conclusions of this study were that overall LASSI performance was lower in trimester 7 compared to trimester 1 and higher BSGPA was positively associated with higher LASSI performance. Given the importance of chiropractic students' academic success, it may be useful to provide early interventions to improve learning and study strategies. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### The effects of dietary modification and whole food supplements on cardiovascular disease risk factors in overweight and obese adults with total cholesterol over 180

*Rodger Tepe, Robert Davidson, Logan College of Chiropractic/ University Programs*

**Objective:** To investigate the effects of dietary modification and whole food supplements on cardiovascular disease risk factors in overweight and obese adults with total cholesterol over 180. **Methods:** This institutional review board–approved study was a 1 group, repeated measures pretest/posttest clinical trial. A convenience sample of 40 consenting adult participants with total cholesterol >180 and body mass index >25 had 12 cardiovascular risk factors assessed before and after 21 days of following their normal diet and again after 21 days of following a nutritional intervention consisting of a mostly fruit and vegetable diet plus whole food supplements (Standard Process 21 Day Purification Program©, Standard Process, Palmyra, WI). **Results:** Statistically significant postintervention improvements (range $p = .034$ to $< .0001$) were found for systolic and diastolic blood pressure, weight, body mass index, total cholesterol, total cholesterol/high-density lipoprotein, low-density lipoprotein, low-density lipoprotein/high density lipoprotein, triglycerides, C-reactive protein, and heart rate variability total power. High-density lipoprotein protein was significantly reduced, and no differences were found for homocysteine. **Conclusions:** A 21-day nutritional intervention resulted in statistically significant improvements for 10 out of 12 known cardiovascular disease risk factors. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Pilot study on the impact of student feedback using in-depth interviews on assessment and achievement of student learning outcomes

*Noni Threinen, Mike Sackett, Victoria Hamdi, Jenna Uyeno, Samaneh Sadri, Southern California University of Health Sciences*

This pilot study was designed to provide preliminary patterns of evidence to improve student learning; to evaluate student interest in participating in a student feedback process; to refine questions for ongoing, regularly scheduled student input to the assessment process; and to evaluate the feasibility of data collection and analysis in an in-depth interview process. An exempt institutional review board–application was completed and approved. Twelve 2nd-term students were purposively selected for in-depth interviews. Interviews were electronically recorded and transcribed. Transcripts were analyzed and coded for themes that indicated a variety of learning approaches as part of students' learning strategies. Findings included motivation for professional education, styles and methods of engaging with a variety of learning materials, development of organization and time management skills, desire to connect with peers and faculty, and need for enhanced use of online resources. Investigators found potentially useful ideas for student and faculty orientation, support, and training. Small sample size and extensive time commitment to conduct interviews and analyze data make this methodology unfeasible for a regular routine. Conducting recorded focus groups may be a alternative consideration for the future. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Student iPad use in a neuromusculoskeletal diagnosis course: The influence of iPads on course grades and student opinions and attitudes toward iPads in the classroom

*Michael Tunning, Christopher Roecker, Robert Rowell, Michael VanNatta, Palmer College of Chiropractic*

**Introduction:** The use of technology may improve student outcomes, attitudes, and learning. We investigated the influence of iPad use on final grades in a neuromusculoskeletal (NMS) course. **Methods:** A 13-question Web-based cross-sectional survey was developed and administered to all 106 NMS students. The Wilcoxon signed rank test was used to test whether iPad use influenced final NMS course grades. **Results:** Thirty-one students responded to the survey (30% response rate). A Wilcoxon signed rank test demonstrated no significant difference in final grades between students who used iPads to study and students who did not. **Discussion:** Using iPads to study NMS course material does not influence final grades, but students believe using an iPad improves their grades. Students using an iPad also felt more organized and more interested in the course content. **Conclusion:** The use of an iPad did not influence final NMS course grades, but students perceived improved course grades. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Prevalence of radiographic findings in a chronic low back pain population

*Robert Vining, Eric Potocki, Ian McLean, Michael Seidman, Paige Morgenthal, James Boysen, Christine Goertz, Palmer Center for Chiropractic Research*

