ABSTRACTS OF ACC CONFERENCE PROCEEDINGS

Platform Presentations

Test–retest reliability of trunk motor variability measured by large-array surface electromyography

Jacques Abboud, Francois Nougarou, Michel Loranger, Martin Descarreaux

Background: The use of large-array surface electromyography (sEMG) has enabled the identification of distinctive neuromuscular patterns in patients with back pain. However, several steps are needed before this tool can be proposed in the investigation of neuromuscular control. **Objective:** To evaluate the test–retest reliability of the trunk muscle activity distribution in healthy participants during muscle fatigue. **Methods:** Trunk muscle activity distribution was evaluated twice in 20 healthy volunteers (3–4 day intervals) using large-array sEMG. Motor variability, assessed with two different variables, was evaluated during a low back muscle fatigue task. Test–retest reliability of muscle activity distribution was obtained using Pearson or Spearman correlation coefficients. **Results:** Moderate to strong correlations were found between both sessions in the last 3 phases of the fatigue task for both motor variability variables and in the 1st phase only for the centroid. **Discussion:** Initial stages of muscle fatigue are characterized by small and variable patterns of EMG activity, whereas later stages are characterized by increased but reproducible patterns of EMG activity. **Conclusion:** Test–retest reliability of the trunk muscle activity distribution assessed during a fatiguing task varies across the stages of muscle fatigue. (This is a conference presentation abstract and not a full work that has been published.)

The PROMIS perspective of parents with children under chiropractic care: A practice-based research network (PBRN) study

Joel Alcantara

Background: There has been an increasing focus on the use of patient-reported outcome measures as a necessary component in clinical care and research. **Objective:** In an exploratory study, we examined the quality of life of children presenting for chiropractic care in PBRN. **Methods:** This study received institutional review board approval from Life University (Marietta, Georgia). In addition to socio-demographic information, we obtained clinical correlates and quality of life measures using a PROMIS pediatrics proxy report. **Results:** A total of 89 parents/guardians reported on similarly numbered children. The majority of parents wanted to promote general health, relieve symptoms, and improve the quality of life of their child. The domain *t* scores were anxiety (47.5), depressive symptoms (44.88), fatigue (41.37), pain interference (45.42), peer relationships (47.91), and physical function (49.6). **Discussion:** To the best of our knowledge, this is the first implementation of PROMIS parent-proxy instruments in the chiropractic setting. Given the novelty of our findings, no study comparisons exists to provide context. **Conclusion:** The use of PROMIS pediatric proxy was successfully implemented. We encourage further research in this area to examine the impact of chiropractic care on health outcomes. (This is a conference presentation abstract and not a full work that has been published.)

The PROMIS perspective of children under chiropractic care: A practice-based research network (PBRN) study

Joel Alcantara

Background: The chiropractic care of children is popular and highly utilized. **Objective:** In an exploratory study, we examined the quality of life of children presenting for chiropractic care in PBRN. **Methods:** This study received institutional review board approval from Life University (Marietta, Georgia). In addition to socio-demographic information, we obtained clinical correlates and quality of life measures using PROMIS-25 for pediatric quality of life. **Results:** A total of 89 parents/guardians reported on similarly numbered children. The majority of parents wanted to promote general health, relieve symptoms, and improve the quality of life of their child. The domain *t* scores were anxiety (45.85), depressive symptoms (44.05), fatigue (44.71), pain interference (46.83), peer relationships (51.95), and physical function (52.92). **Discussion:** To the best of our knowledge, this is the first implementation of PROMIS-25 instruments in the chiropractic setting for children. Given the novelty of our findings, no comparative measures exist. **Conclusion:** The use of PROMIS-25 was successfully implemented. We encourage further research in this area to examine the impact of chiropractic care on health outcomes. (This is a conference presentation abstract and not a full work that has been published.)

The impact of online pre-exam extra-credit assignments on chiropractic term 1 students' learning and performance in a human histology course

Samir Ayad, Jonathan Carlos

Background: Extra-credit assignments are intended to both solidify knowledge obtained from the class lectures and provide supplementary information for students to master the course material. **Objective:** Determine the impact of extra-credit assignments on the learning and assimilation of subject material and their use as an academic tool to improve chiropractic students' overall academic performance. **Methods:** Term 1 chiropractic students from 2 academic terms were offered voluntary participation in online extra-credit assignments in open-book format comprising 15 short-answer questions. **Results:** Students in experimental group 4 showed statistically significant improvement in their final exam scores when compared with control groups 1 and 2 and experimental group 3 ($p < .05$). Comparison of mean scores within the other groups and between the groups showed no statistically significant differences. **Discussion:** The results show a slight pattern supporting learning improvement following the administration of extra-credit assignments. However, the open-book format did not allow an accurate correlation with students' graded performance in the midterm II and final exams. **Conclusion:** Extra-credit assignments may be a good learning tool, with the recommendation that the assignments do not include an open-book option in order to enhance material comprehension and retention. (This is a conference presentation abstract and not a full work that has been published.)

