ABSTRACTS OF ACC CONFERENCE PROCEEDINGS

Platform Presentations

A Practice-Based Prospective Study on the Incidence and Prevalence of Adverse Events Associated With Pediatric Chiropractic Spinal Manipulative Therapy

Joel Alcantara, **Jeanne Ohm**, and **Kurt Kunz**, International Chiropractic Pediatric Association

Background: Concerns regarding the safety and effectiveness of pediatric spinal manipulative therapy (SMT) have been raised. In a practice-based research network, these concerns are addressed. **Methods:** This study was approved by the Institutional Review Board (IRB) of Life University (Atlanta, GA). In a prospective cohort study, the authors characterized the chiropractic care of children and examined the prevalence and incidence of adverse events (AEs) associated with pediatric SMT. **Results:** Two hundred sixty-four chiropractors reported on 512 children. An AE prevalence of 0.67% was calculated with risk estimates of 880, 141, and 28 cases per 1 million person-years for the first, second, and third AE occurrence. Four hundred forty-nine parents reported on a similar number of children. A prevalence of 4.45% calculated with risk estimates of 978 and 172 cases per 1 million person-years for the first and second AE occurrence. **Discussion:** Children attend chiropractic care for wellness and to address dysfunctions of the neuromusculoskeletal system and conditions of childhood. Parents indicate a high perceived effectiveness with indicated AEs as minor and self-limiting. **Conclusion:** This report provides supporting data that AEs associated with pediatric chiropractic SMT are rare. Further research in this field is encouraged.

An International Cross-Sectional Study of Current Instructional Methodologies in Gross Anatomy Curricula in Chiropractic Colleges

Jennette Ball, **Kristin Petrocco-Napuli**, and **Michael Zumpano**, New York Chiropractic College

Introduction: The purpose of this study is to provide the first comprehensive description of the gross anatomy curricula in chiropractic colleges internationally in order to provide baseline data for curricular modification and improvement. **Methods:** A 72-question cross-sectional electronic survey was sent to the anatomy department chairperson at 31 chiropractic colleges internationally using Zoomerang, a web-based survey instrument. To augment the survey response data, public sources of data were also collected. **Results:** Forty-four percent of the electronic surveys were returned and information was gathered from public sources from 31 institutions. These results indicate: (1) Masters and PhD degrees in anatomy and anthropology outnumbered MD and DC degrees within anatomy teaching faculty; (2) 75% utilize human cadavers and 91% present an laboratory anatomical demonstration; (3) 62% utilize Power Point and 100% supply a copy of lecture presentations; (4) 88% required attendance in lab and 50% in lecture; (5) 69% issued one grade for lecture and lab; (6) 100% of laboratory exams were anatomical identification; and (7) 80% of written exams were multiple-choice format. **Conclusion:** While individual variation exists, chiropractic institutions internationally have similar gross anatomy faculty, curricular design, and delivery methods and assessment methods.

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Enhancing the Use of Evidence-Based Clinical Practice Methods Through Diffusion of Innovation Theory and a Train-the-Trainer Model in Chiropractic Education

Michelle Barber, **Ron Boesch**, **Lia Nightingale**, **Michael Tunning**, and **John Stites**, Palmer College of Chiropractic

Introduction: As part of the evidence-based clinical practice (EBCP) initiative at Palmer College of Chiropractic, a small group of selected faculty was trained to aide in dissemination of evidence throughout the curriculum using a "train-the-trainer" model by invoking Rogers' Diffusion of Innovation theory. Members of this group presented a 1-hour faculty in-service program dedicated to how EBCP could be implemented in the DC curriculum. **Methods:** In the presentation, faculty members illustrated how the "ask, acquire, appraise, apply, and assess" approach could be used in courses in basic sciences, clinical sciences, and clinic. Identical formatting was used by each of the faculty members to demonstrate this process with clinical cases. **Results:** Sixty percent (39/65) of the faculty members in attendance rated the workshop and provided subjective feedback. The presentation style was well received and over 90% of the respondents felt that they benefited from the information. The objectives of promoting interest and demonstrating applicability of EBCP among the faculty were achieved. **Conclusion:** The train-the-trainer model is a viable strategy for disseminating EBCP concepts. The framework of "ask, acquire, appraise, apply, and assess" can be used in any course and provides a conceptual continuity among different disciplines.

Interexaminer Accuracy of Seated Motion Palpation for the Identification of the Lowest Lumbar Freely Movable Segment

Derek Barton and **Linda Mullin**, Life University

Introduction: The purpose of this study is to determine if a chiropractor can accurately identify the lowest lumbar spinal segment with the use of seated motion palpation and if years of experience affect the results. **Methods:** After approval was received from a research ethics committee, three chiropractors were recruited with 2, 20, and 30 years of experience. Their new patients were recruited, in a consecutive manner, if they were scheduled to have a full spine radiograph. The doctors taped a metal marker to patient's skin at the spinous process of the lowest movable segment in the spine as identified with extension palpation prior to x-ray exam. **Results:** Combined, doctors recorded the results for 118 consecutive patients. In spines with five typical lumbar vertebra, the accuracy rate for identifying L5 was 89.4%. An 82.9% accuracy rate was found for identification of the lowest movable lumbar vertebra when atypical spines were included. A practitioner's experience was not found to be related to accuracy of results. **Conclusion:** The results of this study suggest that use of seated extension palpation of the lumbar spine is a valid tool to identify the lowest lumbar segment.

Wiki, a Collaborative Faculty Development Tool

Ron Boesch and **Robert Illingworth**, Palmer College of Chiropractic

Background: Collaborating on scholarly material is limited to face-to-face meetings, e-mail, or teleconferencing. It is difficult to schedule meetings and teleconferences. E-mailing papers leads to version control problems. **Objective:** To describe the development and implementation of a Wiki used to enhance faculty collaboration in the development of scientific publications. **Methods:** A Wiki for faculty collaboration was developed which linked faculty to the services of a professional scientific editor. Faculty were shown how to use this site via in-service sessions and were then invited to access the site. **Results:** Success is shown by the production of scholarly material from the faculty. This demonstrates that scholarly activity is occurring. Three papers are completed, submitted, and accepted for publication; many more are in development. A number of posters have been produced from this process for presentation. **Discussion:** The Wiki was introduced for collaboration in real time from anywhere people access the Internet. This allows authors from multiple locations to be part of the process. It provides application for the college and profession to enhance publications. Collaborating at anytime reduces stress of scheduling meetings or working with incorrect version. The Wiki has an experienced editor as part of the process providing feedback. This is a collaborative effort where all work together. **Conclusion:** The Wiki is a useful tool to help faculty collaborate on the development of scholarly materials.

Description of Patient Characteristics and Treatment Methods Utilized of Patients Undergoing Care in an Integrated Chiropractic Clinic Within a Long-Term Care Hospital

Cara Borggren, **Jurgis Karuza**, **Jennifer Hightower**, and **Paul Dougherty**, New York Chiropractic College

Introduction: Chiropractic may play a role in the long-term care setting. Documenting what is seen in an integrated clinic and promoting the benefits of integrated care are essential in pursuing the goal of effectively managing patients' pain in a long-term care hospital. Describing the patient population, classifying conditions, describing communication among providers, and studying the role of chiropractic care in the long-term setting may provide a mechanism to improved communication among providers and enhanced patient care. **Methods:** A retrospective file review was conducted at a chiropractic clinic that is included as part of the consultative services at a metropolitan hospital. All inpatients seen in the clinic from January 2009 through July 2010 were included in the review. Demographic information and problem lists were obtained from patients' hospital medical records. **Results:** Information for 53 patients was utilized as part of the file review. Information was obtained regarding treatment methods, regions treated, diagnoses, and comorbidities. **Conclusion:** This project provides a basis for further research on chiropractic care given in an integrated, long-term care, hospital-based setting, especially research on outcomes. The authors thought it was worthy to begin by documenting what is seen in the patient base in this unique setting.

Assessing the Importance of Course Content and Competencies for a Course in Diagnostic Imaging Principles and Radiation Health: A Survey of Board-Certified Chiropractic Radiologists

Jennifer Bulger, **John Taylor**, and **Douglas Lawson**, D'Youville College

The purpose of this study was to assess the course content and competencies in a diagnostic imaging principles and radiation health course. A survey was administered to board-certified chiropractic radiologists. For each competency or content area, respondents were asked to indicate the relevance for practicing chiropractors and the recommended depth of coverage in terms of the understanding needed in practice. Respondents were asked to bear in mind that college curricula must meet varying state licensing requirements. The majority of respondents assessed collimators, protection for operators, quality (assurance) control, reducing radiological exposure, and protection for patients to have high relevance. Conversely, the majority of respondents assessed xeroradiography, stereoradiography, magnification radiography, fluoroscopy, and tomography to have the least amount of relevance. Furthermore, the majority of respondents assessed reducing radiological exposure, protection for operators, protection for patients, protective barriers, and personnel monitoring to require the highest depth of coverage in terms of the understanding needed for practice. The majority of respondents assessed discovery of x-ray, matter, energy, atomic structure, and electricity to require the least depth of coverage in terms of the understanding needed for practice. Overall, chiropractic radiologists assess a majority of topics within the diagnostic imaging principles and radiation health course to be extremely relevant or often relevant; however, when assessing the depth of coverage in terms of understanding needed for practice, the recommendations for depth of coverage often contradict the level of relevance indicated.

Mentored Research Opportunities for Students in a Doctor of Chiropractic Program

Lori Byrd, **Cynthia Long**, **Liang Zhang**, **Robert Cooperstein**, **Joel Pickar**, and **Charles Henderson**, Palmer College of Chiropractic

Introduction: Chiropractic students do not typically have formal opportunities to participate in research projects. The authors' chiropractic college offers a program through which students can graduate with research honors upon completing a faculty-mentored research project. In January 2009, a task force revised the program's purpose, goals, and process to make it more attractive to both students and mentors. **Methods:** The task force developed a two-step application process, which includes an initial submission containing the proposed project, followed by submission of a draft manuscript upon completion of the project. A committee of research faculty reviews both submissions for approval. Other program enhancements include a discussion forum for students and faculty mentors and travel stipends for students presenting their work at a research conference. **Results:** Ten applications were received by the subcommittee. Three project proposals were approved, two were not approved, and two are currently under review. Three final manuscripts were recommended for Research Honors. Those students were recognized for Research Honors at the Awards Convocation and Graduation. **Conclusion:** The revised program has increased participation by students and allowed greater interaction between the students and faculty mentors.

Shoe Orthotics for the Treatment of Chronic Low Back Pain: A Randomized Controlled Pilot Study

Jerrilyn Cambron, **Manuel Duarte**, **Jennifer Dexheimer**, and **Thomas Solecki**, National University of Health Sciences

Introduction: The use of shoe orthotics is a common component of treatment in chiropractic care; however, there are no clinical trials assessing the treatment effectiveness of orthotics for low back pain. The purpose of this randomized clinical pilot study was to investigate the efficacy of shoe orthotics for chronic low back pain in 50 symptomatic volunteer subjects. **Methods:** Patients were randomized to either a treatment group receiving custom-made shoe orthotics or a wait control group. After 6 weeks, the wait control group also received custom-made orthotics. Primary outcomes were measured using the modified Oswestry Disability Index (ODI) and the visual analog scale (VAS) for low back pain at the randomization visit and at 6 weeks. **Results:** The changes in low back pain and disability from the randomization visit to the 6-week visit were significantly different between groups ($p = .0007$ for low back pain VAS and $p = .002$ for ODI). **Discussion:** This study demonstrated significant changes in back pain and disability with the use of shoe orthotics for 6 weeks. **Conclusions:** Shoe orthotics appear to reduce low back pain and discomfort after 6 weeks of use. A larger clinical trial is needed to verify these results.

Patients' Perception of Care: Comparing Placebo and Manual Therapy Within a Pilot Study

Jerrilyn Cambron, **Cheryl Hawk**, **James Jedlicka**, **Grant Iannelli**, **Jennifer Dexheimer**, and **Gregory Cramer**, National University of Health Sciences

Introduction: Several previous placebo treatments have been developed for chiropractic clinical trials. However, all of the placebos included some form of touch, such as sham massage or manipulation. The objective of this study was to develop and test a placebo treatment that included minimal contact with subjects. **Methods:** Subjects were randomized to one of four groups; three groups receiving flexion distraction care (8, 12, or 18 visits) and one receiving placebo care (8 visits) over 6 weeks. Subjects were asked about their perception of care at the end of the first week of care and at the care completion visit. **Results:** By the end of the study, approximately 23% of the subjects in the placebo group believed that the treatment was certainly placebo and another 39% believed that the treatment was possibly placebo. However, the majority of subjects in the active care groups believed they were receiving active care. Interestingly, more treatments led to a higher percentage of subjects who believed that they were in the active treatment group. **Conclusion:** Based on these results, it does not appear that our placebo was a successful comparison to the active treatment groups.

Effect of Chiropractic Adjustment on Pulmonary Function in Healthy Adults

Mabel Chang, **Brett Sloan**, **Jerrilyn Cambron**, and **Muhammad Khan**, National University of Health Sciences

Introduction: The purpose of this study is to evaluate the presence or absence of changes in lung function after chiropractic adjustments. **Methods:** Healthy subjects aged 20 to 65 were invited to participate in the study. Four subjects received high-velocity, low-amplitude chiropractic adjustments twice a week for 3 weeks. Outcome measures included the SF-36 and spirometry measurements. Subjects were followed for a period of 1 month after treatment was completed. **Results:** The SF-36 scores collected for all of the subjects at the beginning and end of the study were within normal limits. Most of the subjects reported feeling looser or the ability to breathe deeper. Contrary to patient expectations, spirometry measurements did not significantly change over the course of the study. **Discussion:** While the results of this case series indicate no change in lung function as measured by spirometry, this was not entirely unexpected by the investigators. Limitations included the small convenience sample, using healthy patients with normal baseline spirometry measurements, and the case series study design. **Conclusion:** More studies are needed to identify the mechanism behind patients reporting improved ease in breathing after chiropractic treatment.

Sonographic Evaluation of the Greater Occipital Nerve in Occipital Neuralgia

John Cho, **Daniel Haun**, and **Norman Kettner**, Logan College of Chiropractic

Background: Sonography has proven accuracy for the diagnosis of peripheral nerve entrapment. Increased nerve area and circumference are reported. Occipital neuralgia results from greater occipital nerve (GON) entrapment. Little is known regarding its pathoetiology, impeding optimized treatments. **Objectives:** Cross-sectional area

(CSA) and circumference of the GON along with the CSA of the obliquus capitis inferior (OCI) muscle were measured in occipital neuralgia patients to identify entrapment sites. Clinical measures included body mass index (BMI) and HIT-6 (headache disability). **Methods:** Following IRB approval, 20 occipital neuralgia patients qualified and consented (age 21–44, mean 28, 13 females). Both the symptomatic and contralateral asymptomatic GON and OCI were measured by a single examiner using sonography. Correlation analysis was performed between the symptomatic and asymptomatic side GON, OCI, and clinical measures of BMI and HIT-6 scores. **Results:** Significant differences between the symptomatic and asymptomatic CSA (p = .001) and circumference (p = .002) of the GON were noted. No differences were observed in the GON CSA, circumference, and OCI CSA between the symptomatic and asymptomatic sides (p = .71). **Conclusion:** This study reports the first sonographic evidence of increased circumference and CSA of GON in patients with occipital neuralgia.

Interprofessionalis and Turf Wars: How Prevalent Are Hidden Attitudes?