**Objectives:** To report the prevalence of graded disc degeneration, spondylolisthesis, transitional segmentation, and the distribution of sacral slope in patients aged 21–65 with chronic low back pain (CLBP). **Methods:** This retrospective study analyzed radiographs obtained during a randomized controlled trial of patients with CLBP. CLBP was defined as pain in the low back lasting 12 weeks or longer. Following institutional review board exemption, 253 lumbar radiographic series were reviewed. Disc degeneration, spondylolisthesis, and transitional segmentation were graded by 2 study team members using established classification criteria. Sacral slope was measured with a digital tool contained within imaging software. **Results:** The mean (SD) sacral slope was 40.5° (7.78) degrees. Transitional segments graded I– IV (Castellvi classification) were present in 14.2% of cases. Lumbar disc degeneration was most prevalent at L3–4 (49.8%),

followed by L4–5 (42.3%), L2–3 (41.5%), L5–1 (34.8%), and L1–2 (29.2%). Isthmic spondylolisthesis was present in 5.1% of cases, with L5 the most common location. Degenerative spondylolisthesis demonstrated a prevalence rate of 17.0%. **Conclusion:** This study provides practitioners with valuable information regarding the prevalence of conditions that alter treatment approach or prognosis. The clinical relevance of these findings demands carefully considered use of radiography, especially in an aging population. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Systematic review of the use of complementary and alternative medicine by non-Hispanic Blacks

*John Ward, Carol Webb, Kelley Humphries, Texas Chiropractic College*

**Objectives:** To summarize the usage of different forms of complementary and alternative medicine (CAM) used by non-Hispanic Blacks. **Data sources:** This systematic review was generated through a 3-step literature review process. The first step involved a literature search performed using key terms: African Americans, Blacks, complementary therapies, prayer, herbal medicine, massage therapy, chiropractic, acupuncture, and mind–body therapies. This search covered a 10-year period from 2002 to 2011. Databases involved included the Index to Chiropractic Literature, PubMed, Alt Health Watch, and Cumulative Index to Nursing and Allied Health Literature (CINAHL). The 2nd step involved hand-searching numerous journal articles for relevant studies. The 3rd step involved reference tracking of the articles that had already been found. This study was approved by our institutional review board. **Methods:** Articles were screened and then grouped thematically for discussion purposes as follows: prayer, herbal medicine, massage therapy, chiropractic, acupuncture, and mind–body therapies as forms of CAM. **Results:** Twenty-five original articles met the inclusion criteria. Overall, non-Hispanic Blacks reported low use of most forms of CAM compared to Whites. **Conclusion:** The existing evidence suggests that non-Hispanic Blacks use CAM significantly less than do Whites, with the exception of prayer. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Acute cardiovascular response to atlas manipulation

*John Ward, Jesse Coats, Ken Tyer, Shauna Weigand, Gabby Williams, Danielle Cockburn, Texas Chiropractic College*

**Objective:** The aims of this study were to determine if there were any statistically significant acute cardiovascular responses induced by the application of chiropractic manipulative therapy (CMT) to the atlas in normotensive participants. **Design:** A pilot, single-blind, randomized controlled trial. **Setting:** Human physiology laboratory. **Subjects:** Study subjects comprised 48 college students. **Methods:** Participants were equally randomized into four study groups: left head-turn control, no contact control, left atlas manipulation, and right atlas manipulation. The CMT provided was a cervical break. Electrocardiogram (ECG), bilateral pulse oximetry, and bilateral blood pressure measurement were performed at baseline, post-1 minute intervention, post-10 minute intervention, and approximately post-24 hour intervention. Between-group dependent variables were analyzed through 1-way analysis of variance (ANOVA) at each time point. This study was approved by our institutional review board. **Results:** No statistically significant difference was shown among any between-group cardiovascular-dependent variables in this study. **Conclusions:** The results of this research suggest cardiovascular physiology is not affected by CMT to the atlas in normotensive individuals. These findings, in relation to existing research, suggest future cervical spine CMT studies should be performed focusing on hypertensive patients. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Thoracolumbar spinal manipulation impact on exercise performance

*John Ward, Jesse Coats, Michael Ramcharan, Kelley Humphries, Tammy Tong, Cheuk Chu, Texas Chiropractic College*

**Purpose:** The purpose of this study was to determine if thoracolumbar chiropractic manipulative therapy (CMT) has any impact on immediate exercise performance. **Methods:** Subjects (10 male and 10 female college students) were equally randomized into an AB:BA crossover study design, with 10 participants in the AB group and 10 in the BA group. The study involved 1 week of rest between each of the 2 conditions, A (prone diversified T12-L1 CMT) vs B (no CMT). Participants engaged in a treadmill graded exercise test (GXT) 5 minutes after each week's condition (A or B). Outcome measures were blood lactate concentration, exercise heart rate, and rating of perceived exertion monitored at the conclusion of each 3-minute stage of the GXT. The exercise test continued until the participant achieved over 8 mmol/L blood lactate. A dependent sample *t* test was used to make comparisons between A vs B conditions related to exercise performance. This study was approved by our institutional review board. **Results:** No statistically significant difference was shown among any exercise response–dependent variables in this study. **Conclusions:** The results of this research preliminarily suggest CMT to T12-L1 does not significantly impact exercise performance. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