The ring of fire: A review of musculoskeletal sources of posterior, lateral, and anterior generators of hip pain with emphasis on diagnostic imaging

Patrick Battaglia, Norman Kettner

Background: Hip pain presents a challenging clinical scenario with a comprehensive differential diagnosis that is often narrowed with diagnostic imaging. Considering the pelvis to be a bony and soft-tissue ring may aid in categorizing hip pain as posterior, lateral, or anterior. **Objective:** To review musculoskeletal causes of posterior, lateral, and anterior hip pain with an emphasis on diagnostic imaging findings. **Methods:** Review paper. **Results:** Many etiologies, including bone and joint pathology, tendinopathy, ligamentous laxity, and peripheral neuropathy, may produce hip pain. Additional referral from genitourinary, gastrointestinal, and vascular sources should be considered. Many different diagnostic imaging modalities are used to document pathology around the hip. **Discussion:** A review of musculoskeletal sources of hip pain is presented with an emphasis on diagnostic imaging findings. Furthermore, hip pain is categorized within the ring of anatomy from the lumbosacral spine to the pubic symphysis as either posterior, lateral, or anterior. Pain referral is common within the pelvis and needs to be considered from both a musculoskeletal and visceral perspective. **Conclusion:** When examining a chief complaint of hip pain, a combination of accurate localization and appropriate diagnostic imaging will narrow the differential and suggest a diagnosis. (This is a conference presentation abstract and not a full work that has been published.)

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Interdisciplinary collaboration for education and clinical practice: Establishing a community hospital affiliation with chiropractors

David BenEliyahu, Alan Kaell, Duy Tran, Neil Sutaria, Michael Tofano

Background: Patients who suffer from acute and chronic spinal pain are evaluated and managed by various types of practitioners without the benefit of communication and coordination of care. Typically that leads to inefficient, suboptimal outcomes. **Objective:** The first step toward building an interdisciplinary collaboration between chiropractors and other specialists was to establish an affiliation with a local community hospital for educational and clinical-practice endeavors. **Methods:** We discuss the process for establishing an affiliation between chiropractors and a hospital that focused on education and clinical collaboration for patients and providers. The timeline, interactions with the administration, medical staff, inclusion in the hospital's Web site, and interprofessional educational programs are described. **Results:** We demonstrate a successful process that accepted 72 chiropractors who established an affiliation with a hospital to enable clinical collaboration and educational programs. This ultimately led to approval of a hospital-based multidisciplinary, collaborative spine care program. **Discussion:** Nonchiropractic practitioners that treat acute and chronic spine pain conditions include orthopedists, neurologists, neurosurgeons, rheumatologists, anesthesiologists, and others. Misunderstanding and lack of communication lead to fragmented, costly, ineffective care. **Conclusion:** Interdisciplinary collaborative care and educational-hospital affiliations can be successfully established by chiropractors and enhance clinical outcomes. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractors' characteristics associated with physician referrals

Marc-Andre Blanchette, Michele Rivard, Clermont E. Dionne, J. David Cassidy

Background: Physicians tend to refer to particular chiropractors. **Objective:** To identify factors associated with Canadian chiropractors who receive more referrals from medical doctors. **Methods:** Secondary data analyses were performed on the 2011 survey of the Canadian Chiropractic Resources Databank. Of the 6533 mailed questionnaires, 2529 (38.7%) were returned and 2040 meet our inclusion criteria. Bivariate and multivariate (negative binomial) analysis were conducted between potential predictors and the annual number of patients referred by physicians. **Results:** Higher number of physician referrals was associated with a multidisciplinary clinic including a physician, the Atlantic provinces, the number of treatments provided per week, the number of practicing hours, rehabilitation and sports injuries as the main sector of activity, use of heat packs, exercises and ultrasound, and referring more patients to other health care providers. The percentage of patients with somatovisceral conditions, using Hole In One or Thompson technique, taking his/her own X-rays, being the client of a chiropractic management service, and considering maintenance/wellness care as a main sector of activity were associated with fewer physician referrals. **Conclusion:** Canadian chiropractors involved with other health care workers and who focus their practice on musculoskeletal conditions are more integrated into the health care setting. (This is a conference presentation abstract and not a full work that has been published.)