Chadwick Chung, **Jasmin Manga**, **Marion McGregor**, **Christos Michailidis**, **Demetrios Stavros**, Canadian Memorial Chiropractic College, and **Linda J. Woodhouse**, McMaster University

Introduction: Interprofessional collaboration in health care is believed to enhance patient outcomes. However, where professions have overlapping scopes of practice (eg, chiropractors and physical therapists), "turf wars" can hinder effective collaboration. Deep-rooted beliefs, identified as implicit attitudes, provide a potential explanation. Even with positive explicit attitudes toward a social group, negative stereotypes may be influential. Previous studies on interprofessional attitudes have mostly used qualitative research methodologies. This study used quantitative methods to evaluate explicit and implicit attitudes of physical therapy students toward chiropractic. **Methods:** A paper-and-pencil instrument was developed and administered to 49 individuals (students and faculty) associated with a Canadian university master's entry-level physical therapy program after approval by the Research Ethics Board. The instrument evaluated explicit and implicit attitudes toward the chiropractic profession. Implicit attitudes were determined by comparing response times of chiropractic paired with positive versus negative descriptors. **Results:** Mean time to complete a word association task was significantly longer ($t = 4.75$, $p = .00$) when chiropractic was associated with positive rather than negative words. Explicit and implicit attitudes were not correlated ($r = .13$, $p = .38$). **Conclusion:** While little explicit bias existed, individuals associated with a master's entry-level physical therapy program appeared to have a significant negative implicit bias toward chiropractic.

Improving Targeting Accuracy in Mapping Upright Spinal Levels to the Prone Position

Robert Cooperstein, Palmer College of Chiropractic West

Introduction: Although it is widely taught that the inferior scapular tip lies at the T7 spinous process upright and T6 prone, newer anatomical studies suggest the upright level is actually centered about T8 and the prone level at T9. Manual therapists using the inferior scapular tip as a landmark may erroneously map upright spinal levels at a different prone level. **Methods:** A skin mark was placed at the spinous process most closely lined up with the inferior tip of the right scapula on two subjects. Another marker was placed on the L4 spinous process. Ten palpators (two experienced and eight novice) placed a finger on the thoracic skin mark and maintained contact as the subject moved to the prone position. The distance from thoracic to lumbar skin marks was measured. **Results:** The average difference between each palpator's prone target from group was a mean of 4.7 mm (range 6–11.6 mm, SD = 6.2 mm). There was no difference in reliability of the two experienced doctor palpators compared with the eight novice student palpators. **Discussion and Conclusions:** None of the 20 measurements were more than halfway between the targeted thoracic skin marker and the adjacent spinous processes, suggesting 100% reliability. Thus following the spinous process method may serve as an alternative to the more usual but suspect scapula landmark method of mapping spinal levels to prone position.

At What Angle of Hip Flexion Is the Gillet Test the Most Effective for Detecting Sacroiliac Motion?

Robert Cooperstein, **Morgan Young**, and **Michael Haneline**, Palmer College of Chiropractic West

Introduction: The Gillet test checks for fixation in the sacroiliac joint. Interexaminer reliability studies have ranged from poor to good. Careful observation of Gillet testing usually showed an initial drop of the posterior superior iliac spine (PSIS), then a rise as hip flexion increased. This study aimed to describe the examiner's thumb movements during the Gillet test, especially this paradoxical upward motion. **Methods:** A convenience sample of five asymptomatic chiropractic students (three male), all able to flex each hip to 90° painlessly, underwent Gillet testing. Frames from a videorecording including time stamps for degrees of hip flexion (100 intervals) were analyzed. Thumb movements

as a function of hip flexion were determined. **Results:** 8/10 sacroiliac joints showed an initial drop of the PSIS, followed by rising relative to the sacrum; 2/10 showed rise only. The most effective degree of hip flexion for detecting PSIS descent was 24.40. **Conclusion and Discussion:** There is a normal posterior rotation of the ilium on the sacrum during one-legged stance and "hip-hiking" on the raised hip side, as contralateral gluteal muscles contract to maintain balance. Sacroiliac fixation results in hip-hiking that overwhelms posterior innominate rotation, resulting in a positive Gillet test.

Concurrent Validity of the Block Method for Measuring Anatomical Leg Length Inequality: A Literature Review

Robert Cooperstein and **Michael Lagueux**, Palmer College of Chiropractic West

Introduction: Anatomical leg length inequality (aLLI) is a risk factor for low back, sacroiliac, and lower extremity disorders. Block measures determine the amount by which a leg must be lifted to level the pelvis. The width of inserted blocks serves as an indirect measure of aLLI. This study determined the concurrent validity of block measures versus a radiological reference standard. **Methods:** Eight articles were retrieved wherein block method was compared with a radiological reference standard, using electronics sources and citation snow-balling. **Results:** The mean absolute discrepancy between block and radiological methods was 5.7 mm, SD = 6.4 mm, and 95% confidence interval ± 12.5 mm. **Discussion and Conclusion:** The block method is not accurate or precise relative to low-end 3-mm estimates of LLI thought to be clinically significant. However, the goal of lift therapy should not be to even the leg lengths per se, but rather to produce a desirable clinical outcome for the pelvis and spine. The block method may be more useful than directly measuring the legs, using low-tech tape measure methods or high-tech imaging procedures.

Localization of Cavitations Using Accelerometry

Gregory Cramer, **Kim Ross**, **Preetam Bora**, **P.K. Raju**, **Scott Selby**, **Jerrilyn Cambron**, National University of Health Sciences, **Adam Habeck**, Private Practice, **Jennifer Dexheimer**, National University of Health Sciences, and **Ray McKinnis**, Consultant in Statistics

Introduction: Novel methods were used to assess cavitations (audible release) of the lumbar zygapophysial (Z) and sacroiliac joints (SIJs) following side-posture manipulation (SMT) and side-posture positioning alone. **Methods:** Healthy subjects in this IRB-approved study had nine 1-cm^3 accelerometers affixed to the L1–L5 spinous processes, S1 and S2 sacral tubercles, and left and right lateral to L4/L5 interspinous space. Subjects were randomized into: group 1 side-posture SMT ($n = 30$) or group 2 side-posture positioning alone ($n = 10$). Accelerometer recordings were conducted during side-posture positioning and SMT (left = upside). Vertebral segments that cavitated were identified, and comparisons of cavitations were made between group 1 vs. group 2, upside vs. downside, and target vs. nontarget joints. **Results:** Data were recorded from 40 subjects (20 males, 20 females). The reliable methods identified 56 cavitations from 46 joints. Unexpectedly, multiple joint cavitations were recorded from eight joints. Cavitation occurred more frequently in group 1 vs. group 2 ($p < .0001$), upside vs. downside joints ($p < .0001$), and target area vs. nontarget area joints ($p < .01$). **Conclusions:** Most cavitations occurred in the upside targeted segments. Multiple cavitations of single Z joints have not been previously reported. These reliable, novel accelerometry methods can be used in future studies.

Relationships Among Cavitation, Z Joint Gapping, and Spinal Manipulative Therapy

Gregory Cramer, **Kim Ross**, **P.K. Raju**, **Jerrilyn Cambron**, **Joe Cantu**, National University of Health Sciences, **Preetam Bora**, Auburn University, **Scott Selby**, National University of Health Sciences, **Adam Habeck**, Private Practice, **Jennifer Dexheimer**, National University of Health Sciences, **Doug Gregerson**, Private Practice, and **Ray McKinnis**, Consulting Statistician

Introduction: The purpose of this IRB-approved study was to quantify zygapophysial (Z) joint cavitation (audible release) and therapeutic gapping during spinal manipulative therapy (SMT) and side-posture positioning alone (SPP). **Methods:** Nine accelerometers (vibration recording devices) were affixed to specific lumbosacral locations. Subjects were randomized into group side-posture SMT ($n = 30$) or group 2SPP ($n = 10$). Cavitation was determined by accelerometer recordings during SMT and SPP (left side = upside for both groups), and gapping was determined by pre- and postintervention magnetic resonance imaging joint space measurements. Results of mean gapping differences were reported and compared. **Results:** Upside SMT and SPP joints gapped more than downside joints ($p < .0001$). SMT upside joints gapped more than SPP upside joints ($p = .05$). SMT upside joints of males gapped more than those of

females (p = .002). Overall, joints that cavitated gapped more than those that did not (p = .011). No relationship was found between the occurrence of cavitation and gapping with upside joints alone (p = .43). **Conclusions:** Cavitation indicated that a joint had gapped, although gapping occurred in noncavitation joints as well. Future research assessing the relationships among paraspinal tissue resistance, Z joint architecture, cavitation, and gapping is warranted.

Measurement and Analysis of a Biomechanical Outcome of Chiropractic Adjustment Performance in Chiropractic Education

Christina Cunliffe, **Christopher Colloca**, **Mostafa Afifi**, **Marisa Pinnock**, and **Richard Hinrichs**, Arizona State University

Introduction: The purpose of this study was to compare biomechanical measures of chiropractic adjustment performance of the McTimoney Toggle-Torque-Recoil (MTTR) technique among students and chiropractors. **Methods:** Fifty-three subjects (15 year-3 and 16 year-5 chiropractic students, and 22 McTimoney chiropractors) participated in this study. Each applied 10 MTTR thrusts to a dynamic load cell. Peak forces and time durations were computed from each of the force-time histories. Repeated-measure analyses of variance were used to compare the variables. The Games-Howell post hoc test was used for pairwise comparisons. **Results:** Experience showed a difference in thrust speed ($p < .05$) favoring chiropractors. Post hoc analysis showed that chiropractors produced MTTR thrusts over a significantly shorter total time compared to students (p = .02). Similarly, chiropractors had faster times to peak force than students (p = .02). Chiropractors had significantly shorter time to peak (p = .003 and p = .031) and total time (p = .031 and p = .006) for both dominant and nondominant hands. **Conclusions:** Differences in the biomechanical characteristics of force production between students and chiropractors support the theory of the importance of training and technique performance. Identification of such biomechanical markers as performance outcomes may be of assistance in providing feedback for training in chiropractic education.

Are Chiropractic Patients Less Likely to Get the Flu Vaccine?

Matthew Davis, **Monica Smith**, and **William Weeks**, Dartmouth Medical School

Background: Previous studies of adult influenza vaccination rates among chiropractic patients have reported conflicting findings. **Design and Setting:** The 2007 National Health Interview Survey was used to examine influenza vaccination among adult respondents who, according to the 2007 guidelines were considered high priority for receiving the influenza vaccine (n = 12,164). Respondents were categorized according to reported health services use in the prior year: chiropractic, noncomplementary and alternative medicine (CAM), and CAM (excluding chiropractic care). Logistic regression adjusted for covariates was used to determine if having used chiropractic predicted influenza vaccination by age category. **Results:** Forty-one percent of high-priority chiropractic users between the ages 18 and 64 and 64% of those age 65+ were vaccinated in 2007, which approximated that of non-CAM and CAM users. In adjusted logistic regressions, the authors found statistically insignificant differences between chiropractic users when compared to non-CAM users [OR: 0.90 (95% CI 0.77–1.06) for age category 18 to 64 and 0.90 (95% CI 0.66–1.23) for age category 65+]; however, CAM users were more likely to have been vaccinated across all ages. **Conclusions:** When compared to CAM users and non-CAM users, chiropractic patients are not less likely to receive the influenza vaccine.

Use of Encounter-Based Curriculum to Foster Primary Care Competencies in Chiropractic Education

Vincent DeBono, National University of Health Sciences

Introduction: This paper examines the utilization of encounter-based curriculum strategies as one method to aid in reversing the downward trend in chiropractic school admissions and to address the underutilization of chiropractic services in society. **Objective:** The objectives were (1) to examine the concept of encounter-based curriculum and determine if it may have the ability to broaden chiropractic students' knowledge and enhance their skills to function as a primary care provider and (2) to further examine if encounter-based curriculum models may build confidence (attitude) in students to perform as a primary care provider. **Methods:** Initial methods include a faculty and student survey at one health sciences university to determine the current attitudes and perception of primary care education. **Conclusions:** The concept of encounter-based curriculum is introduced as a possible method to bolster the chiropractic student's ability to function as a primary care provider after graduation.

Characterizing the Toggle-Recoil Delivery of Practicing Clinicians

James DeVocht and **Ram Gudavalli**, Palmer College of Chiropractic

Introduction: A common perception is that the specific mechanical characteristics of chiropractic thrusts play a significant role in determining the therapeutic value of chiropractic treatment. Previous data showed considerable variation of characteristics of toggle-recoil type thrusts among both students and instructors. The objective of this study was to determine the variation of thrust characteristics when delivered by field doctors who use toggle-recoil technique in their practice. **Methods:** Two annual state chiropractic association meetings were attended. The force-time profiles of toggle-recoil type thrusts were taken using an instrumented device designed for practicing such thrusts (speeder board) from active field chiropractors who use toggle-recoil at least occasionally in their practices. The amount of force applied and the rate at which the force was applied were derived from the force-time profiles. **Results:** Data were taken from 77 field doctors. A wide variety of values was observed for both the amount of force applied in N [mean ± SD: 156 ± 110; coefficient of variation (CV): 70%] and the rate of force application in N/ms (mean ± SD: 4.20 ± 3.62; CV: 87%). **Conclusion:** There is a wide range in the mechanical characteristics of toggle-recoil thrusts among practicing clinicians who use that technique.

Chiropractic Management for Veterans With Low Back Pain: A Retrospective Study of Clinical Outcomes

Andrew Dunn, **Lance Formolo**, and **David Chicoine**, VA Western New York/New York Chiropractic College

Introduction: Musculoskeletal complaints, most notably low back pain (LBP), are prevalent among veterans. Despite a focus on LBP management by chiropractors within the Veterans Health Administration, there are limited published accounts of clinical outcomes with chiropractic management of LBP among veterans. **Methods:** Retrospective review of a prospectively maintained quality assurance data set for $n = 171$ veterans with a chief complaint of LBP. Descriptive statistics and paired *t*-tests were utilized with numeric rating scale (NRS) and Back Bournemouth Questionnaire (BBQ) serving as the outcome measures. Minimally clinically important difference was set as 30% improvement from baseline. **Results:** The mean number of treatments was 8.68. For the NRS, the mean raw score improvement was 2.18 points, representing a 37.53% change from baseline. For the BBQ, the mean raw score improvement was 13.75, representing a 34.82% change from baseline for both measures. **Discussion:** This study attempts to advance previous work with enhanced data capture, increased sample size, and a change in self-reported outcome measures from disability to LBP symptom severity. Additional research is warranted into chiropractic management of LBP among veterans with a shift toward prospective study design. **Conclusions:** Chiropractic clinical outcomes were both statistically significant and clinically meaningful for this sample of veterans presenting with LBP.

Chiropractic Management for Veterans With Neck Pain: A Retrospective Study of Clinical Outcomes

Andrew Dunn, **Lance Formolo**, and **David Chicoine**, VA Western New York/New York Chiropractic College

Introduction: An estimated one in five veteran patients seeking chiropractic care within Veterans Health Administration clinics presents with a chief complaint of neck pain. Despite this, there are limited published reports of clinical outcomes for veterans with chiropractic management for neck pain. **Methods:** Retrospective review of a prospectively maintained quality assurance data set for $n = 54$ veterans with a chief complaint of neck pain. Descriptive statistics and paired *t*-tests were utilized with numeric rating scale (NRS) and Neck Bournemouth Questionnaire (NBQ) serving as the outcome measures. Minimally clinically important difference was set as 30% improvement from baseline. **Results:** The mean number of chiropractic treatments was 8.72. For the NRS, the mean raw score improvement was 2.63 points, representing a 42.91% change from baseline. For the NBQ, the mean raw score improvement was 13.98, representing a 33.11% change from baseline. **Discussion:** This study attempts to advance previous work with enhanced data capture, increased sample size, and a change in self-reported outcome measures from disability to neck pain symptom severity. Additional research is warranted into chiropractic management of neck pain among veterans. **Conclusions:** Chiropractic clinical outcomes were both statistically significant and clinically meaningful for this sample of veterans presenting with neck pain.