### Immediate effects of anterior upper thoracic spine manipulation on cardiovascular response

*John Ward, Jesse Coats, Ken Tyer, Shauna Weigand, Gabby Williams, Texas Chiropractic College*

**Objectives:** The aims of this study were to determine if there were any statistically significant immediate effects of anterior upper thoracic chiropractic manipulative therapy (CMT) on cardiovascular response. **Methods:** Subjects were 36 chiropractic college students who were equally randomized into a single-blind, controlled trial involving 3 study groups: anterior upper thoracic manipulation of T1–4, activator-based placebo manipulation, or a no T-spine contact control. Outcome measures used were electrocardiogram, bilateral pulse oximetry, and bilateral blood pressure measurement performed at baseline, post-1 minute intervention, post-10 minute intervention, and post-24 hour (+1 hour) intervention. Between-group dependent variables were analyzed through 1-way analysis of variance at each of the 4 time points. Within-group dependent variables were analyzed through 2 paired sample *t* tests comparing baseline to post-10 minute and again between baseline to post-24 hours (+1 hour). This study was approved by our institutional review board. **Results:** No statistically significant difference was shown among any between-group or within-group cardiovascular-dependent variables in this experiment. **Conclusions:** The results of this study suggest cardiovascular physiology, short term, is not affected by anterior upper thoracic spine CMT to a clinically relevant level. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Plantar fascia dynamics in runners and walkers

*Aaron Welk, Daniel Haun, Thomas Clark, Norman Kettner, Logan College of Chiropractic*

**Introduction:** The plantar fascia is stressed throughout the gait cycle with the most tension occurring at the toe-off phase. Microtears of the plantar fascia occur with repetitive stress, although the dynamics of this process have not been clearly understood. Measures of the plantar fascia thickness after different degrees of gait stress may further elucidate its dynamics. **Methods:** A sample of 61 consented asymptomatic participants, 36 walkers and 25 runners, walked on a treadmill for 10 minutes or ran for 30 minutes. Standardized measures of the thickness of the plantar fascia were obtained in both groups using high-resolution ultrasound at baseline and after the use of the treadmill. **Results:** The plantar fascia thinned a mean of 0.06 mm ± 0.33 mm SD following running and 0.02 mm ± 0.22 mm SD following walking, although significance was not reached ($p = .24$). **Discussion:** Although there is a substantial amount of stress placed on the plantar fascia during the gait cycle, this study's parameters were within physiological accommodation. **Conclusion:** Walking for 10 minutes or running for 30 minutes on a treadmill did not significantly alter the thickness of the plantar fascia. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Trends in the use and cost of chiropractic spinal manipulation under Medicare Part B

*James Whedon, Yunjie Song, Matthew Davis, The Dartmouth Institute for Health Policy & Clinical Practice*

**Background:** Little is known about recent trends in the use and cost of chiropractic spinal manipulation provided under Medicare. **Methods:** To quantify trends in the cost of chiropractic services under Medicare Part B, we employed a serial cross-sectional design for retrospective analysis of Medicare claims data. A 20% nationally representative sample of Medicare Part B claims for the years 2002–2008 was merged with beneficiary demographic data. Annualized estimates of expenditures were extrapolated and per beneficiary rates were estimated and compared with overall Medicare cost trends. Services were stratified by current procedural terminology codes. **Results:** The number of chiropractic users grew 13% from 2002 to 2004, remained flat through 2007, then declined 5% through 2008. Payments per user increased by 5% from 2002 to 2005, then declined by 18% through 2008. Chiropractic treatment of 1–2 spinal regions declined to 29% of services, 3–4 regions increased to 62% of services, and 5 regions remained flat at 9%. **Conclusions:** Payments for chiropractic spinal manipulation under Medicare Part B generally increased from 2002, peaked in 2005 and 2006, and then declined through 2008. Per user spending for chiropractic declined by 18% from 2006 to 2008, in contrast to 10% growth in spending per beneficiary for Medicare overall. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Within-day and between-day reliability of spinal stiffness measurements using a mechanical indentation device in individuals with and without low back pain

*Arnold Wong, Gregory Kawchuk, Eric Parent, Narasimha Prasad, University of Alberta*