Does interprofessional education influence physical therapy students' attitudes toward chiropractic?

Bryan Bond, Jamie Dehan, Mark Horacek

Background: Interprofessional education (IPE) facilitates collaborative health practice, leading to improved outcomes. **Objective:** Explore physical therapy (PT) students' observations about chiropractic, including comparing attitudes within distinctive PT programs. **Methods:** We administered a 74-item electronic survey, including 12 attitudinal items composing the chiropractic attitude questionnaire (CAQ), to PT students at two universities. The CAQ score ranged from 10 (most-negative attitude toward chiropractic) to 60 (most-positive attitude toward chiropractic). Both universities were private institutions of similar size and geographic location. However, PT students at University 2 interacted with faculty members who were chiropractors, while PT students at university 1 did not interrelate with faculty members who were chiropractors. **Results:** The mean CAQ score for university 1 was 35.92 (SD = 5.62), while the mean CAQ score for university 2 was 40.67 (SD = 5.34), indicating a significant mean difference of 4.75 points (SE = 0.89; $p < .001$). **Discussion:** Our results suggest that IPE may improve attitudes amongst PT students. **Conclusions:** Our results advocate that PT students exposed to educational resources related to chiropractic, including IPE, are more likely to demonstrate a positive attitude toward chiropractic than PT students not exposed to chiropractic through IPE. (This is a conference presentation abstract and not a full work that has been published.)

Transformation to confident clinician: A focus group study of chiropractic students following an international service–learning experience

James Boysen, Stacie Salsbury, Dustin Derby, Dana Lawrence

Background: One objective of chiropractic education is to cultivate clinical confidence in novice health care professionals. **Objective:** To describe how participation in a short-term service–learning experience changed perceptions of clinical confidence in chiropractic students. **Methods:** After institutional review board approval, 17 students attended 1 of 4 focus groups within 4 months of practicing in an international setting. Interview questions elicited insights on how clinical confidence was changed by the experience. Two investigators conducted thematic analysis. **Results:** Transformation was the core concept underlying the process of gaining clinical confidence and becoming a doctor of chiropractic. Participants identified 9 competencies integrated during their experiences. Chiropractic competencies included enhanced skills in observation, palpation, and manipulation. Clinical competencies emphasized problem solving, clinic flow, and clinical decision making. Communication competencies included patient communication, interprofessional communication, and doctor–patient relationships. **Discussion:** Service–learning afforded these chiropractic students an opportunity to engage in deliberate practice and for transformative learning to occur. Students integrated theoretical concepts and technical skills taught separately in the core curriculum to develop chiropractic, clinical, and communication competencies. This intensive practical experience helped transform unsure students into confident doctors. **Conclusion:** Service–learning was an effective means to cultivating clinical confidence in chiropractic students. (This is a conference presentation abstract and not a full work that has been published.)

Awareness and recognition of ovarian cancer in chiropractic practice

Rebecca Burkhalter, Mark Pfefer, Stephan Cooper

Background: The diagnosis of ovarian cancer can be difficult in clinical practice. Since it may be encountered at various stages by all clinicians, chiropractors should be aware of the clinical picture with which it might present to assist in earlier diagnosis in their patients. **Objective:** To discuss the clinical presentation of ovarian cancer and to review risk factors, symptoms, and current diagnosis and treatment strategies. **Overview:** Chiropractors encountering women with back pain, abdominal pain, bloating, feeling of fullness without having eaten, vaginal bleeding, and other gastrointestinal symptoms should consider a differential diagnosis of ovarian cancer, especially in patients who do not experience improvement or return with similar symptoms after a course of conservative care. **Conclusion:** Chiropractors can play a role in early detection of ovarian cancer by remaining vigilant for symptoms. Chiropractors should also be mindful of the possibility of relapse or the development of metastatic disease when encountering patients who have been diagnosed or are undergoing treatment for ovarian cancer. (This is a conference presentation abstract and not a full work that has been published.)