Muscle Fatigue and Cryotherapy-Mediated Changes in Proprioception

Dennis Enix, Logan College of Chiropractic

Introduction: Proprioception can be impacted by external forces and environmental changes affecting the peripheral sensory receptors in muscle spindle and joint afferents. Cryotherapy is commonly used to treat acute posttraumatic muscular injuries in athletes. This temporary method of tissue cooling can create significant temperature decreases in superficial cutaneous tissue up to 2.0 cm deep. The cumulative effects of muscle fatigue and cryotherapy on proprioception was examined in this study. **Objective:** To evaluate the effect of cryotherapy on fatigued muscles in athletes. **Methods:** Thirty-two adult athletes, 27 men and 5 women between ages 21 and 34 (mean: 25.9 ± 2.8 years) without glenohumeral, elbow, or neurological conditions; Reynaud's disease; or contraindications to cryotherapy participated in this IRB-approved study. Proprioception was determined by calculating the absolute angular error after passive and active elbow joint repositioning tasks using BioPac Tri-Axial Accelerometers. **Results:** Significant decreases in proprioception were noted between the control group (p = .235), fatigued muscle group (p < .001), and fatigued muscle cryotherapy group (p < .001). **Conclusions:** Proprioception significantly decreased in fatigued muscles and further decreased after cryotherapy. Clinicians and trainers should note that changes in positional awareness may result from cryotherapy when considering return to play decisions for the fatigued athlete.

Notochordal Cells Protect Nucleus Pulposus Cells From Degradation and Apoptosis: Implications for the Pathophysiology and Treatment of Intervertebral Disc Degeneration

William Mark Erwin, **Diana Islam**, **Robert Inman**, and **Michael Fehlings**, Toronto Western Hospital, University of Toronto, Canadian Memorial Chiropractic College

The nonchondrodystrophic canine is protected from developing degenerative disc disease (DDD) perhaps in part due to the secretion of prosurvival and antidegeneration soluble factors such as interleukin-1β (IL-1β) and/or Fas ligand (FasL). The authors evaluated the ability of notochordal cell-conditioned medium (NCCM) to protect nucleus pulposus (NP) cells from IL-1β and IL-1β + FasL-mediated cell death and degeneration. **Methods:** Under in vitro hypoxia (3.5% O^2), bovine NP cells were treated with serum-free NCCM or basal medium (serum-free Advanced DMEM/F-12) for 48 hours. Flow cytometry was used to evaluate NP cells for apoptosis and total cell death. Quantitative RT-PCR was used to examine the expression of the extracellular matrix genes aggrecan, collagen 2, link protein, ADAMTS-4 and MMP3, the matrix protection molecule TIMP1, the CD44 receptor, and the expression of the inflammatory cytokine IL-6. **Results:** NCCM robustly protects NP cells from both total cell death and apoptosis and protects NP cells from degradation. **Discussion:** Notochordal cell-secreted factors significantly protect NP cells from cell death and upregulate the expression of genes that encode for anabolic activity and matrix protection of the intervertebral disc NP. Harnessing the restorative/regenerative powers of the notochordal cell will lead to novel cellular and molecular strategies in the treatment of DDD.

Association Between Sensory Impairment and Functional Limitations in Balance in Community-Dwelling Older Adults

Kimary Farrar and **Debra Rose**, Texas Chiropractic College

Objective: The purpose of this study was to investigate whether impairments in the peripheral and central components of the visual, somatosensory, and vestibular systems were associated with performance on the Fullerton Advance Balance (FAB) Scale. **Design:** Spearman rho analyses were conducted to examine how each impairment variable correlated with each functional limitation. Post hoc forward stepwise multiple regression analyses were conducted to identify which impairment best predicted the score on each FAB Scale test item as well as the total score. **Participants:** A sample of community-residing older adults (N = 101; mean age = 76.9 years; SD = 5.8). **Interventions:** Participants attended a single, 90-minute test session conducted by trained personnel. **Outcome Measures:** FAB Scale, visual tests, somatosensory tests, vestibular tests, Sensory Organization Test (SOT). **Results:** Spearman rho analyses revealed a moderate correlation (r = .61) between the SOT total score and the total FAB Scale score. Post hoc multiple regression analyses revealed that sensory organization abilities best predicted overall performance on the total FAB Scale (r = .60). **Conclusions:** The SOT was the impairment variable that correlated the most with FAB Scale test items and was the best predictor of functional limitations in balance.

Chiropractic Care of the Older Patient: A Review of the Literature Between 2001 and 2010

Brian Gleberzon, Canadian Memorial Chiropractic College

Introduction: The purpose of this article was to conduct a review of the chiropractic geriatric literature between 2001 and 2010. **Methods:** A three-step search strategy of the literature was used. This involved: (1) electronic searching of databases using appropriate subject headings, key words, and MeSH terms; (2) hand searching of chiropractic journals and conferences; and (3) reference tracking. **Results:** A total of 185 articles germane to chiropractic geriatric care were retrieved. **Discussion:** Compared to the review of the literature conducted prior to 2000, the number of references on chiropractic geriatric education increased from 3 to 11, the number of demographic studies increased from 9 to 18, the number of case reports increased from 25 to 83, the number of clinical trials increased from 4 to 21 (only two randomized controlled trials found), and the number of references on clinical guidelines and general clinical information increased from 18 to 52. **Conclusion:** The exponential accrual of the evidence base of chiropractic care for older patients bodes well for the profession's future. That said, there is clearly a gap in the evidence base of chiropractic geriatric care, with the underrepresentation of clinical trials of all kinds involving chiropractic patients.

Effect of a Lumbar Support Pillow on Muscle Activation and Comfort During a Repetitive Reaching Task

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

Purpose: The aim was to determine whether a lumbar pillow is more effective than a standard chair in improving comfort and muscle activation during seated work. **Methods:** Twenty-eight males with and without a history of low back pain (LBP) sat in a standard office chair and in a chair with a lumbar support pillow for 30 minutes and performed seated work. Comfort was measured by the least squares radius (LSR) of the center of pressure shifting at the buttock–chair interface and through visual analog scale reporting. Muscle activation of the shoulder girdle and trunk muscles was recorded. Analysis of variance methods were used to assess chair support effects over time. The study was approved by the institution's Research Ethics Board. **Results:** LSR results showed that individuals were more comfortable with the pillow during the 30 minutes of sitting than without ($p = .017$), and LBP patients reported better comfort overall. Only the lower trapezius muscle was significantly affected by the lumbar support device during the repetitive reaching movement (activation decreased). **Conclusions:** A lumbar pillow is more comfortable than a standard chair during prolonged sitting. However, it may compromise scapular stabilization if used for repetitive reaching movements.

Integrating Two Complementary and Alternative Medicine Programs in an Evidence-Informed Practice Course: Lessons From the Trenches

Linda Hanson, **Brent Leininger**, **Louise Delagran**, **Corrie Vihstadt**, and **Roni Evans**, Northwestern Health Sciences University

Purpose: To present strategies for educationally integrating chiropractic and acupuncture and Oriental medicine (AOM) student cohorts and to discuss results reflecting student and instructor perceptions. **Methods:** Several strategies were used to integrate the two programs: multidisciplinary instructors, content examples, and discussion groups utilizing active learning techniques. To evaluate the effectiveness of the integrated approach, an eight-question survey was created and distributed to 127 students prior to the final exam. IRB approval was given. Students rated their experience on a five-point scale. Descriptive statistical analysis was performed. **Results:** Instructor observations show that many of the techniques used to integrate the two programs were effective. Survey results indicate overall that chiropractic and AOM students were receptive to the integrated course. **Conclusion:** With careful preparation, it is possible to integrate chiropractic and AOM students in one course where learning objectives are common to both professions.

Where's the Evidence? Mapping Evidence-Informed Practice Learning Objectives

Linda Hanson, **Renee DeVries**, **Louise Delagran**, and **Roni Evans**, Northwestern Health Sciences University

Purpose: To describe the process and results of an initiative to map evidence-informed practice (EIP) learning objectives within a chiropractic curriculum. **Methods:** An EIP learning objective (LO) mapping sheet, using a check box mechanism, was created and distributed to chiropractic teaching and clinical faculty. Individual faculty meetings were also conducted. LOs were mapped across fall 2009 and winter and summer 2010 trimesters.

Faculty indicated if LOs were covered and how they were addressed. IRB approval was given. **Results:** Forty-three of 46 institutional teaching and clinical faculty mapped 92 of 100 foundational and elective didactic courses across 10 academic trimesters. Preliminary results show that 64% of courses in the DC curriculum incorporate at least one of the identified EIP learning objectives; EIP objectives are integrated across 10 trimesters. Interviews indicate faculty motivation to add additional EIP learning objectives into their courses. **Discussion:** This project quantified which EIP LOs were covered and where in the curriculum they are delivered. Furthermore, this project highlighted where additional attention is needed as faculty strive toward meeting identified institutional strategic goals. **Conclusion:** Mapping competencies and LOs across a professional curriculum are possible using specially designed curriculum mapping tools.

Learning Spinal Manipulation: Comparison of Two Teaching Models

Marie-Pierre Harvey, **Claude Dugas**, **Shari Wynd**, and **Martin Descarreaux**, Université du Québec Trois-Rivières

Introduction: Although most chiropractic colleges have implemented motor learning principles in their technique curriculum, some have maintained traditional approaches to spinal manipulation (SM) skills teaching. The objective of this study was to quantify SM biomechanical parameters of students from two teaching institutions with different teaching models. **Methods:** Forty-five students enrolled in a chiropractic program using a patient–doctor positioning model and 43 students enrolled in a chiropractic program emphasizing complete practice of SM skills participated in the study. Both cohorts were asked to complete 10 thoracic SMs on an instrumented mannequin. Between group differences in various SM force-time variables were assessed. **Results:** Statistical analyses revealed significant between-group differences in time to peak force, peak force, and rate of force application. Students exposed to complete practice demonstrated lower time to peak values, higher peak forces, and a steeper rate of force application. **Discussion and Conclusion:** The results suggest that an increase in the number of hours spent on procedural learning leads to improved motor performance. Advantages related to earlier acquisition of SM skills may include improvement in patient care and clinical training all through internships. Although this needs to be investigated, improved SM motor performance could be linked to improved clinical outcomes and safety.

Empowering Student Learning Through Rubric-Referenced Self-Assessment

Xiaohua He and **Anne Canty**, Palmer College of Chiropractic Florida

Objective: The purpose of this study was to investigate the effect of rubric-referenced self-assessment on performance of anatomy assignments in a group of chiropractic students. **Methods:** Participants ($N = 259$) were first-quarter students who were divided into a treatment group ($N = 130$) and a comparison group ($N = 129$). The intervention for both groups involved the use of rubrics to complete the first draft of anatomy assignments. General feedback was given by the instructor and the students had the opportunity to amend the assignments before resubmission (second draft). The treatment group, however, was also asked to perform rubric-referenced self-critique and self-assessment of their assignments during their second draft. Although the comparison group was also provided with the identical rubrics for the assignments, it did not perform rubric-referenced self-critique and self-assessment. **Results:** The results revealed that the students in the treatment group, who used a rubric-referenced self-assessing learning model, received statistically significant higher scores than their counterparts in the comparison group, who did not use a rubric-referenced self-assessing learning model, in performing assignments. **Conclusion:** This study suggests that practicing rubric-referenced self-assessment enhances students' performance on anatomy assignments. However, educators continue to face the challenge of developing practical and useful rubric tools for students' self-assessment.

Burnout, Depression, and Alcohol Use in Chiropractic Students

Sean Herrin and **Darcy Vavrek**, University of Western States

Objective: No research has been done on burnout specifically in chiropractic students. This study sought to identify the prevalence of and the associations with burnout in chiropractic students. **Methods:** A total of 381 chiropractic students who matriculated in spring of 2010 were surveyed using validated instruments to assess burnout, depression, and alcohol use. Occurrence of personal life events in the previous 12 months, demographic information, and grade point average (GPA) were also requested. **Results:** A total of 213 chiropractic students responded (56%). Burnout was present in 34 (16%) of students. Year-in-training was associated with increased burnout ($p = .027$), but not with alcohol use. Student-reported comfort-with-progress (OR = 0.2; CI: 0.1, 0.4), depression (OR = 4.8; CI: 1.3, 17.8), and year-in-training (OR = 1.5, CI: 1.0, 2.2) demonstrated a stronger relationship to burnout than did GPA (OR = 0.8;

CI: 0.5, 1.2) and major illness of family member (OR = 1.4; CI: 0.5, 3.8) after adjusting for one another with multivariate logistic regression. **Discussion and Conclusion:** Burnout, depression, and at-risk alcohol use among chiropractic students appears to be present in similar percentages reported for other health care student populations. Burned-out students had a higher tendency to be uncomfortable with their progress and score positive for depression than their peers, suggesting these instruments could be useful as an efficient screen to identify at-risk students.

Calling All Students: Cell Phones in Chiropractic Education

Glori Hinck and **Tom Bergmann**, Northwestern Health Sciences University

Introduction: Can technology such as mobile phones be used to support teaching and learning in chiropractic institutions? This research investigated the feasibility of using the video recording capability of mobile phones to record supervised adjustments for self-appraisal of supervised adjustments. **Methods:** Seventy-seven students completed a 10-question hard-copy survey regarding their experiences with recording supervised adjustments. Questions included details of mobile phone ownership, technology preferences, technical difficulties, and satisfaction with the recording experience and video critique process. The study design was approved by the University IRB process. **Results:** Eighty-three percent of those responding currently own a mobile phone with video capability. Of these, 78% preferred a mobile phone over other methods of recording, but 38% had issues with transferring their video file to a computer. Sixty-three out of 72 found viewing and critiquing a video of their adjustment a valuable experience. **Discussion:** Students own mobile phones, prefer this technology for video recording, and found reflective learning to be a valuable experience. However, technical issues may limit viewing of videos to individual phones. **Conclusion:** Results suggest that mobile phones are a viable technology for the video capture of student adjustments for use in self-evaluation and instructor feedback.

A Survey of Chiropractic Students' Opinions About the Importance of Research

Chabha Hocine and **Rodger Tepe**, Logan College of Chiropractic

Objective: The objective of this study was to survey chiropractic students' opinions about the importance of research to the chiropractic profession in four content domains: chiropractic education, chiropractic practice, cultural authority, and political/economic areas. It is hoped that the survey results may be of value in curricular planning to ensure that students receive the necessary education to prepare them to be information-literate, lifelong learners. **Methods:** Participants were chiropractic students in trimesters 1 through 9 during the summer 2010 trimester. Students received instructions that their participation was voluntary and anonymous and that there would be no penalty for not taking the survey. Participants self-administered a 10-item paper-and-pencil questionnaire. **Results:** A total of 640 participants completed the survey, which was 88% of all students in trimesters 1 through 9. Sixty-two percent were male (mean age 26, SD = 4.4) and 38% were female (mean age 25.2, SD = 4.2). Students' responses that research is important or very important to chiropractic varied from 79.2% to 93.1%. **Conclusion:** This study shows that the chiropractic students surveyed place a high value on the importance of research.

Effects of Manual Therapy on Balance and Falls: A Systematic Review

Kelly Holt, **Heidi Haavik**, and **C. Raina Elley**, New Zealand College of Chiropractic

Objective: To assess the effects of manual therapy interventions on falls and balance. **Design:** Systematic review. **Data Sources:** Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, MEDLINE, EMBASE, CINAHL, PsycINFO, AMED, Current Controlled Trials, MANTIS, ICL, National Institutes of Health (USA), and Google Scholar. **Results:** Ten trials were identified. Most trials had poor to fair methodological quality. Only one trial included falls as an outcome measure, but as a feasibility study no meaningful conclusions could be drawn about the effects of the intervention on falls. All included trials reported outcomes of functional balance tests or tests that utilized a computerized balance platform. Seven of the 10 included trials reported some statistically significant improvements relating to balance following an intervention that included a manual therapy component. The ability to draw conclusions from a number of the studies was limited by poor methodological quality or very low participant numbers. **Conclusion:** There is little to no evidence to support the role that manual therapy may play in preventing falls and there is only limited evidence to support the role of manual therapy in improving balance.