**Introduction:** Instrumented spinal stiffness measurements have demonstrated high test-retest reliability, although various factors that may affect reliability have yet to be investigated. This study aimed to compare (1) within-day and between-day reliability of spinal stiffness measurements using a mechanical indentation device (MID), (2) precision of averaging multiple stiffness measurements, and (3) reliability of stiffness measurements between individuals with and without low back pain (LBP). **Methods:** The spinal stiffness of 12 volunteers with and 14 without LBP was measured 3 times by MID in 2 visits 1–4 days apart. Two stiffness measures were calculated from the resulting force-displacement data: global stiffness (GS) and terminal stiffness (TS). Reliability was estimated by intraclass correlation coefficients. Measurement precision was

analyzed by standard error of measurement. The institutional review board approved this experiment. **Results:** Averaging 3 measurements yielded 33.7% precision improvement over a single measurement. Averaging 3 measures, the within-day and between-day reliability point estimates of both GS and TS were 0.99 and 0.98, respectively. The reliability of spinal stiffness measurements was not significantly altered by the participants' LBP status (95% confidence intervals overlapped). **Discussion:** Spinal stiffness assessments by MID, using 3 measurements averaged, are reliable for within-day and between-day circumstances regardless of LBP status. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## The development of a critical appraisal tool for the quantitative assessment of case reports

*Shari Wynd, Texas Chiropractic College, Kent Stuber, Canadian Memorial Chiropractic College, Eric Hurwitz, University of Hawaii, Al Adams, Texas Chiropractic College, Nancy Petersen, Baylor College of Medicine*

**Introduction:** To date, there has been no attempt to create a reliable tool for examining the quality of case reports. The objective of this study was to develop a reliable critical appraisal tool that that can be used to assess the quality of a case reports and case series. **Methods:** The critical appraisal tool was developed by the authors and distributed to a panel of experts. Participants used the tool to rate a single case report and provided their overall impression on a 4-point Likert scale. Reliability was assessed using the Kappa statistic. **Results:** The 11 respondents demonstrated poor agreement in their ratings of the components of the tool, with $\kappa = .14$, with 95% confidence interval of (0.08, 0.21). Nonparametric correlation between the raters' scaled scores based on the tool's 6 components and their overall impression of the article was $r = .20$ ($p = .56$). **Conclusion:** The poor agreement and association among the raters indicates that further refinement of the tool will be necessary. Future iterations of the tool will replace subjective items with specific items. Once a reliable critical appraisal tool for case reports is established, systematic reviews of case reports can be performed using those reports meeting acceptable quality standards. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## Test anxiety and academic performance in chiropractic students

*Niu Zhang, Charles Henderson, Palmer Chiropractic College*

**Aim:** To assess the level of students' test anxiety and the relationship between test anxiety and academic performance. **Method:** A total of 166 3rd-quarter students were recruited. The Test Anxiety Inventory (TAI) was administered to all participants. Total scores from written examinations and objectively structured competency exams were used as dependent variables. **Results:** The mean total and emotionality TAI scores for females were significantly higher than those for males, but not worry scores. One-way analysis of variance (ANOVA) demonstrated no significant differences in written test performance among the 3 TAI groups (low, moderate, and high anxiety). Multiple regression analysis shows that there was a modest, but statistically significant, negative correlation between TAI scores and written exam scores. Worry and emotionality had a negative correlation with written exam scores. **Conclusion:** It was observed that 85% of students have moderate to high test anxiety. Multiple regression demonstrated that the TAI scores suggested the worry and emotionality. TAI subscales may be more effective measures of the anxiety/performance relationship. Future chiropractic education research may provide a clearer picture of how test anxiety can adversely affect academic performance, particularly as a function of worry and emotionality. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

## The 2008 prevalence of chiropractic use in the US adult population

*Marc Zodet, Agency for Healthcare Research and Quality, Joel Stevans, University of Pittsburgh*

**Introduction:** The purpose of this study was to produce prevalence estimates and identify determinants of variability in chiropractic use for the US adult population. **Methods:** The Medical Expenditure Panel Survey was used to estimate prevalence for the population and subpopulations according to several patient and geographic characteristics. We fit a multivariable logistic regression model to explore the effects of the independent predictors on chiropractic use. **Results:** The 2008 prevalence was estimated to be 5.2%. The adjusted odds of using chiropractic services were less for Asians, Hispanics, and Blacks compared to Whites; less for men than women; higher for those with arthritis than those without; and greater for persons from high-income families compared to middle- and low-income families. There was a significant interaction between Census region and urban vs rural location. Prevalence is highest in small metropolitan areas in the Midwest and Northeast and micropolitan/noncore areas in the West and Midwest. **Conclusions:** This study validates previous findings regarding sociodemographic factors associated with chiropractic prevalence. The results of this study also indicate that chiropractic use varies across the urban vs rural landscape depending on the region of the country, suggesting that the effect of geographic location may be more complex than previously reported. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)