The reliability of lumbar motion palpation using continuous analysis and confidence ratings

Robert Cooperstein, Morgan Young

Introduction: Most studies show motion palpation (MP) to be unreliable, with agreement near chance levels. This study's primary objective was to assess the inter-examiner reliability of lumbar MP by (1) assessing agreement on the most-fixated location and (2)

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stratifying by examiners' confidence in their findings. **Methods:** Thirty-four minimally symptomatic participants were palpated in side posture for lumbar joint fixation by 2 experienced examiners. The distance of the most fixated location from S2 was measured and the level of examiner confidence recorded. ICC and mean absolute deviation (MAD) values were calculated, stratified by confidence and other demographic findings. **Results:** For the full data set, ICC = 0.39, MAD = 2.6 cm. Inter-examiner agreement was not related to confidence. On average the most fixated levels were <1 segment apart. **Discussion:** Using continuous-measures methodology and ICC for determining reliability provides an alternative to discrete level-by-level analysis and using kappa. The method of identifying the most-fixated level better captures the actual practice of MP and thus is more clinically relevant. **Conclusion:** The statistical estimate of agreement understates the clinically relevant level of agreement. Future studies will need a larger sample size to analyze subgroups of the data set. (This is a conference presentation abstract and not a full work that has been published.)

Criterion validity of static spinal palpation compared with a reference standard

Robert Cooperstein, Morgan Young, Michael Haneline

Background: Anesthetists and manual therapists are the main health care specialties to have studied the accuracy of palpatory procedures for identifying spinal segments. Accuracy is essential to the practice of anesthesiology to ensure optimal anesthesia/analgesia. Manual therapists continue efforts to optimize the site of care through both motion and static palpation. **Objective:** The authors' primary goal was to write a systematic review of articles that addressed the accuracy of spinal palpation in relation to an acknowledged reference standard. **Methods:** To be included, a study had to address the ability of examiners to accurately identify, through manual palpation, single or multiple spinal levels in relation to an acknowledged reference standard, usually but not always an imaging procedure. Cadaveric and non-English studies were excluded. **Results:** The initial search retrieved 1084 studies; 62 abstracts were read, 41 full-text articles were retrieved, and 24 were deemed to satisfy the inclusion criteria. **Discussion:** Although accuracy for identifying exact segments is often relatively low, a more liberal definition of accuracy consisting of ±1 level is usually very high, up to 100%. **Conclusion:** Future studies should determine the extent to which accurate level estimates are necessary for good clinical outcomes. (This is a conference presentation abstract and not a full work that has been published.)

The neuromuscular response to spinal manipulation in the presence of pain

Stuart Currie, Alicia Everitt, Brian Enebo, Bradley Davidson

Background: Quantifying differences in muscle response to spinal manipulation (SM) between asymptomatic and symptomatic populations will lead to a better understanding of the neuromuscular mechanisms of SM. There are no known comparisons of the muscle responses in these populations during lumbar, side-lying SM. **Objective:** To evaluate the differences in percent occurrence and timing of muscle responses in asymptomatic and symptomatic participants during a side-lying, lumbar diversified manipulation. **Methods:** Muscle activity was recorded during lumbar manipulations in 20 participants. The percent activity occurrence and the muscle activity onset delays were compared between asymptomatic and symptomatic participants. Patient consent and institutional review board approval were obtained. **Results:** Compared to the symptomatic group, the asymptomatic group had a higher percent of muscle activity occurrence in the surface electrodes (66.3% vs 45.0%, $p = .007$) and shorter muscle activity onset delays in both the indwelling (136.7 ±101.1 milliseconds vs 182.0 ±88.90 milliseconds, $p = .013$) and surface electrodes (171.0 ±84.5 milliseconds vs 220.1 ±80.4 milliseconds, $p = .007$). **Discussion:** The lower activity occurrence may relate to increased muscular dysfunction, and the longer muscle activity onset delays may indicate responses from different reflex pathways in the presence of pain. **Conclusion:** The presence of low back pain resulted in fewer muscle responses and longer muscle activity onset delays. (This is a conference presentation abstract and not a full work that has been published.)

Ambiguity in the onset of electromyography response to a visual prompt

James DeVocht

Background: Various methods are used to determine the onset of electromyography (EMG) activity, which identifies an increase over baseline. The exact beginning of such an increase can be difficult to pinpoint. **Objective:** Provide awareness of a phenomenon that induces ambiguity in determination of EMG onset that appears to be related or at least similar to a documented phenomenon in electroencephalography. **Methods:** An institutional review board–approved pilot study was conducted to test ways of precisely measuring the reaction time for pressing a specified foot pedal or hand button after a visual prompt. The time of EMG onset was identified in order to determine the premotor and motor time phases. **Results:** On some plots a slight but distinct increase was seen just before the burst of EMG activity. **Discussion:** At first we thought it might be a startle response due to general awareness of the prompt before a decision of which button or pedal to press. However, it does not appear in plots from the other extremities. It looks much like the Bereitschafts potential observed in electroencephalography. **Conclusion:** When the Bereitschafts potential–like phenomenon is observed, it is not obvious if EMG onset should be regarded as before or after the slight increase. (This is a conference presentation abstract and not a full work that has been published.)