A Biomechanical Finite Element Study of the Disc Tissues With Incompleteness and Laxity in Annular Fibers

Mozammil Hussain, Logan College of Chiropractic

Introduction: Progressive disruptions in disc incomplete length and laxity in annular fibers affect disc biomechanics in different ways. However, the extent to which the incomplete annular fibers contribute to disc behavior as compared to the contribution by laxity in fibers is poorly understood. **Materials and Methods:** A previously validated finite element model of a cervical segment was used. Disruptions in fibers were simulated in the outer, middle, inner, outer-middle, and middle-inner annulus regions. Two different disruptions were modeled in annular fibers: a reduction in fiber length (incompleteness) and a decrease in fiber elasticity (laxity). Stress patterns in disc tissues were quantified in pure compression. **Results:** With fiber disruptions (incompleteness and laxity), disc stresses increased as compared to the intact model. Disc tissues were more affected by incomplete fibers than lax ones. Incompleteness and laxity in a greater number of fiber layers leads to higher disc stress changes. **Discussion:** The present data provide the basis for the altered stress patterns in disc tissues due to incompleteness and laxity in fibers and this may initiate (or contribute) to the progression of degenerative features. Further biomechanical experiments are advocated to understand the effects of incompleteness and laxity in annular fibers on disc response.

Carpal Tunnel Syndrome: A Diffusion Tensor Imaging Study of the Brain

Norman Kettner, **James Sheehan**, **Vitaly Napadow**, **Yumi Maeda**, **Jieun Kim**, Logan College of Chiropractic, **Ang Li**, Massachusetts General Hospital, and **Joe Audette**, Massachusetts General Hospital

Introduction: Connectivity of the cortex is partly governed by the organization and integrity of white matter (WM) tracts. The impact of median nerve neuropathy (carpal tunnel syndrome, CTS) on WM is unknown. Magnetic resonance imaging (MRI) diffusion tensor imaging characterizes WM microstructure by computing water diffusion using validated metrics of fractional anisotropy (FA). **Methods:** Following IRB approval and consent, the FA of WM tracts in 14 CTS patients was compared with 11 healthy controls. T1-weighted MRI structural scans (3.0 T)were co-registered with diffusion tensor data sets (TE = 82 ms, 128 × 128 matrix, 256 mm FOV, slice thickness 2.0 mm, 60 phase encoding directions, 10 B0 volumes). Tract-based spatial statistics registered all subjects to a common FA map to detect group differences in FA. Probabilistic and deterministic analyses identified WM tracts containing between-group FA differences. **Results:** Both analyses confirmed reduced FA in the anterior corpus callosum (CC), and WM fibers supplying the medial prefrontal cortex (PFC) in CTS patients. **Conclusion:** The CC and medial PFC relay sensory, motor, and cognitive information between and within cerebral hemispheres. FA is abnormal in CTS patients and suggests disordered connectivity in the brain, which is concomitant with the known median nerve lesion.

Helping Uniprofessionally Trained Students to Think Integratively: An Interactive Educational Intervention

Lisa Killinger, Palmer College of Chiropractic

Introduction: In some cases, chiropractic college is a uniprofessional affair. Students may complete their entire education without a single integrative experience. An educational intervention was designed to familiarize chiropractic students with the roles of other health professionals and to help students to think integratively when addressing the complex health care needs of older patients. This project is part of a HRSA Geriatric Education Center grant. **Methods:** During 2009–2010, 420 chiropractic students completed an interactive activity to solve clinical geriatric patient scenarios. Modified Pew Health Foundation materials provided training, role, and scope of information on numerous health professions. Students identified and discussed the most appropriately trained professionals to address the complex needs of their patients. **Results:** Results from previous interdisciplinary assessments will be compared with the performance of this student cohort. Positive attitudes toward integration were evident, in spite of minimal integrative experience. Students rated this activity as highly educationally valuable. This activity also complements an integrative student Veterans' Administration rotation, and feedback from VA staff regarding chiropractic student performance will be examined. **Conclusions:** With only minimal integrative experiences for our students, this simple education intervention has been applied. This educational intervention provides foundational knowledge to increase students' integrative problem-solving skills.

Using Evidence-Based Clinical Practice Principles to Utilize and Enhance Student Clinical Reasoning Skills in a Classroom-Based Case Management Course: A Pilot Project

Nancy Kime, Palmer College of Chiropractic

Introduction: With the intention to utilize concepts of adult learning, a teaching methodology was developed that incorporates evidence-based clinical practice (EBCP) principles into a case management classroom-based course. **Methods:** In order to train students in the knowledge, skills, and attitudes necessary to implement EBCP, this pilot method consisted of three components: introductory lecture, guided work outside the classroom, and faculty-guided small group presentations within the classroom. **Results:** Student qualitative feedback was overwhelmingly positive. Students reported greater levels of confidence related to the development of patient care plans following application of evidence and related value in professional dialogue with peers. **Conclusion:** This method represents a more credible approach to clinic-level student learning utilizing available classroom time to enhance high-level critical thinking and create familiarity and competence in use of EBCP, thereby benefiting patients by the use of the most valid and current evidence.

One-on-One Lifestyle Learning Methodologies: Using Interactive Tools in an Integrative Workshop Setting

Ron Kirk, Life University

Introduction: It is clearly documented that most of the deadly disorders of developed countries are lifestyle related. Through collaborative efforts on common lifestyle-related issues, the author has developed integrative relationships with diverse health professionals. After a community empowerment workshop at the World Health Organization Headquarters in Geneva, Switzerland, leaders of the International Federation of Medical Students Association invited the author to present lifestyle improvement workshops at their General Assembly. **Objectives:** The objectives for the workshops were to build integrative health care relationships and to motivate and empower students to improve their lifestyles through introspection and interactive incremental goal setting. **Methods:** The hour-long health promotion workshops spanned 4 days, focusing on partner-based learning utilizing lifestyle inventories. **Results and Discussion:** Workshop participants expressed enthusiasm for the pragmatic interactive format. Afterwards they noted that they feel more motivated in carrying out their local health promotion activities. An innovative learning tool, lifestyle inventories, was presented. **Conclusion:** Building trust and garnering interest are key elements of learning and lifestyle change. Few subjects are more important to health professional students than promoting health. Interaction and personalization add empowerment to learning.

Facilitating Development and Refinement of an Activity-Based Walking Module Through a Delphi Process: An Exercise in Integrative Health Empowerment and Shared Vision

Ron Kirk, John Hyland, Life University

Introduction: The alarming global trend toward sedentary living and obesity continues to accelerate. Hypokinetic disorders comprise the principal causes of morbidity and mortality in developed nations. Concerted integrative action is needed. **Objective:** The objective is to develop a broadly embraced activity module using a modified seed and Delphi panel process. **Methods:** An experienced facilitator convened seed and Delphi panels to develop a walking module through electronic surveys. Panelists included chiropractic college presidents; academic and clinical deans; researchers; officials and leaders of the World Health Organization, International Red Cross, Bone and Joint Decade, World Federation of Chiropractic, Association of Chiropractic Colleges, American Chiropractic Association, International Chiropractic Association, World Federation for Mental Health, NGO Alliance for Health Promotion, and Solar Cookers International; and many others. **Results:** Many national and global health organizations across a range of disciplines have incorporated the walking module on their websites and are actively encouraging their members and the public to become more physically active through walking. **Conclusions:** The seed and Delphi panels are currently catalyzing a global activity campaign. It is critical to become more active now.

A Survey of Student and Faculty Attitudes Toward Geriatric Wellness Care

Anupama Kizhakkeveettil, **David Sikorski**, and **Gene Tobias**, Southern California University of Health Sciences

Purpose: The purpose of this study was to identify the student and faculty attitudes toward geriatric wellness care at a chiropractic and acupuncture university. **Methods:** A survey was conducted with interns and faculty from chiropractic and acupuncture and oriental medicine programs. Questions were based on the Wellness Competency from the 2007 Standards of the Council on Chiropractic Education (CCE). Frequencies and inferential statistics were performed using SPS statistics. **Results:** Interns and faculty agreed on the value of the principles of wellness care for geriatric patients with some differences in emphasis. No significant differences were found between the two programs. **Discussion and Conclusions:** The survey results indicate that this institution is in compliance with the wellness competency within the CCE Standards. Most of the interns and faculty feel that they have the education, time, resources, and opportunity to provide wellness care to geriatric patients in this institution's clinical settings. Differences between interns and faculty responses may be attributed to differences in their education in geriatrics. Finally, the surveyed interns indicated that they intend to provide wellness care to geriatric patients in their future practices. This study was conducted using a sample size of 52. A larger sample would add power and yield better generalizability.

A Mechanoacoustic Indentor System for In Vivo Measurement of Nonlinear Elastic Properties of Soft Tissues

Terry Koo, **Jeffrey Cohen**, **Lisa Papenbrock**, and **Yongping Zheng**, New York Chiropactic College

Background: Muscle is a nonlinear viscoelastic material. Extracting its nonlinear elastic properties will aid detection, diagnosis, and treatment of muscle abnormality. **Objective:** To develop a mechanoacoustic indentor system and evaluate its test–retest reliability. **Method:** An indentor system using a linear actuator to drive a force-sensitive probe with a tip-mounted ultrasound transducer was developed. Twenty independent sites at the gluteal region from 11 asymptomatic subjects were indented at 6%/s for three sessions, each consisting of five trials. Tissue thickness, force at 25% deformation, and area under the load-deformation curve from 0% to 25% deformation were calculated. Optimized hyperelastic parameters were also calculated using an order-one Ogden material model. Using the optimized parameters, the load-deformation response on a standardized block was simulated and the corresponding area and force parameters were calculated. Test–retest reliability of each parameter was studied using intraclass correlation coefficients (ICCs). **Results:** All ICCs ranged between 0.970 and 0.999, indicating excellent test–retest reliability. **Conclusions:** The indentor system and its corresponding FE optimization method offers a viable technology to measure nonlinear elastic properties of soft tissues in vivo. The technology has the potential to quantify the effects of a wide variety of chiropractic techniques on soft tissue elastic properties.

Development of Classification and Description of Fascia Based on Literature Review: Rationale for Manual Therapists

Myroslava Kumka and **Jason Bonar**, Canadian Memorial Chiropractic College

Background: Controversy exists on the definition and terminology for fascia. **Purpose:** To further develop the classification and description of fascia based on literature review to improve manual therapists' diagnostic precision and treatment efficiency. **Methods:** Peer-reviewed articles and conference proceedings were reviewed through reproducible searches through EBSCO databases, PubMed, and Google scholar. **Results:** Fascia is an innervated, vascular, contractile, fibroblastic, uninterrupted connective tissue proper that allows myofascial force transmission. Being a pain generator, fascia is affected by soft tissue and joint manipulative therapies, as well as various modalities. Gross anatomical, histological, and biomechanical features of fascia include location, density, fiber organization, collagen type ratio, extracellular matrix content, and mechanotransduction. **Discussion:** Fascia can be organized into four major functional categories: separating, linking, fascicular, and compression. Separating fascia compartmentalizes the body with sheets and layers. Linking fascia has greater contractile and proprioceptive properties. Fascicular fascia contributes to muscle/tendon architecture by dissipating force within them. Compression fascia ensheathes limbs to influence contraction and venous return. **Conclusion:** This review provides insight into definition, description, and nomenclature of fascia.

Human Subject Research: Reporting Informed Consent and Ethics Approval in Three Chiropractic Journals

Dana Lawrence, Palmer College of Chiropractic

Objective: To assess the reporting of ethics approval and informed consent in articles published during the 2008 volume year of three chiropractic publications included in Medline and PubMed. **Methods:** A descriptive review of the articles published in each journal was conducted. Information collected included whether or not the paper involved human subject research, whether it reported ethics board approval, and whether or not informed consent was given. Data are presented as descriptive statistics (frequency counts and percentages). **Results:** In aggregate, 51 articles out of a total of 143 involved human subject research (36%). Forty-three reported ethics board approval (73%), while 28 reported that informed consent had been obtained (40%). Data for individual journals are provided as well. **Conclusion:** While all three journals have policies in place covering the ethical reporting of human subject research, this is a goal that is only partially being met. The importance of the ethical reporting of human subject research is discussed, and implications for future research are described.

Integration of Evidence-Based Practice Into the General Curriculum: Assessing Faculty Behavior

Ronald LeFebvre, Dave Peterson, University of Western States

Introduction: Our institution launched an evidence-based practice (EBP) curriculum based on the premises that this discipline should not be limited to specialty courses and that faculty collegewide should be trained. A 2010 survey reflected the degree of integration into the general academic program. **Methods:** Faculty behavior across academic divisions was assessed via a survey spanning multiple domains (eg, lecture notes, EBP concepts, quality of evidence, global impact) as part of an Institutional Review Board exempt education grant. **Results:** With a 100% response rate ($N = 29$), a picture emerged of the degree of integration and specific forms it has taken. Fifty-nine percent reported that the training had a positive effect. **Discussion:** The overall degree of integration appears to be favorable. The survey served as a useful vehicle to provide (1) a snap shot of integration, (2) assessment of individual instructor behaviors, (3) a very specific menu for future course development, and (4) a baseline for future assessment. **Conclusion:** A survey was administered to faculty to gauge the degree of EBP integration across our general curriculum. The data suggest that the EBP training over the prior 4 years has had a significant impact on the curriculum.

Degree of Vertical Integration Between the Undergraduate Program and Clinical Internship With Respect to Cranial and Cervical Diagnostic and Therapeutic Procedures Taught at a Chiropractic College

Charmody Leppington, **Brian Gleberzon**, **Lisa Fortunato**, **Nicole Doucet**, and **Kyle Vandervalk**, Canadian Memorial Chiropractic College

Objective: The purpose of this study was to determine the degree of vertical integration (VI) between the undergraduate program and clinical internship of diagnostic and therapeutic procedures for the cervical and cranial spine taught to students at Canadian Memorial Chiropractic College. **Methods:** A list was compiled of all diagnostic and therapeutic procedures of the cranial and cervical spine from course manuals from the Applied Chiropractic and Clinical Diagnosis courses of the college for the academic year 2009–2010. Clinicians were asked to indicate how frequently they used or required their interns to use each procedure. Demographic information was also obtained. **Results:** Most cranial diagnostic procedures were seldom used, with the exception of postural observation and palpation. Most cervical orthopaedic tests were often used, with the exception of tests for vertigo. Most therapeutic procedures were used frequently with the exception of prone cervical and "muscle" adjustments. **Discussion:** VI is an important element of curricular planning and these results may be helpful to aid educators to more appropriately allocate classroom instructional time. **Conclusion:** There was low degree of VI of cranial procedures as compared to a much higher degree of VI for cervical diagnostic and therapeutic procedures at this college.

Studying the Introduction, Integration, and Effectiveness of Chiropractic Services Within the VA Health Care System: A Novel Clinical/Research Collaboration

Anthony Lisi and **Brian Mittman**, Department of Veterans Affairs

Introduction: The Department of Veterans Affairs' (VA) introduction of chiropractic services offers a unique opportunity for policy-, practice-, and science-relevant research. A novel partnership was established between clinical leadership and health services research to study chiropractic service implementation, integration, and effectiveness. **Methods:** VA's chiropractic program (CP) and Center for Implementation Practice and Research Support (CIPRS) created a policy/practice/research partnership. A year-long process established common areas of interest and built a team to launch an initial study. Subsequent months focused on securing funding for the initial study, investigator training, data collection instrument development, and pilot testing. **Results:** Routine, open communication facilitates effective collaboration. The research agenda encompasses key questions relevant to clinical leadership plus research questions derived from current literature. The initial study employs a comparative case study approach guided by a program/logic model encompassing context, planning and implementation, clinic structure, process, and outcomes. The clinical/research partnership facilitated development of a comprehensive protocol balancing internal and external validity and incorporating insights from theory, research, policy and program leadership, and practice. **Conclusions:** Interprogram collaboration expands the reach of each party, yielding a superior study grounded equally in theory, research, policy, and practice and yielding a research agenda with clear and direct implications for program leadership and improvement.

Use of Veterans Health Administration Chiropractic Services Among Operation Enduring Freedom and Operation Iraqi Freedom Veterans

Anthony Lisi, **Joseph Goulet**, **Cynthia Brandt**, and **Todd Kawecki**, VA Connecticut Healthcare System

Introduction: The Veterans Health Administration (VA) recently began providing chiropractic services for the management of musculoskeletal conditions. Veterans of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) commonly seek care for musculoskeletal conditions; however, national use of VA chiropractic services among this population has not been described. **Methods:** The sample consisted of veterans listed on the VA's OEF/OIF roster, containing information on all U.S. military personnel discharged between September 12, 2001, and September 30, 2009. This information was linked to VA administrative and clinical databases to determine the number of veterans who had one or more visits to a VA chiropractic clinic. **Results:** Over the study period 3485 OEF/OIF veterans received chiropractic care in VA. Use increased each year from 2004 to 2009. Of the 3485 individuals, 507 (14.6%) were female, 1832 (52.6%) were white, and the mean age was 30.3 years (range 18–60 years). The most common primary diagnostic codes for each encounter indicate musculoskeletal disorders. **Conclusions:** Use of chiropractic services in VA by OEF/OIF veterans has been increasing since 2004. The primary diagnoses for which these patients were seen are disorders of the musculoskeletal system. Further work is needed to better understand the delivery of chiropractic services for OEF/OIF veterans.

Spinal Manipulation for Treatment of Hypertension: A Qualitative Literature Review

Kevin Mangum, **Darcy Vavrek**, and **Lester Partna**, University of Western States

Background: Spinal manipulation (SMT) has been reported in recent studies to be helpful in treating hypertension. This study is a qualitative review of the literature on the efficacy of SMT for treatment of hypertension. **Methods:** The literature was systematically searched in PubMed, MEDLINE, Cumulative Index to Nursing and Allied Health Literature, and Index of Chiropractic Literature. Included articles were rated using the Cochrane Collaboration's tool for accessing risk of bias. **Results:** Of 215 articles identified, 19 were potentially relevant; 10 relevant articles were assessed. Scores revealed two studies with low bias, three studies with unclear bias, and five studies with high risk of bias. Studies with unclear bias had a 5-fold increase in the clinical effect over those studies with low risk of bias. Studies with low risk of bias showed a nominal clinical effect. **Discussion:** Each selected study used a different SMT method, frequency of treatment, time of follow-up, and inclusion criteria. There were also considerable design and bias issues. These factors made it difficult to summarize blood pressure changes, across clinical trials, with SMT on hypertensive patients. **Conclusion:** Better designed and larger clinical trials are needed to assess if SMT is an effective treatment for treating hypertension.

A Comparison of Student and Alumni Perception of Value in Chiropractic Clinical Education

John Markham and **K. Caroline Anderson**, Life University

Objective: This pilot study surveyed students at three stages of their chiropractic clinical education (student clinic, outpatient clinic, preceptor clinic) to assess their perception of the value of their experiences. Alumni who had been through the clinical education program were also surveyed in order to compare their retrospective perceptions with currently enrolled students. **Methods:** Online surveys were sent to students and alumni that asked for their perception of value of different aspects of their clinic experience: teaching, adjusting, practice preparation, diagnosing, case management, chiropractic communication, patient variety, extra effort encouraged, and talked to others about the class. **Results:** Of 410 surveys sent out, 90 participated. The student responses were equal in the number of male and female respondents. The alumni had slightly more males than females responding (19 male, 14 female). The student and alumni were both mostly between 26 and 31 years of age (41) with slightly more over 31 years (27) than below 26 years (22). Current students and alumni both report a favorable perception of their clinical training experience. **Conclusion:** While the respondents were generally satisfied with their clinical education at each level, students tended to have a less favorable perception of their clinical learning experience than did alumni. Alumni considered the preceptorship as their most satisfying clinical education experience.

Complementary and Alternative Medicine for Neuropathic Pain: A Literature Review

John Mayer and **Scott Haldeman**, University of South Florida

Introduction: Neuropathic pain is common, disabling, and difficult to treat. While the use of complementary and alternative medicine (CAM) appears to be extensive in those with neuropathic pain, the safety and effectiveness of CAM therapies is not well understood. The purpose of this study is to summarize the literature about common CAM therapies for neuropathic pain. **Methods:** A systematic search of the literature in the CINAHL, EMBASE, and MEDLINE databases was conducted using a strategy developed by the authors. **Results:** Thirty randomized controlled trials (RCTs) studying 3289 cases were found to be eligible, including acupuncture (3 RCTs), acupuncture and B vitamins (1 RCT), alpha lipoic acid (6 RCTs), alpha lipoic acid and B vitamins (1 RCT), B vitamins (6 RCTs), manipulation (5 RCTs), transcutaneous electrical nerve stimulation (5 RCTs), and transcranial magnetic stimulation (3 RCTs). **Discussion:** The CAM therapies assessed in this review appear to be safe when administered for neuropathic pain. Overall, the available evidence of efficacy regarding common CAM therapies for neuropathic pain was limited and the results were mixed. **Conclusion:** CAM for neuropathic pain is an area of promise with a huge patient interest. CAM researchers should consider conducting high-quality comparative effectiveness research trials on CAM therapies for neuropathic pain.

Clinical Simulation and the Evolution of Chiropractic Education

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

Introduction: Health care educators seek to provide real-world experiences in diagnosis and care. Simulation environments in medical and nursing schools address this. This study represents the first time such an environment has been implemented in chiropractic education. The aims of this pilot were to provide data regarding feasibility of the program, perceived satisfaction, anxiety levels faced (dependent on role played), and the extent to which learning outcomes were achieved. **Methods:** Simulation experiences were provided to student interns and their clinicians at the main campus, summer 2010 clinic program. Life-sized mannequins were used as the patient. Each simulation consisted of a patient in the chiropractic clinic who presented with rib pain that was in fact a cardiac event. After Research Ethics Board approval, questionnaires were used to measure all outcomes. **Results:** Descriptive results indicated that participants perceived good usability of the lab and satisfaction ratings were high. Anxiety was especially high for students designated as doctor ($F = 8.07$, $p = .001$). It was perceived that the learning objectives had been met. **Discussion:** Simulation experiences were favorably received by participants. Learning objectives were met and results were consistent with theories that drive simulation environments in other professions. **Conclusion:** The mannequin-based simulation program should be considered for expansion.

Application of the Medical Imaging Resource Center Radiology Database in a Chiropractic Educational Environment

Ian McLean, Palmer Chiropractic College

Objective: To describe the process of installing and developing a radiology teaching file based on the Radiological Society of North America's (RSNA) Medical Imaging Resource Center (MIRC) software system. **Introduction:** The MIRC project was initiated by the RSNA Radiology Informatics Committee specifically for developing libraries of radiology data. Installation of the software sets up a local MIRC Web Server capable of distributing data. **Method:** The MIRC library and associated software was installed in a large Midwest chiropractic college allowing distribution of images to learners through an intranet environment. The authoring process is initiated by logging into the designated server and accessing the Basic Authoring Tool. **Results:** The library is actively functioning with distribution of radiology teaching cases across multiple campuses. The cases are frequently utilized by students in preparation for Objective Structured Clinical Examinations (OSCE) and national board examinations. **Discussion:** Radiology education is strongly dependent on visual data, requiring students to review and master a large volume of images. While film-based libraries have adequately served educational processes, they are expensive to produce and maintain. The software-based radiology database is a preferable alternative that effectively disseminates clinical information and diagnostic images to learners.

Using Clinical Case Studies to Teach Biochemistry in a Chiropractic Doctoral Program: The Art of Integrating Clinical Science With Basic Science

Marc McRae, National University of Health Sciences

Introduction: Biochemistry has traditionally been taught through lectures and rote memorization, paying little attention to nurturing key problem-solving skills. The literature on clinical case studies utilized in health education indicates that case studies facilitate and promote active learning, help clinical problem solving, and encourage the development of critical thinking skills. **Methods:** This paper describes a method of using clinical case studies to deepen and solidify the students' understanding of biochemical facts and concepts as related to clinical medicine. **Discussion:** Clinical case studies are a valuable addition to the traditional methods of lecture, textbook reading, and laboratory for teaching biochemistry. More important, clinical case studies help remind students that what they are learning has relevance in the real world and may help motivate students to pay more attention to the numerous facts faced in biochemistry.

The Case for Collaborative Assessment of Students: A Meta-analysis

Christopher Meseke, **Jamie Meseke**, and **Rita Nafziger**, Palmer College of Chiropractic Florida

Objective: This study evaluated the efficacy of collaborative assessment on student performance. **Methods:** Electronic and print resources were used to identify references for inclusion in this review including ERIC, CINAHL, MEDLINE, and Academic Search Premier. Search terms used were collaborative testing, cooperative testing, and group testing. Cohen's d was used to identify differences in assessment performance, final examination performance, and final grades. Comprehensive meta-analysis was used for computations. **Results:** Of the 220 articles identified, 29 were nonduplicated, complete articles. An additional 17 were identified from reference sections of related articles. Collaborative testing groups significantly outscored the control groups on unit exams (Cohen's $d = 1.103$, $p < .01$). Final examination grades did not differ between students taking the exam solo or collaboratively (Cohen's $d = -0.005$; $p > .05$). Course grades of students involved with collaborative testing were higher than those involved with traditional testing (Cohen's $d = 0.811$; $p < .001$). **Conclusion:** Collaborative testing seems to be a powerful technique for the improvement of student performance. However, the efficacy of collaborative testing also seems to be relatively short-lived. While performance may improve during the assessments in which the group format is used, no improvements are seen when students take the assessments solo. The claim of increased learning is equivocal, based on final examination performance.

Low Back Pain Response to Pelvic Tilt Position: Practice-Based Research, Phase 2

Salvatore Minicozzi, **Brent Russell**, and **Kathryn Ray**, Life University

Introduction: This was an evaluation of the pelvic tilt exercise, as a provocative test for low back pain. **Hypothesis:** Patients experiencing pain in response to a pelvic tilt exercise are more debilitated and have a poorer response to care. **Methods:** Prospectively collected data (group 2) from the principal investigator's chiropractic practice were pooled with earlier data retrospectively collected (group 1). Patients were categorized according to pelvic tilt response: pain (positive) versus no pain (negative), and compared by quadruple visual analog scale, Revised Oswestry Disability Index (group 2 only), age, body mass index, gender, pain location, and chronicity. Postcare data were available and analyzed only for group 2. **Results:** Precare, positive patients had statistically greater levels of pain and disability and pain extending into the lower extremity. Their care outcome was not poorer than patients with a negative response. **Discussion:** The small number of positive patients ($n = 8$) limits the postcare analysis, and all patients were from the practice of a single doctor. The meaning and usefulness of the findings are questionable. **Conclusions:** Patients experiencing pain in response to a pelvic tilt appear to have a poorer precare status but may not have lesser outcomes from care. Additional data may shed light on whether this maneuver would be useful to practitioners.

Effects of Satisfaction of Search on Chiropractic Radiologist Performance

Christopher Morasco and **John Taylor**, D'Youville College

Introduction: This study was designed to determine how the phenomenon of satisfaction of search affects chiropractic radiologists' performance in interpreting radiographic images. **Method:** A hotel banquet room at the 2009 ACCR Workshop was converted into a diagnostic imaging interpreting laboratory. Fifteen sets of spine and musculoskeletal radiographs containing one, two, or three clinically significant abnormalities were placed on illuminated view boxes. **Results:** A total of 33 chiropractic radiologists attending the workshop participated by identifying all clinically significant abnormalities on each set of radiographs. **Conclusion:** The results of the study indicated that a satisfaction of search phenomenon existed among chiropractic radiologists.

Usefulness of Clinical Measures of Psychological Factors in Patients With Spinal Pain

Donald Murphy and **Eric Hurwitz**, Alpert Medical School of Brown University and New York Chiropractic College

Introduction: Psychological factors have been found to be important contributors to pain and disability in patients with neck pain (NP) and low back pain (LBP). Detection of these factors involves time-consuming questionnaires that usually only capture a single dimension and may not be useful in a busy practice environment. The purpose of this study was to investigate whether a simple screening procedure can capture the most important psychological factors with minimum burden to the patient and to investigate correlations among the various psychological factors. **Methods:** A screening procedure consisting of measures of fear, coping, anxiety, and depression was provided to patients with NP or LBP as part of the usual initial assessment process at a busy spine center. **Results:** Data were collected on 95 NP and 260 LBP patients. Significant correlations were found between virtually all psychological measures within the screening examination in both cohorts. Significant associations (prevalence ratios) were found between all measures in LBP patients but not in NP patients. **Conclusion:** A simple screening procedure can provide useful clinical information regarding psychological factors that are of potential relevance in patients with NP and LBP. It is likely that these psychological processes have close interaction rather than existing as isolated phenomena.

For the Good of All: A Collaborative Effort to Develop and Deliver an Excellence in College Teaching Certificate Program for Chiropractic College Faculty

Rita Nafziger, Palmer College of Chiropractic

Background: This study details the creation of a training program to improve pedagogical skills and best practices for chiropractic college faculty. Additional goals of the project are to encourage peer networks among academic personnel and minimize program costs while maximizing training opportunities for faculty. **Methods:** Common training needs among regional colleges resulted in a professional development network (PDN). Learning outcomes and portfolio artifacts for program workshops were developed and peer reviewed by a faculty PDN team. Responsibility for course design, materials, and delivery was distributed among team members based on expertise and interest. College meetings were held to gain support for the program and identify chiropractic faculty participants.

Results: Participants in the Excellence in College Teaching (ECT) certificate program complete five core courses plus one elective and submit a portfolio for peer review within a 3-year period. Faculty participation has exceeded expectations. Course evaluations are uniformly positive, and learner feedback guides future programs. **Conclusion:** The ECT program's initial goals have been achieved. A high-quality, low-cost program to strengthen teaching skills of college faculty was developed and delivered. Positive response has ensured the program's continuation and supports peer-to-peer connections among individual faculty and faculty development leaders.

Use of Sports Enhancement Supplements by Adolescents in the United States: Analysis of National Health Interview Survey 2007 Child Alternative Medicine Core Sample

Harrison Ndetan, **Will Evans**, **Ronald Williams**, **Michael Perko**, and **Clark Walker**, Parker Chiropractic College

Objectives: The aim of this study was to assess self-reported use of supplements to enhance sports performance among an adolescent subset of the National Health Interview Survey (NHIS) data set and consequently to determine the national population estimates (NPE) of those using herbal, vitamin, or mineral supplements within this sample. **Methods:** SAS version 9.1.3 was used to generate NPE of adolescence usage of herbs, vitamins, and minerals from the Child Alternative Medicine Core sample of NHIS 2007 data set. Odds ratios (OR) and 95% confidence intervals (CI) were calculated using binary/multiple logistic regression models that assessed the likelihood of adolescents reporting using those supplements in general to improve sports with respect to various demographic variables. **Results:** Usage of supplements to enhance sports was reported by over 1.2 million (1.6%) adolescents; among which 94.5% used multivitamin and/or mineral combination, 43.5% used fish oil/omega3/DHA fatty acids, 34.1% used creatine, and 25.9% used fiber or psyllium. In general, reported usage increased with age ($p < .001$); males more likely than females (OR = 2.1; 95% CI = 1.3–3.3); and high school students more likely than those at lower levels (OR = 1.87, 95% CI = 1.13–3.08). No statistically significant effects were noted on adolescence usage by parent-based demographics such as mother and/or father presence in the family or their level of education. **Conclusion:** A considerable number of adolescents in the United States report using various types of herbal, vitamin, or mineral supplements to improve sports performance. A large proportion used multivitamin and/or mineral combinations. Usage could be predicted by age, gender, and level of education but less likely by parent-based demographics.