Building a culture of workplace wellness in a chiropractic university background

Karen Doyle, J. Dale Marrant, Mark T. Pfefer, Sarah Shelnutt

Background: Lifestyle diseases are prominent in today's workforce. Only 44% of chiropractic college Web sites mention employee wellness programs. Cleveland University–Kansas City studied employee health and wellness. **Objective:** The objective was to build a culture that empowers individuals to take responsibility for achieving their personal best in health and wellness. **Methods:** Three institutional review board–approved surveys and 6 campaigns were conducted to target identified goals and objectives. **Results:** University administrators supported work site health promotion (88%), while 40% were not active. Employees (63% response) identified interest in nutrition (range 57%–66 %) and physical activity (range 56%–68%) categories. Lowest-interest areas included smoking (26%), education (36%), and mental health (range 29%–37%). Results of a behavior survey (62% response) indicated 94% of employees were in good-to-excellent health. Concerns were blood pressure (30% borderline to hypertensive), woman body mass index (M = 31), and employees who exercise less than once a week (30%). Forty-one percent of employees entered in at least 1 campaign. Only 10% were chiropractic doctors. (This is a conference presentation abstract and not a full work that has been published.)

Paraspinal soft-tissue layer differential movement from spinal manipulation therapy (SMT) preload forces

Shawn Engell, Jay Triano

Introduction: Studies suggest differences in physiological response to changes in SMT force. Variation of SMT should result in specific and predictable responses. Such fine tuning is not evident in most clinical reports. Studies evaluating tissue loads near the target articulation raise doubt for control of load past the skin. This work monitored tissue motion in 3 sequential strata at the SMT site using ultrasound (US) elasotography. **Methods:** Volunteers were placed prone and a typical thoracic preload maneuver applied. Force, skin and torso motions, and US tissue layer displacements were monitored synchronously. **Results:** Transmitted force was 93.51 N (17.62) causing 57.58 mm (9.94) skin displacement. Intra-rater reliability for layer identification was excellent (ICC > 0.98). Displacement occurred in all 3 layers. Statistical differences were identified for cumulative displacements: layer 1 vs layer 2: $t(20) = 3.22$, $p = .004$; layer 2 vs layer 3: $t(20) = 5.86$, $p < .0001$. The Wilcoxon signed rank test ($A\pm = 0.05$) yielded significant difference in shear between layers 1 and 3 compared with layers 2 and 3 ($W(21) = 26$, $p = .002$) only. **Conclusion:** Relative tissue displacement suggests a differential load transmission from layer to layer during SMT preload maneuvers. (This is a

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Molecular probing of the intervertebral disc: Quantitative iTRAQ proteomic analysis of the nucleus pulposus in health and spontaneous degeneration

William Mark Erwin, Leroi DeSouza, Muhammad Zia Karim, Sophia Wang

Introduction: The morphology of the intervertebral disc nucleus pulposus (NP) varies dramatically between the notochordal cell-rich nonchondrodystrophic (NCD) and the notochordal cell-poor chondrodystrophic (CD) canine, as does their respective susceptibility to degenerative disc disease. Here we used iTRAQ quantitative proteomic analysis to determine the differential protein/peptide "fingerprint" of the NCD and CD canine NP. **Methods:** Soluble proteins obtained from NPs of NCD and CD canines were mechanically homogenized, centrifuged, and then separated on a nano-LC column. The eluting peptides were analyzed using iTRAQ proteomic methods. **Results:** Significant differences in protein expression were seen in fibronectin, decorin, biglycan, cartilage intermediate layer protein, cartilage oligomeric protein, fibromodulin, and isoform B of proteoglycan-4 (lubricin), all of which were dramatically underexpressed in the NCD canine NP compared with the CD canine NP. **Conclusions:** We have determined that the small leucine-rich proteoglycans such as decorin, biglycan, and fibromodulin were far more abundant in the CD nucleus pulposus homogenate as compared with the NCD canine. Degenerative changes seen in the CD as compared with the NCD animal may make this an ideal entity with which to study the biology of degenerative disc disease. (This is a conference presentation abstract and not a full work that has been published.)