Integration of Evidence-Based Clinical Practice Into a Basic Science Course

Lia Nightingale, Palmer College of Chiropractic

Introduction: Evidence-based clinical practice (EBCP) has permeated every health care profession, including chiropractic. The focus of this project was to incorporate EBCP concepts into a first-trimester nutritional biochemistry course at a chiropractic institution. Course learning outcomes were changed to integrate EBCP concepts, including interpretation of relative risk, absolute risk, odds ratios, and number needed to treat. **Methods:** Four complete lectures were developed to teach EBCP concepts and its functionality in a chiropractic practice. Several new slides were added to each previously taught lecture to illustrate the importance of EBCP throughout the course. Quiz and exam questions were written to reflect the new material and an assignment was developed to guide students in the process of using evidence in practice via the four A's (ask, acquire, appraise, and apply). **Results:** Initial examination illustrated improved student performance on exam questions and written papers, but further assessment is required. **Conclusion:** Integration of EBCP concepts into a basic science course in a chiropractic curriculum promotes meaningful learning and enhances critical reasoning skills. Furthermore, addition of EBCP has taken a preclinical biochemistry course and made it relevant to patient care, enhancing student satisfaction.

Concept Mapping as a Study Tool for Chiropractic Students in a Basic Science Course

Lia Nightingale, Palmer College of Chiropractic

Introduction: Concept mapping is a tool used to visually arrange concepts and illustrate interrelationships between information, rather than rote memorization employed in most basic science courses. This instrument has been used to increase critical thinking skills and has been shown to improve knowledge retention and recall from elementary through postsecondary students. **Objective:** The objective of this experiment was to utilize concept mapping as an in-class review tool for Biochemistry One. **Methods:** Hand-drawn concept maps were completed as a review for the remaining two exams. Exam results were compared with the previous trimester on identical exams, anonymous student comments were collected, and in-class discussions were held. **Results:** Results indicated that concept mapping

improved mean exam performance, increased the percentage receiving an A on both exams, and drastically decreased the number of failing students. Student comments also favored the use of concept mapping as a study aid. **Conclusion:** Overall, concept mapping in a basic science course was shown to positively influence exam grades, decreased the number of exam failures, and was found to be a beneficial in-class review tool by the majority of the class.

Are Chiropractors Adequately Prepared to Handle the Obesity Epidemic?: A Review

Catherine O'Neill, Private Practice

Introduction: Obesity rates continue to climb in the United States, soon to become the number one cause of preventable death. The purpose of this review was to determine if chiropractic educational requirements and clinical practice reflect appropriate measures to address the behavioral and psychological factors that contribute to obesity. **Methods:** Chiropractic educational requirements set forth by the Council for Chiropractic Education were reviewed, along with scholarly articles on the implementation of obesity treatment and prevention programs by interns and practicing chiropractors. **Results:** Chiropractors, students, and faculty tend to agree that they should educate patients on proper diet and exercise, although some do not practice this belief. A very small percentage of chiropractic coursework is devoted to public health and does not necessarily address the specific factors related to obesity. **Discussion:** Obesity causes a myriad of systemic diseases as well musculoskeletal and spinal complaints. Chiropractic education should include learning about the specific factors that lead to obesity, the psychological components, and how to create effective interventions. **Conclusion:** More research needs to be done on the implementation of obesity-specific courses for chiropractic students and the impact they could potentially have on preventing and treating obesity.

Paraspinal Muscle Function Assessed With the Flexion–Relaxation Ratio at Baseline in a Population of Patients With Back-Related Leg Pain

Edward Owens, **M. Ram Gudavalli**, **Craig Schulz**, **David Wilder**, **Maria Hondras**, and **Gert Bronfort**, Northwestern Health Sciences University

Objective: The objective of this study was to assess back muscle status at baseline in patients suffering from back-related leg pain (BRLP). **Methods:** A total of 210 patients signed written informed consent approved by the Institutional Review Boards in two metropolitan areas in the Midwest United States. The authors used state-of-the-art surface electromyography (EMG) equipment, electromagnetic motion tracking, and force plates to detect flexion–relaxation (FRR). Surface EMG electrodes were attached with standard skin preparation over the right and left paraspinal muscles at L3. Participants moved from upright standing into full forward flexion, rested flexed for 1 second, and returned to the upright position. A descriptive analysis was performed on variables describing muscle activity, motion, and clinical characteristics to identify trends in the data. **Results and Conclusion:** The study found very high repeatability, with ICC (1,3) 0.94 for the left side and 0.86 for the right between three cycles of assessment at the same session. BRLP patients exhibited a loss of FRR. Higher Roland Morris Disability Questionnaire scores are related to lower FRR, and heavier patients displayed lower FRR. Range and timing of lumbar motion also influenced FRR.

Alberta Chiropractors' Opinions and Practices Regarding the Sale of Health Products

Stacey Page, **Jaroslaw Grod**, and **Gord McMorland**, University of Calgary

Background: Arguments for and against health product sales by health professionals have been made. Those in favor suggest it is a convenience for patients and may influence product quality and patient adherence. Those opposed argue it undermines the integrity of the profession and brings motives into question. **Objectives:** To describe opinions and practices of chiropractors in Alberta, Canada, regarding health product sales. **Methods:** A random sample of 544 chiropractors was mailed a survey soliciting opinions and practices on health product sales. This study was approved by the Conjoint Health Research Ethics Board, University of Calgary. **Results:** Surveys were returned by 50%. Ninety-five percent of respondents thought chiropractors should sell health products and 90% currently sold products. Most commonly, orthotics, pillow, and supplements were sold. Five percent of respondents believed product sales are unethical and 23% believed they created a conflict of interest. Fifty percent knew of the Canadian Chiropractic Association's code of conduct statement in this area. **Conclusion:** The majority of chiropractors endorse product retailing and many do so in practice. Individual practitioners are responsible for informing themselves about professions' standards of practice. Chiropractic may wish to re-examine policies to ensure current professional guidance is sufficient.

Perceived Educational and Chilly Climate Among Chiropractic Undergraduates

Per J. Palmgren, Scandinavian College of Chiropractic

Introduction: The educational environment has a significant impact on students' behavior, sense of well-being, and academic advancement. The objectives of this study were to identify the perceived educational environment in a chiropractic educational institution and the effects of respondents' demographic background on possible perceptual differences. **Methods:** The perceived educational environment was surveyed using Dundee Ready Education Environment (DREEM) and Perceived Chilly Climate Scale (PCCS) and focus group interviews. **Results:** Both surveys had high response rates (83%). The DREEM score was very high (78%). However, certain individual items were consistently perceived negatively. No significant DREEM score variations were observed with demographic variables. The PCCS score was significantly lower ($p < .05$) among females than males, immigrants than nonimmigrants, and ethnic minority than ethnic majority. Differences in educational climate were identified under 19 themes in the focus group interviews. **Conclusions:** The highest DREEM score compared to the published literature is indicative of an excellent overall educational environment at the institution. However, certain specific aspects of the educational process may need to be addressed. The high PCCS score among females, which are related to gender discrimination, needed immediate attention. As identified during the focus group sessions, a diverse approach may be needed to address the issues identified.

Attitudes of Canadian Memorial Chiropractic College Clinicians Toward the Chiropractic Treatment of Nonmusculoskeletal Conditions

Jodi Parkinson, **Jennifer Lau**, **Sandeep Kalirah**, and **Brian Gleberzon**, Canadian Memorial Chiropractic College

Objective: The objective of this study was to determine the attitudes of clinical faculty during the 2009–2010 academic year at Canadian Memorial Chiropractic College toward the treatment of various nonmusculoskeletal disorders. **Methods:** A confidential online survey was distributed to the clinical faculty via e-mail. It consisted of several questions polling the demographic of the respondent, such as years in clinical practice, and a list of 29 nonmusculoskeletal conditions. Clinicians were asked to indicate their opinions on each condition on a rating scale ranging from strongly agree to strongly disagree. **Results:** Twenty of 22 clinicians responded. The conditions garnering the greatest positive ratings include asthma, constipation, chronic pelvic pain, dysmenorrhea, infantile colic, and vertigo. The options regarding vertigo and asthma, while demonstrating an overall positive attitude toward the benefits of chiropractic care, were stratified among clinicians with varying years in clinical practice. **Conclusion:** This study suggests that clinicians at this college are moderately open to the chiropractic treatment of some nonmusculoskeletal disorders.

Integration and Utilization of a Chiropractor Within a Veterans' Health Administration Pain Management Telehealth Clinic

David Paris and **Andrew Dunn**, Veterans' Health Administration

Introduction: Telehealth has known utility in providing specialty care and/or primary care to patients in remote settings and is primarily utilized to provide appropriate, necessary care and follow-up for various conditions. The purpose of this paper is to describe the utilization of a chiropractor as a telepresenter within a Veterans Health Administration (VHA) Telehealth program. **Methods:** A brief descriptive report including an example is provided. **Results:** In the example of chiropractic involvement with Telehealth, the chiropractor served as the telepresenter, providing the hands-on evaluation for a remotely located pain specialist. **Discussion:** The consultative model used in this VHA Pain Management Telehealth Clinic may be useful in instances where case management is the predominant need. This program and the technology that support it provide for a unique opportunity for chiropractors to contribute to patient care within the context of integrated pain management. **Conclusions:** This report provides a brief summary of Telehealth and an example of a chiropractor within an integrated health care setting contributing to a Telehealth program. As chiropractors become more involved within mainstream health care, opportunities may exist to contribute to patient care in ways not generally considered within traditional chiropractic practice.

Somatosensory Integration and Behavioral Measures Associated With Vibrotactile Letter Acquisition During Task-Irrelevant Median Nerve Paresthesia

Steven Passmore, **Bernadette Murphy**, and **Timothy Lee**, University of Manitoba/New York Chiropractic College

Introduction: The present study quantified the effect of task-irrelevant paresthesia on tactile perception. Specifically, median nerve paresthesia was induced during an ulnar nerve-dependent vibrotactile Morse Code task. **Methods:** Ethics approval was obtained and 12 healthy volunteers (20–28 years old) unfamiliar with Morse Code received electrically induced paresthesia at the right forearm, or no paresthesia, on separate days during letter acquisition trials. Vibration patterns representing eight Morse Code letters were individually and randomly delivered to the palmar surface of the distal aspect of the right fifth digit. Participants indicated the letter they believed was communicated before augmented feedback was displayed. Behavioral measures included response accuracy and total response time (TRT). Somatosensory evoked potential (SEP) peak amplitudes were compared pre- and post-letter acquisition as a neurophysiological measure of central processing. **Results/Discussion:** Across all acquisition trials accuracy increased, TRT decreased, and SEP peak N18 increased. These findings demonstrated predictable improvement during letter acquisition. Attenuation of SEP peak N24 amplitude occurred exclusively with paresthesia, $F(1,11) = 7.37$; $p = .02$. This revealed a task-associated change in somatosensory integration. **Conclusion:** Task-irrelevant perturbation yields a measurable effect on central sensory processing. These findings serve as a model to quantify altered somatosensory processing of individuals with paresthesia.

Use of Soft Tissue Manual Techniques by Chiropractors in the United Kingdom

Abigail Penson, **Gabrielle Swait**, and **Christina Cunliffe**, McTimoney College of Chiropractic

Introduction: Spinal manipulation and massage are each effective in improving patient outcomes. It is unclear whether soft tissue manual techniques (STMT) have a role in chiropractic practice. It may be that in some cases STMT are seen as part of chiropractic practice and therefore they are not differentiated in research. **Objectives:** To investigate the extent of STMT education and utilization in the treatment of low back pain (LBP) among chiropractors in the United Kingdom (UK). **Methods:** After IRB/Ethical approval, a descriptive cross-sectional self-administered structured web-based survey was designed, piloted, and distributed to 853 associates, members, and fellows of the College of Chiropractors in the United Kingdom. **Results:** A total of 290 completed questionnaires (34% response rate) were collected. Ninety-six percent ($n = 278$) of respondents had used STMT as part of their treatment for LBP and of those 95% ($n = 264$) found them to be effective. Sixty-three percent ($n = 175$) perceived STMT to be either most often or always effective. Eighty-three percent ($n = 229$) believed UK chiropractors should be trained in STMT. Eighty-eight percent ($n = 255$) respondents had received soft tissue instruction in their chiropractic training. **Conclusion:** STMT appear to be regularly employed by UK chiropractors as part of their treatment for patients with LBP, which may suggest that they view STMT as an effective part of this regimen.

Effect of the Mechanical Characteristics (Magnitude and Duration) of a Spinal Manipulative Thrust on Lumbar Paraspinal Muscle Spindle Discharge

Joel Pickar, **William Reed**, **Dong-Yuan Cao**, and **Gregory Kawchuk**, Palmer College of Chiropractic

Background: Neural responses to a high-velocity, low-amplitude (HVLA) spinal manipulation may be dependent on the mechanical parameters that chiropractors control during the manipulation, including its speed, magnitude, preload, contact location, and direction. **Objective:** To determine the effect of a lumbar HVLA spinal manipulation's duration and magnitude on the activity of 120 lumbar paraspinal muscle spindle afferents in anesthetized cats. **Methods:** Manipulative thrusts using a feedback-controlled motor were delivered as linear ramps rising to a peak within each of seven durations between 25 and 250 ms. Peak thrusts reached 25%, 55%, and 85% of body weight (BW) under force control, and reached 1, 2, and 3 mm under displacement control. **Results:** Spindle afferent discharge was graded with the increase in peak thrust under displacement but not under force control. Under displacement control, discharge increased in a curvilinear fashion as thrusts became faster. An inflection was observed between 100 and 150 ms for all displacements. Force-controlled spinal manipulation produced a sigmoidal increase in spindle discharge with a threshold change occurring between 100 and 150 ms for the 25% BW thrust and between 75 and 100 ms for the 55% or 85% BW thrust. **Conclusion:** These data indicate that both thrust duration and magnitude shape the neural response of lumbar muscle spindles to HVLA spinal manipulation.

Evaluation of Three Different Methods of Distance Learning for Postgraduate Radiology Education: A Pilot Study

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Introduction: Chiropractic radiology residency education has traditionally utilized face-to-face sessions to guide residents in training. Delivering these sessions efficiently can be a challenge for faculty and residents. Recent advances in web technologies have led to an increase in popularity of distance learning programs in health care education. The purpose of this prospective controlled pilot study is to evaluate the perceived effectiveness of three web-based educational delivery methods in achieving of the course objective and goals. **Methods:** Three instructors from different geographic locations led different miniradiology courses using asynchronous discussion board, synchronous web conferencing, and asynchronous presentations with voice-over PowerPoint technologies. Qualitative surveys were sent to residents and radiologists for evaluation. **Results:** Forty-six individuals volunteered to participate in the study; 20, 15, and 10 participants, respectively, completed the three surveys. The evaluated teaching methods demonstrated high levels of perceived effectiveness in achieving the course objective and most of the goals. **Discussion:** A technology-oriented and image-based field such as radiology is well suited for online courses. Careful attention to teaching methodologies and high level of interactivity between participants is required to be successful. **Conclusion:** The findings suggest that the use of distance education can be of benefit to the training of chiropractic radiology residents.

Does Chiropractic Internship Prepare Students for Private Practice? A Comparison of Conditions Seen in One College to the National Board of Chiropractic Examiners Job Analysis of Chiropractic

Kevin Rose, **Jesika Menasaka**, and **Anupama Kizhakkeveettil**, Southern California University of Health Sciences

Introduction: Chiropractic colleges are charged with training their students to deal with the variety of patient conditions that they will encounter in their future practice. There are reasons to suspect that chiropractic interns may see patients with different conditions than private practitioners. This study evaluated one chiropractic college's conditions seen to those of private practitioners as reported in the *Job Analysis of Chiropractic* (JAC). **Methods:** Los Angeles College of Chiropractic (LACC) interns are required to complete a clinic log for each patient whom they treat. The primary diagnosis from all clinic logs submitted over 3.5 years was compared to those of the JAC. **Results:** A total of 198,559 clinic logs submitted by 541 interns were analyzed. Large differences in LACC versus JAC conditions included those of the neck (32.5% vs. 18.7%), low back/pelvis (32.4% vs. 23.6%), wellness (1.9% vs. 8.0%), and headache (1.7% vs. 12.0%). **Discussion:** LACC students reported treating more neck and low back pain than private practitioners and less headache and wellness patients. This may be due to the nature of professor clinicians at LACC and the large number of students treated. **Conclusion:** This study may be useful for chiropractic internship administrators who are designing programs to educate interns in clinical practice.

Evidence-Based Clinical Practice in Chiropractic: Description of a Class Assignment and Survey of Student Knowledge and Attitudes

Robert Rowell and **Michael Tunning**, Palmer College of Chiropractic

Introduction: Recognizing the importance of evidence-based clinical practice (EBCP), the authors initiated an assignment in which students use EBCP. Following this assignment, a survey was conducted of attitudes and comfort with evidence-based practice. **Methods:** Students participated in a lecture introducing EBCP, then critiqued an article as a group discussion, then designed a PICO (Patient, Intervention, Comparison, Outcome) question, searched the literature, and critiqued an article that they found. A short survey was conducted after they completed the assignment. **Results:** Out of 126 students registered for class, 86 surveys were collected (68%). Seventy students (81.4%) did a literature search. **Discussion:** These students had little training in EBCP prior to this assignment. They feel their skills in literature searching are generally good. However, several students did not perform a literature search. Most students used good sources of information, such as PubMed or Dynamed for their literature searches. Many students feel that they have some skills in EBCP. **Conclusion:** The topic of EBCP was introduced in a class assignment and students' attitudes and self-rated understanding of EBCP were assessed.

Prevalence of Swine Flu Among Chiropractic Pediatric Patients

Drew Rubin and **Kurt Kunz**, Life University

Introduction: The swine flu of 2009–2010 is not a new form of influenza. In 1918, 500 million people across the globe were infected with the H1N1 flu. It was not until the 1930s that scientists realized that the flu actually had its origins in pigs. In 1977, H1N1 reappeared, and it has existed in the population at various rates until its explosive jump in April of 2009. This paper studies the prevalence of swine flu H1N1 subtype A in a chiropractic pediatric population. **Method:** Members of the International Chiropractic Pediatric Association were polled via e-mail to determine how many of the members had pediatric patients who contracted swine flu. **Results:** For pediatric patients (age 0–18), 64.81% of practices observed no cases of swine flu over the flu season of 2009–2010. The mean distribution of pediatric cases of swine flu was 1.24 cases per office. **Conclusion:** A total of 84.46% of chiropractors surveyed said that in their practices their pediatric patients either did not contract H1N1 or only one to two of their pediatric patients contracted H1N1. This implies that chiropractic pediatric patients apparently had less prevalence of swine flu in the 2009–2010 pandemic than the general population.

Current Status of Pediatric Education in Accredited Chiropractic Colleges: A Website Survey

Drew Rubin, Life University

Introduction: The first chiropractic textbook, *Modernized Chiropractic*, published in 1907, contained references to pediatric care. *Chiropractic Hygiene and Pediatrics* was written by Dr. John Craven in 1924. Hence, the idea of a separate branch of chiropractic for pediatric patients has been promoted since the profession's infancy. In this study, the current status of pediatric chiropractic education across the globe was evaluated. **Methods:** To assess pediatric curriculum at accredited chiropractic colleges across multiple continents, all chiropractic college websites were examined to see what pediatric courses were offered according to their online academic catalogs. **Results:** The results were tabulated in several categories to determine which schools listed pediatric diagnosis, pediatric technique, combined diagnosis and technique, or no pediatric class on the website. This research revealed 23 out of 35 schools worldwide had at least one pediatric class within their curriculum. **Conclusion:** Pediatric education in chiropractic is still not fully realized. Some schools do not appear to teach pediatrics, while others have pediatrics significantly in the curriculum. It is recommended that accredited chiropractic institutions have at least one required class in pediatrics to meet the potential future demand.

Attitudes of Life Coaching in a Chiropractic University Setting

Lisa Rubin, Life University

Introduction: This study is a preliminary look at Life Coaching and its introduction as a program of study at a chiropractic university. This course appears to be the first in-classroom education system for this type of certification in the country. This paper explored Life Coaching for future educational purposes within chiropractic curriculum, since the coaching principles could help chiropractors become better communicators and offer other varied services to their patients. **Methods:** Data were collected by administering questionnaires to students at the university. A hard copy was distributed to chiropractic and undergraduate students. **Results:** The chiropractic students reported that 70% feel that Life Coaching coursework could help in their future career path, and 23% plan to practice Life Coaching concurrently with another career such as chiropractic. **Discussion:** There appears to be a positive response to Life Coaching on campus. Chiropractors could conceptually incorporate coaching components into their existing profession through guiding their patients with wellness, nutrition, exercise, and overall health advice. It would seem that Life Coaching would be a good fit to training all chiropractic students with coaching techniques to help their patients' overall wellness concept.

Utilization of Dry Lab in a Chiropractic Educational Setting

Lisa Rubin, Life University

Introduction: Dry labs at this university are utilized for anatomy classes using plastic models instead of cadavers, so students are not exposed to contraindicated chemicals if they have a diagnosed condition. **Methods:** Questionnaires were e-mailed to the appropriate staff, faculty, or administrator who oversees anatomy labs at chiropractic colleges in the United States. Questionnaires included items related to schools offering a dry lab at their chiropractic school, format for documentation, and utilization by students. Limited responses were collected so all data were only from the

author's university setting. **Results:** The majority (75.4% over the past year) of the documented reasons to use dry lab were chemical sensitivities or allergies. Other documented issues for the past year were pregnancy/nursing (7.25%), medical issues (5.80%), temporary injuries (0%), psychiatric disorders (5.80%), disability accommodations (0.72%), and asthma (6.52%). **Discussion:** Life University has offered an alternative for individuals who have specific documented reasons to not be exposed to formaldehyde. Future research would be needed to assess students' performance in these classes academically as well as on their national board licensing exams taken in the future.

Do Chiropractic Philosophy and Chiropractic Technique Prevent Medicare Compliance?

David Seaman and **Jonathan Soltys**, Anabolic Laboratories

Introduction: Appropriate Medicare compliance is an issue that is being actively pursued by the chiropractic profession. The objective of this paper is to identify factors within chiropractic education and practice that may prevent Medicare compliance with the purpose of improving patient care and reducing the potential for negative postpayment audit outcomes. The relevance of this topic has been outlined in a 2009 report published by the Office of Inspector General (OIG) of the United States Department of Health and Human Services entitled "Inappropriate Medicare Payments for Chiropractic Services," which estimated that approximately 47% of paid chiropractic claims were inappropriate. **Methods:** Medicare chiropractic documentation requirements and practice guidelines were identified in the 2009 OIG report, the *National Medicare Benefit Policy Manual*, and the Florida Local Coverage Determination (LCD). Five documentation requirements were contrasted with chiropractic philosophy tenets and chiropractic technique goals to identify inconsistencies that may prevent Medicare compliance. **Results:** A conflict appears to exist between Medicare documentation requirements for identifying and treating spinal subluxation versus the approach espoused by chiropractic philosophy and chiropractic technique systems. **Conclusion:** The Medicare version of chiropractic practice is not consistent with chiropractic philosophy and technique applications, which may play a role in preventing Medicare compliance.

Development of the Murdoch Chiropractic Graduate Pledge

J. Keith Simpson, **Barrett Losco**, and **Kenneth J. Young**, Murdoch University

Purpose: This paper reviews the origins of the learned professions, the concepts of professionalism, and the common elements within healers' oaths toward the goal of the development of a new graduate chiropractic pledge. The new pledge was considered necessary by the school in order to incorporate modern cultural concepts such as continuing professional development and to be more inclusive of all peoples than currently existing oaths. **Methods:** A committee performed literature searches on the topic of professionalism and healers' oaths and used the Quaker consensus process to develop the Murdoch Graduate Chiropractic Pledge. **Results:** The committee in its deliberations utilized over 200 relevant papers and textbooks to formulate the pledge that was administered to the 2010 graduates. **Conclusions:** The reciting of a healers' affirmation such as the Hippocratic Oath is widely considered to be the first step in a new doctor's career. It is seen as the attestation that a newly trained health care provider will use his or her newfound knowledge exclusively for the benefit of mankind. The overall concept is still relevant, and there is therefore a duty to ensure that the ideas within a professional affirmation are current.

Usual Source of Care for Persons With and Without Back Pain (Medical Expenditures Panel Survey Data)

Monica Smith, Palmer Center for Chiropractic Research

Introduction/Purpose: To explore the extent to which individuals with back pain or other health conditions, and individuals with no health problems, report having a Usual Source of Care (USC) for their health care needs. **Data/Methods/Analysis:** Secondary analysis of Medical Expenditures Panel Survey (MEPS) data was performed. Of 51,842 MEPS respondents who reported having a USC, 56% listed a specific USC provider type. Two-stage hypothesis testing compared three condition groups on "Have a Usual Source of Care" and "Report a Specific Provider Type as the Usual Source of Care." **Results:** Compared to individuals with no health problems, those with back pain were almost eight times more likely (OR = 7.8, $p < .001$) to report having a USC; those with other health problems besides back pain were five times more likely to have a USC (OR = 5.4, $p < .001$). For those with a USC ($n = 51{,}842$), individuals with back pain and those with other problems but not back pain were one and a half times more likely than those without any health problems to report a specific provider type as their USC ($p < .001$). **Conclusion:** There is a significant and substantial variation in USC utilization behaviors.

Immunization Status of Adult Chiropractic Patients: Analyses of National Health Interview Survey (NHIS)

Monica Smith and **Matthew Davis**, Palmer Center for Chiropractic Research

Background/Introduction/Purpose: Two recent studies analyzing National Health Interview Survey (NHIS) data have reported markedly divergent findings regarding the propensity of adult chiropractic users to receive seasonal influenza immunization. One study found significant negative association between chiropractic use and influenza vaccination; the other study found chiropractic users significantly more likely to be vaccinated. **Data/Methods/Analysis:** The authors used 2007 NHIS data to examine vaccination among adult chiropractic users who, according to the Center for Disease Control and Prevention guidelines, should receive both influenza and pneumococcal vaccine. Our analysis employed logistic regressions using complex survey design methods (weighted data adjusting for complex sampling frame of NHIS). **Results:** It was found that chiropractic users were significantly less likely than nonusers to have received the pneumococcal vaccine, and no significant difference was found between chiropractic users and nonusers relative to having received the seasonal flu vaccine. **Conclusions:** In addition to the data, analyses, and results presented in this submitted paper, the presentation of this work at ACC/RAC 2011 will invite discussion among attendees regarding the potential implications of these findings on the topic of adult immunization status of chiropractic users, toward further advancing professional consensus on this topic.

Effect of Traditional Chinese Medicine Acupuncture on Vertical Jump Height Enhancement

Brian Snyder and **John Zhang**, Logan College of Chiropractic

Introduction: This study investigated the immediate effect of traditional Chinese medicine (TCM) acupuncture treatment of ST-36 acupuncture compared to sham acupuncture treatment on vertical jump height. **Methods:** This study was a prospective, single-blind (participants), randomized, sham-controlled, parallel group clinical trial. A total of 68 recreational athletes were randomized to receive TCM acupuncture treatment of point Stomach 36 or a sham acupuncture point located 1 tsun lateral and 2 tsun proximal to the medial epicondyle of the humerus bilaterally in a single-blind, parallel group clinical trial of one 25-minute treatment. Assessment included a maximum jump height measurement after three trials on the Vertec™ vertical jump tester for pre- and posttreatment by a blinded investigator. Both groups received a single TCM acupuncture treatment. The experimental group (n = 36) received a single acupuncture treatment to ST-36 bilaterally and the sham group (n = 32) received a single sham acupuncture treatment. **Results:** Sixty-eight subjects' data were analyzed by t-test and showed a significant increase (0.958 inches) in vertical jump height of the experimental group ($p < .001$) compared to the sham acupuncture group, which did not show a significant increase (0.421 in) of vertical jump height ($p = .092$). **Conclusion:** This study showed that the experimental group had a significant increase in vertical jump height compared to the sham group. Further study should investigate the long-term effects of this acupuncture treatment.

A Survey of Wellness Management Strategies Used by Canadian Chiropractors

Brynne Stainsby, **Peter Kim**, **Jason Porr**, **Ashley Collinge**, and **Julie Hunter**, Canadian Memorial Chiropractic College

Objective: To investigate strategies used by Canadian chiropractors to address wellness following functional recovery in acute and chronic cases by identifying influential words or word-pairings used. Specifically, this study aims to determine if chiropractors educate their patients following recovery. Further, this study attempts to determine if there is a difference in the use of wellness management strategies when comparing mixer and straight chiropractors. **Methods:** Forty-one practicing, licensed chiropractors were recruited to complete an interview survey regarding two case presentations. Investigators formulated criteria to divide responses into mixers and straights. Data were analyzed using Crawdad Analysis Software (version 1.2). **Results:** There were 100% participation and completion rates. All subjects indicated they would provide information regarding wellness strategies to the patient following functional resolution of the presenting complaint. Mixer chiropractors appeared to focus on the patient's needs, while straight chiropractors appeared to be less specific. **Conclusion:** A national survey of practicing, licensed Canadian chiropractors suggests wellness strategies are commonly used in practice. Chiropractors considered mixers in the current study appear more likely to focus strategies on the patient specifically, while those considered straights have a more broad approach; however, this observed difference is based on a small sample size and simple cases.

Preparing for Teaching Moments in Evidence-Based Clinical Practice

John Stites and **Ron Boesch**, Palmer College of Chiropractic

Introduction: A challenge that teaching clinicians face when demonstrating evidence-based clinical practice (EBCP) is that often clinical questions yield insufficient evidence to be clinically meaningful. By anticipating potential clinical questions, evidence can be prescreened, providing opportunities for EBCP teaching moments. **Methods:** A hypothetical scenario with a PICO (Patient, Intervention, Comparison, Outcome) question, search strategy, and identified papers was written up with potential teaching points. When a patient presents with a similar clinical presentation, the clinician used the already developed process to take advantage of the teaching opportunity. **Results:** Six scenarios have been created to date. Teaching points include developing PICO questions, search strategies, levels of evidence, randomization, blinding, and statistical versus clinical significance. **Discussion:** This project creates the potential to provide learning moments in EBCP based on scenarios that are likely in clinical practice. It was initiated by a small group of clinic faculty who meet periodically to study EBCP. These clinicians are piloting the process and refining the scenarios prior to dissemination to other clinicians. Additional scenarios are being created. **Conclusion:** By creating potential clinical questions and identifying scientific literature that influences patient care, clinicians can initiate teaching moments to illustrate the utility of EBCP.

Developing a Clinical Practice Journal Club

John Stites and **Dana Lawrence**, Palmer College of Chiropractic

Introduction: Journal clubs are a means for clinicians to keep current with the literature and enhance clinical expertise. At Palmer College of Chiropractic, a clinical research journal club focused on critical appraisal has been active for 5 years. This journal club has limited relevance for clinicians, so a second journal club based on current clinic patient cases was developed. **Methods:** This journal club starts with a description of a patient's clinical presentation and the PICO (Patient, Intervention, Comparison, Outcome) question generated. The search strategy used to identify relevant articles is described. The discussant then demonstrates how this information is applied to patient management. **Results:** Five clinical practice journal club meetings have taken place since inception, covering a variety of topics. An average of 25 faculty members have participated. **Discussion:** Shifting the focus from critical appraisal to clinical utility increases the interest and value of a journal club to clinicians. The journal club also serves to introduce and teach concepts of evidence-based clinical practice (EBCP). **Conclusion:** A journal club focused on clinical practice and based on clinic patients increases the value of the process to teaching clinicians and provides a mechanism of disseminating EBCP concepts.