Learning to adjust: Is training to become a chiropractor hazardous to your health?

Susan Esposito, Linda Mullin, Ronald Hosek, Frederick Carrick

Introduction: Chiropractic students must master the skill of high-velocity, low-amplitude (HVLA) adjusting. These students participate in labs where they reciprocate the role of doctor and patient. Adverse events of this pedagogy have been reported to be as high as 55%. This study documents the neurologic effects of repetitive HVLA adjustments delivered by student–doctors to student–patients. **Methods:** Forty-one subjects participated in a 5-week adjusting class. They completed nervous system measurements before and after the class, including vital signs, pain inventory, then PROMIS-29 survey, cervical and lumbar dual inclinometry, and computerized dynamic postural-stability testing. **Results:** All paired *t* tests yielded no significant changes before to after in all objective measurements of nervous system function except cervical left lateral bending (decreased) and lumbar flexion (increased). **Discussion:** There are only a few studies in the literature that reported adverse events sustained while learning chiropractic adjusting skills. These adverse events occur at the same rate in chiropractic practice, with local pain and stiffness the most common reported complaint. **Conclusion:** This study provides evidence that HVLA adjustments delivered by student–doctors on student–patients did not degrade the patients' neurological function. This study has clear relevance in selecting a pedagogy for skill acquisition in a chiropractic curriculum. (This is a conference presentation abstract and not a full work that has been published.)

Cavitation and the neuromuscular response to spinal manipulation

Alicia Everitt, Stuart Currie, Brian Enebo, Bradley Davidson

Background: The neuromuscular response to spinal manipulation (SM) may provide insight into the mechanism of this common treatment for low back pain; however, the importance of cavitation to achieve this response is not fully understood. **Objective:** To examine the relation between the occurrence of cavitation and the presence of neuromuscular response during SM. We hypothesized that the presence of cavitation would relate to the occurrence of muscle activation and muscle activity onset delay. **Methods:** Muscle activity was recorded using indwelling electrodes in 20 asymptomatic participants during lumbar SM. The occurrence of muscle activation and the muscle activity onset delay were compared in the presence and absence of cavitation. Patient consent and institutional review board approval were obtained. **Results:** Clear trends of higher percent activation in the presence of cavitation occurred. Clear trends of shorter onset delays also occurred with cavitation (Cohen's $d > 0.5$). **Discussion:** Findings of higher muscle activation occurrence in the presence of cavitation could be the result of indwelling activity measurements. Shorter delays indicate a faster response to SM in the presence of cavitation. **Conclusion:** Relationship seen in these data between cavitation and neuromuscular response support the significance most clinicians attribute to achieving audible release during SM. (This is a conference presentation abstract and not a full work that has been published.)

Design and implementation of a quality assurance program in a chiropractic college clinic: Implications for improved patient care and program feedback

Matthew F. Funk, Anthony Onorato

Objective: Our college's clinical quality assurance (QA) committee utilized a consensus process to update our QA process. This paper discusses how we developed a system based on data available in the electronic health record (EHR) and the results of reviews over the last 2 academic years. **Methods:** The committee reviewed several consensus guidelines and management protocols. We agreed on essential data that must be present in the daily EHR and other documents to determine the quality of care provided. We defined indicators of quality, organized into 6 sections: subjective, objective, assessment, plan, miscellaneous, and scanned items. The committee hoped this would facilitate completion of all necessary steps of a thorough review. **Results:** Reviews were performed during the 2012–2013 and 2013–2014 academic years, and results were compared to determine if improvements were made. Each clinician received average scores based on all reviews. **Discussion:** These results revealed deficiencies in several indicators in 2012–2013. Many improvements were noted over the following year. **Conclusion:** We collected QA data over 2 successive academic years and provided ongoing feedback to clinicians. Peers provided comments about the quality of care and thoroughness of documentation. Recommendations were made to the entire faculty regarding curricular changes necessary. (This is a conference presentation abstract and not a full work that has been published.)