Teaching Evidence-Based Clinical Practice Concepts Using Radiology Case Types at a Chiropractic College

John Stites and **Ian McLean**, Palmer College of Chiropractic

Introduction: At Palmer College of Chiropractic evidence-based clinical practice (EBCP) teaching opportunities are being weaved into patient interactions. Radiology case types are tracked for each intern and used to ensure exposure to a variety of conditions in diagnostic imaging. A program was developed to link an EBCP exercise to radiology case type credit. **Methods:** Interns present the images to the radiologist. The images are reviewed and clinical implications are discussed. If an imaging finding of importance is identified, the intern prepares a case type worksheet. A clinical question is developed and the intern performs a search and obtains a peer-reviewed article. When this is reviewed with the radiologist, the opportunity is taken to discuss EBCP principles. **Results:** Every student entering the clinic system since October 2009 has participated in multiple EBCP exercises. **Discussion:** The exercise provides an opportunity to address EPCB learning objectives appropriate to the case. Each encounter provides unique opportunities for teaching moments based on the diagnostic imaging finding, clinical scenarios, and literature. **Conclusion:** A program to incorporate an EBCP exercise into the clinical radiology educational program is described.

Impact of Curricular Interventions on Evidence-Based Practice Skills, Attitudes, Clinical Behaviors, and Patient Care Outcomes in a Complementary and Alternative Medicine Journal Club

Barbara Myszkiewicz Sullivan, **Judith Pocius**, **Christopher Wolcott**, **Jerrilyn Cambron**, and **Gregory Cramer**, National University of Health Sciences

Introduction: A comprehensive, evidence-based practice (EBP) curriculum introduced into a doctor of chiropractic (DC) program included core course integrated modules, stand-alone courses, and a clinically integrated, intern-led journal club. This cohort study describes the impact of curricular interventions on EBP skills, attitudes, clinical behaviors, and patient care outcomes in an evidence-based journal club. **Methods:** Interns generated clinical questions; accessed, appraised, and applied evidence to patient cases; and assessed the impact of evidence on patient care, clinical practice, and the profession in a clinically integrated journal club. One cohort received minimal in-service (IS) EBP instruction, while another completed the full comprehensive curriculum (FC). Journal club quality, EBP skills, attitudes, clinical behaviors, and patient care impact were assessed using published rubrics and questionnaires. **Results:** FC interns (56%) addressed more nonmusculoskeletal topics compared to IS interns (45%), asked more clinical questions based on patients (96% vs. 41%), and accessed evidence from biomedical databases to a greater extent (95% vs. 59%). Self-reported confidence regarding EBP skills and use indicated that FC interns felt competent to very competent (70%) compared to the IS cohort (33%). **Conclusions:** Adding core course integrated and stand-alone EBP content to a DC curriculum positively impacted EBP skills, attitudes, clinical behaviors, and patient care.

Impact of Chiropractic Adjustments on Pulse Oximetry: A Pilot Study

Stephanie Sullivan, **Lawrence Hansen**, **Korey Revels**, and **James Duffy**, Life University

Introduction: Pulse oximetry has become a standard of care in hospital and emergency settings. It provides health care workers with a noninvasive tool for the measurement of arterial oxygen saturation in the body and potential respiratory distress. **Methods:** Thirty patients presenting to a chiropractic student clinic received pulse oximetry readings just prior to their chiropractic adjustment, and at 1 and 5 minutes after the adjustment. **Results:** No significant differences were reported between any of the pre- and post-pulse oximetry or pulse rate readings. Forty-seven percent of the participants were female, and the average age of the participants was 26 years. Eighty percent of the participants experienced a change in oxygen saturation between the preadjustment reading and either the 1- or 5-minute postreading. **Conclusion:** The purpose of this pilot study was to determine if chiropractic adjustments impacted arterial oxygen saturation levels as measured through the noninvasive utilization of pulse oximetry. While the results did not illustrate a significant difference, a change was noted. Pulse oximetry is a simple, quick, and noninvasive technology with the potential to provide quantitative insight into chiropractic's impact on the body.

Advancing Evidence-Based Practice Through an Integrated Approach to Information Literacy Instruction: Library/Faculty Collaboration at University of Western States

Janet Tapper, University of Western States

Introduction: The paradigm shift that is evidence-based practice (EBP) sets off a cavalcade of changes to the conventional practice and teaching of chiropractic, particularly the requirement for high-level information search and retrieval skills. Previously information literacy training on campus was segregated into niche librarian-given instruction sessions. Today at this institution search and discovery activities are integrated throughout the curriculum. Critical to this cultural shift is the collaboration between the faculty and the library. **Methods:** The university made empirical use of the evidence-based practice cycle (Ask, Acquire, Appraise, Apply, and Assess) in making cultural changes to the academy. **Discussion:** Five years of collaboration between faculty and library were condensed to advance EBP skills within the curriculum. **Conclusion:** Saturation of information literacy activities across the curriculum habituates and reinforces key skills required of modern clinicians. Inclusion of the library throughout implementation of the R25 grant goals assured utilization of the campus information professionals' expertise. Their perspective helps to inform the faculty training process and guide meaningful curricular information activities and assignments. In return this allows the library focus to grow, adapt, and reconfigure its resources in concordance to the demands and expectations of not only born-digital students but a faculty reinvigorated and confident around their research and discovery processes.

A Single-Blind Randomized Controlled Trial of the Effects of Spinal Manipulative Therapy on Fitts' Law Performance

Rodger Tepe, **Dean Smith**, **Kevin Ward**, **John Ellis**, and **Jonathan Emlet**, Logan College of Chiropractic

Objective: The objective of this study was to investigate the effects of spinal manipulative therapy (SMT) on fine motor movement time (MT) during a computerized Fitts' Law task. **Methods:** This study received Institutional Review Board approval. Twenty consenting, asymptomatic adult participants were randomly assigned to treatment and control groups. The treatment group completed three Fitts' Law trials before and five Fitts' Law trials after SMT, while the control group received seated rest between the pre- and post-Fitts' Law measures. **Results:** A two-way mixed model analysis of variance showed no main effect of group (SMT vs. control), $F(1, 18) = 1.45$, $p = .24$; no main effect of time of measurement, $F(1, 18) = 2.22$, $p = .154$; and no significant interaction between group and time of measurement, $F(1, 18) = 1.49$, $p = .239$. **Conclusion:** Although two previous studies demonstrated that SMT decreases MT as measured by Fitts' Law tasks, the present study showed no effects of SMT on Fitts' Law performance. Whether SMT affects motor performance has many implications for chiropractic and deserves continuing investigation utilizing symptomatic participants and larger samples.

Interactive Neurostimulation in Pain Management for Chronic Mechanical Neck Pain

John Triano, **Linda Woodhouse**, and **Marion McGregor**, Canadian Memorial Chiropractic College and McMaster University

Introduction: Inconclusive results for electrical stimulation in neck pain patients may be due to the ability of the nervous system to accommodate to stimuli. Interactive neurostimulation modulating pulse parameters in response to change in the skin impedance may prove more effective. Positive results are reported in acute postsurgical pain. This study examined the effects in chronic mechanical neck pain. **Methods:** After ethics approval, a multi-institutional, randomized controlled trial was performed on patients aged 18 to 60. Pain and function were evaluated at baseline, 2 weeks into treatment, and again at 4 weeks. Visual analog scale (VAS) and the Neck Disability Index (NDI) were administered as well as time to tolerance in staged progression of exercise activation. **Results:** A total of 80 subjects were enrolled. Analysis of covariance was performed on VAS and NDI scores demonstrated significant change with time ($p = .0043$ and $p = .0038$, respectively) in pooled data for treatment and control but no differences between groups. Similarly for rate of progression through stages of exercise, no differences between groups were observed in the time to reach tolerating exercise ($p = .0345 < p < .5077$).

Evidence-Based Clinical Practice: Experience of an Early Adopter Adding an Assignment in Evidence-Based Clinical Practice to a Class

Michael Tunning and **Robert Rowell**, Palmer College of Chiropractic

Introduction: Evidence-based practice is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients." Evidence-based clinical practice (EBCP) may be broken down into the steps of Ask, Acquire, Appraise, Apply, and Assess. The authors wanted to incorporate aspects of EBCP into their physiotherapy curriculum and identify areas that students understand and areas that need more review. **Methods:** As a method to incorporate EBCP, an assignment was developed to find a randomized control and critique its validity. In an effort to evaluate this implementation of EBCP, a survey was developed. **Results:** Of the 117 students registered for Active Care Class in the fifth trimester, 83 completed and returned the surveys for a response rate of 70.9%. **Discussion:** The task of teaching some aspect of EBCP as well as the physiotherapy curriculum was easily accomplished. Instructors who are interested in adding elements of EBCP to their course can easily do so. **Conclusion:** This assignment was a way to evaluate how students acquire and assess information. While signs of positive attitudes were evident in these students, there is still a need for further explanation and refinement of skills.

Abdominal Muscle Thickness and Low Back Pain During Pregnancy: A Preliminary Study

Carol Ann Weis, **Jennifer Nash**, **John Triano**, and **Jon Barrett**, Canadian Memorial Chiropractic College

Objective: The aim of this preliminary study is to determine differences in abdominal musculature morphology, within 1 month of delivery, in women who experienced back pain during pregnancy compared to those who did not. **Methods:** Ultrasound imaging was used on 18 postpartum subjects participating in the study, six who experienced back pain during pregnancy and 12 who did not. Muscles examined included rectus abdominus (upper and lower fibers, URA and LRA, respectively), external oblique (EO), internal oblique (IO), and tranversus abdominus (TrA). **Results:** Statistically significant results were found in the thickness of IO. Subjects who suffered from back pain during pregnancy had significantly thinner IO muscles (p = .03) than those who did not suffer from low back pain during pregnancy: 5.42 mm (SD = 1.95) and 7.79 mm (SD = 2.00), respectively. Measurements of EO, TrA, URA, and LRA were not significantly different between the groups. **Conclusion:** Back pain during pregnancy for some is an unavoidable complaint and the morphological changes to the IO during pregnancy may alter its ability to contibute to spinal stabilization, therefore contributing to a decrease in spinal/pelvic stability and resulting in back pain. The knowledge from this study will provide a foundation for treating and preventing low back pain during pregnancy.

Medical Student Attitudes Toward Complementary and Alternative Medicine Following a Brief Clinical Rotation in a Student-Run Multidisciplinary Clinic in an Underserved Area

Michael Wiles and **Karen Lawson**, Northwestern Health Sciences University

Background: As integrated practices increasingly involve complementary and alternative medicine (CAM) providers, the attitudes of physicians toward CAM and CAM providers may be an important determinant of clinical and collaborative effectiveness. Studies have shown that medical students' attitudes toward CAM are positive and that a variety of interventions, such as a web-based course and even a single lecture, are capable of positively affecting their attitudes. The effect of a brief clinical experience alongside CAM providers has not been previously reported. **Methods:** Attitudes toward CAM and CAM providers were studied in medical students who had elected to attend a brief rotation working alongside CAM providers. Sixty-seven students responded to a survey containing the Integrated Medicine Attitudes Questionnaire (IMAQ) and an open-ended question about their attitudes toward CAM and CAM providers. **Results:** The results show that students who self-select to attend this rotation have more favorable attitudes toward CAM and CAM providers than those who decline to attend this rotation. Fisher's Least Significant Difference test indicates that even though the self-selected clinic attendees had a more favorable attitude toward CAM even before attending the clinic, their attitude toward CAM was significantly improved following the experience in two areas: openness to holism and effectiveness of CAM.

Chiropractic Student Motivations and Course Choices

Philip Yalden and **Christina Cunliffe**, McTimoney College of Chiropractic

Background: Chiropractic's future relies on colleges attracting, educating, and graduating new chiropractors. Despite studies into chiropractic education, less is known about motivations for, and potential barriers to, studying chiropractic. **Aims:** To investigate motivations for studying chiropractic, to determine what students look for in a course/college, and to determine potential barriers to studying chiropractic. **Methods:** After IRB/Ethics approval, a paper-based, semi-structured, self-administered questionnaire was piloted, modified, and distributed to students at a chiropractic college. Comparative demographic data were also collected from another chiropractic college. **Results:** The questionnaire response rate was 70.8% (121). Motivating factors for studying chiropractic included a desire to help others (54.5%; 66), with 44.6% (54) attracted by chiropractic's holistic, drugless approach to health. Previous help from chiropractic influenced 55.4% (67), and 22.3% (27) felt chiropractic had "changed their life." In addition, 55.4% (67) of respondents viewed the ability to work while studying as extremely important and 73.6% (89) said they could not have studied chiropractic without this. **Conclusion:** Previous help from chiropractic and a desire to pass on this help were common motivations for studying chiropractic. The ability to work while studying was seen as vital by many students and, without it, the vast majority felt they could not have studied chiropractic.

Reliability of the Standing Hip Flexion Test: A Systematic Review

Morgan Young and **Robert Cooperstein**, Palmer College of Chiropractic West

Introduction: The standing hip flexion test is used by many in the allied health professions to evaluate mobility of the sacroiliac joint. The goal of this paper was to abstract the findings from and assess the quality of published works on the Gillet step test. **Methods:** A wide search strategy was used, including results from a previous systematic review. The QAREL instrument was used to assess quality of the selected articles by consensus from both authors. **Results:** The reliability of the step test appears equivocal, with large swings in reliability from large negative values to almost perfect agreement. Trends were found for differences between inter- and intraexaminer reliability. **Discussion:** Performance of the test and interpretation varies greatly between papers, as well as other confounding issues with methodology. **Conclusion:** Given the many variations in test performance, evaluation criteria, small motion of the joint, and mixed methodology, it is not surprising that the step test has wide swings in reliability. Intraexaminer reliability appears to be generally higher than interexaminer, although this is not universally the case. The overall quality of the articles varied greatly and casts doubt on the conclusions of many articles.

A Pilot Study of the Effects of Logan Basic Technique Adjusting on Heart Rate and Heart Rate Variability

John Zhang and **Patrick Montgomery**, Logan College of Chiropractic

Objective: To investigate the effects of Logan Basic Technique (LBT) adjustments on heart rate (HR) and heart rate variability (HRV). **Methods:** This was a single-blind randomized controlled trial. Subjects were 18 asymptomatic consenting students at a chiropractic college who were randomly assigned into treatment and control groups. The treatment group received LBT adjustments twice a week for 2 weeks, while controls received sham LBT adjustments. HR and HRV data were collected before and after each trial. Data were analyzed by paired and unpaired *t*-tests ($p < .05$). **Results:** The experimental group had significant decreases in HR ($t = 2.279$; $p < .05$); significant increases in RR interval ($t = 2.589$; $p < .05$); and nonsignificant positive changes for total power, node-to-node standard deviation, high and low frequency, and low/high frequency ratios. The control group had no significant or positive changes in HR or any HRV components. **Conclusions:** The experimental group showed significant decreases in HR, significant increases in RR interval, and nonsignificant improvements in other HRV components. Future research should include participants with HRVs below normal range using various types of spinal manipulative therapy.

Effect of Problem-Based Video Instruction on Learning in Physical Examination: An Alternative Paradigm for Chiropractic Students

Niu Zhang and **Sudeep Chawla**, Palmer College of Chiropractic Florida

Objective: It is perceivable that there is an insufficiency of physical examination (PE) skills in chiropractic students and lack of studies on PE teaching from chiropractic instructors. This study examines the effect of implementing both standard and problem-based ophthalmic PE video instructions on the enhancement of laboratory PE skills and written test results for chiropractic students. **Methods:** Video clips of ophthalmic PE, consisting of both standard procedure and common mistakes, were created. Students' ophthalmic PE skills and written test results were statistically evaluated and compared among three study cohorts: a comparison cohort who did not view the videos, the standard video cohort who viewed the standard procedure video, and the problem-based video cohort who viewed both standard procedure and problem-based videos. **Results:** The mean score was statistically higher in both video cohorts when compared with the comparison cohort ($p < .001$). There was no statistic difference of mean scores between two video cohorts ($p > .05$). The percentage of perfect score was the highest in the problem-based video cohort. There was no statistic difference of written test scores among all three cohorts ($p > .05$). **Conclusion:** The ophthalmic PE video instruction improves chiropractic students' PE skills, which can be further enhanced by implementing the problem-based videos.