Emergency department clinician perceptions and actions regarding noncardiac chest pain

Geoffrey Gelley, Mohammed Zarrabian, Steven Passmore

Background: Hospital emergency departments (EDs) are challenged when patients ostensibly present with cardiac symptoms yet diagnostic tests are normal. While patients are relieved there is no cardiac pathology, they become mired in treatment alternatives for their persistent chest pain. **Objective:** The objectives of this study are (1) to determine ED clinician perceptions regarding characteristics of noncardiac chest pain (NCCP) patients and their management and (2) to explore clinician satisfaction toward the current care standard and whether they would consider nonpharmacological/nonsurgical referral options. **Methods:** A cross-sectional survey was delivered to ED clinicians. Data was reduced descriptively and thematically summarized to assess the frequency, current perceptions, and actions of ED clinicians who manage NCCP. **Results:** Respondents agreed that on-site/on call providers for NCCP referral would assist in patient management (63.0%). Further, clinicians would consider referring NCCP patients to a nonpharmacological, nonsurgical, clinical-research study (66.7%). **Discussion:** Patients with NCCP are a variable and heterogeneous population. Clinicians want better access to on-site referrals and outpatient clinics for patients experiencing NCCP after discharge and would consider nonpharmacological/nonsurgical referral. **Conclusion:** Future clinical trials with an NCCP population referred from ED clinicians are feasible for further understanding nonpharmacological/nonsurgical options that could include chiropractic management. (This is a conference presentation abstract and not a full work that has been published.)

Student perceptions of resistance tube training in chiropractic technique labs

Christopher Good

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Background: Despite many chiropractic training methods, some students appear to lack strength, power, and/or endurance when performing thrust procedures. **Objective:** The purpose of this study was to train students with resistance tubes (RTs) and survey their perceptions and utilization rates. It was approved by the university's institutional review board. **Methods:** Students used RTs twice per week for 5 minutes over 12 weeks, using slow and explosive repetitions. An anonymous blinded survey was used to collect information. **Results:** The response rate was 97%. Regular at-home RT use rose from 20% to 43%, with higher rates for upper-semester students. Fifty-two percent believed RTs improved their manipulation skills, and 35% felt more confident, with higher rates for women. Sixty-eight percent enjoyed RT training and felt they should be used in future courses. **Discussion:** Utilization by upper-semester students was probably due to classroom adjusting experiences and entering student clinic. Differences among the sexes were probably related to previous RT training and classroom adjusting experiences. Constant safety reminders, new exercises, and a manual and video are needed. **Conclusion:** Training with RTs should be incorporated into technique labs. Future studies should involve larger cohorts and measuring actual strength, power, and endurance changes. (This is a conference presentation abstract and not a full work that has been published.)

Positive outcomes increase over time with the implementation of a semiflipped teaching model

Brittany Gorres-Martens, Angela Segovia, Mark Pfefer

Background: The flipped teaching model has been proposed as a new teaching technique that can engage students in the learning process and improve learning outcomes. **Objective:** The purpose of this study was to assess the outcomes of a semiflipped teaching model. **Methods:** Students taking Neurophysiology during the spring 2014 and summer 2014 terms spent the majority of class time listening to traditional didactic lectures, but they also listened to 5 online lectures on their own time and spent 8 (spring 2014) or 10 (summer 2014) class periods completing an active-learning assignment. An institutional review board–approved survey was distributed to the students at the end of the term to assess the outcomes of the active learning assignments. **Results:** Positive outcomes resulted from a semiflipped classroom model, and even more positive outcomes resulted after the second time the course was taught in a semiflipped manner. Outcomes included increased critical thinking and comprehension and retention of information and a desire for more instructors to use active-learning techniques. **Conclusion:** While completely flipping a course takes a tremendous amount of time, instructors can still see positive outcomes by implementing a semiflipped teaching model. (This is a conference presentation abstract and not a full work that has been published.)

Comparison of chiropractic student scores before and after the use of a student response system in a clinical skills course

Joseph Guagliardo

Background: Active-learning techniques have been shown to improve student learning in the classroom. **Objective:** I report the differences in final examination scores achieved by students at the culmination of 2 different active-learning strategies in an introductory skills course. **Methods:** Analysis of examination scores from 6 consecutive academic sessions over 18 months ($n = 558$) were compared. Cohort A ($n = 263$) and cohort B ($n = 295$) represented students 3 consecutive academic sessions before and after inclusion of an audience response system (clickers). Statistical analyses used were 2-tailed independent t test, 1-way analysis of variance (ANOVA), Tukey's honestly significant difference (HSD), and effect size. **Results:** The 2-tailed independent test with equal variances was significant ($t = .843$, $p < .400$, 95% confidence interval 0.9–2.26). One-way ANOVA showed no difference found in any of the subgroups: cohort A ($F = 1.404$, $p = .089$, Tukey's HSD $< .01$) and Cohort B ($F = 1.680$, $p = .0.39$, Tukey's HSD $p < .01$). Cohen's d demonstrated a small effect (d = 0.124). **Discussion:** The literature encourages that students need frequent opportunities to perform for improvement in learning. **Conclusion:** Compared with previous versions of the same course, in the new course design students performed better, suggesting that using clickers as an active-learning technique helps improve student achievement. (This is a conference presentation abstract and not a full work that has been published.)

Force-time characteristics of double thenar posterior to anterior thoracic spinal manipulations

Maruti Ram Gudavalli

Background: Doctors of chiropractic deliver treatments to the spine using quick dynamic loads using their hands with contacts on the patient's back, and several sources point to a need for more biomechanical research. **Objective:** The objectives of this paper were to measure and characterize the dynamic force characteristics of posterior-to-anterior thoracic spinal manipulations on different days using double-thenar 2-hand contact procedure to a mannequin. **Methods:** Three doctors of chiropractic performed double-thenar posterior-to-anterior thoracic spinal manipulations to a mannequin. Two 3-dimensional force transducers were used to measure force-time profiles. Descriptive statistics and 1-way analysis of variance were performed. **Results:** We observed 3-dimensional forces during double-thenar thoracic spinal manipulations. There were differences between the 3 doctors. **Discussion:** In order to compare the characteristics of the 3 doctors, we chose to use a mannequin to minimize the variability of the subject and to receive repeated spinal manipulations. This study observed 3-dimensional forces in both hand contacts. **Conclusion:** The 3 doctors have different, distinct characteristics in terms of duration, preload, rate of loading, and peak loads. Each doctor delivered similarly during each of the sessions over a 2-week period. (This is a conference presentation abstract and not a full work that has been published.)

Changes in manipulative peak-force modulation and time to peak thrust among 1st-year chiropractic students following a 12-week detraining period: A pilot study

Brett Guist, David Starmer, Taylor Tuff, Sarah Warren, Matthew Williams

Objective: Analyze differences in peak-force modulation and time to peak thrust in posterior-to-anterior (PA) high velocity, low amplitude manipulations in 1st-year chiropractic students prior to and following a 12-week detraining period. **Methods:** One hundred twenty-five chiropractic students performed 2 thrusts prior to and following a 12-week detraining period: typical and half-typical force, on a force-sensing table using a PA hand contact of the participant's choice (bilateral hypothenar, bilateral thenar, or cross-bilateral). Force modulation was compared to defined target values of 600 N and 400 N, and time to peak thrust was compared between data sets using 2-tailed paired t tests. **Results:** Typical peak thrust varied by $124.11 + 65.77$ N during the pretest and $123.29 + 61.43$ N during the posttest compared to the defined target of 600 N ($p = .8994$); halftypical peak thrust varied by $44.91 + 34.67$ N during the pretest and $44.60 + 32.63$ N during the posttest compared to the defined target of 400 N ($p = .5690$). Time to peak thrust for halftypical peak thrust was $0.4077 + 0.1045$ seconds during the pretest and $0.4169 + 0.1028$ seconds during the posttest ($p = .3641$); time to peak thrust for typical peak thrust was $0.4166 + 0.0991$ seconds during the pretest and $0.4126 + 0.0963$ seconds during the posttest ($p = .7430$). **Conclusion:** The results indicate neither a drop-off in the ability to modulate force nor a change in time to peak thrust in 1st-year chiropractic students following a 12-week detraining period. (This is a conference presentation abstract and not a full work that has been published.)

The effects of a single session of chiropractic care on lower-limb muscle strength

Heidi Haavik, Imran Khan Niazi, Mat Kingett, Jens Duehr, Kelly Holt

Objectives: The objective of these combined studies was to investigate changes in lower-limb muscle maximum strength following a single session of chiropractic adjustments. **Methods:** Three single group, basic science, crossover experiments ($n = 8$–11) with 2 assessment sessions were conducted. Interventions were a single session of chiropractic care and a passive movement control. Outcomes were maximum isometric force measured during isometric maximum voluntary contraction (MVC) of ankle plantar and dorsiflexors, maximum surface electromyography (SEMG), and EMG power spectrum analysis (mean power frequency, MPF). **Results:** In the chiropractic groups, MVC of the soleus muscle, as determined by SEMG, increased significantly by 59.5% ($p = .03$), and absolute MVC force significantly increased by 16.1% ($p < .001$) during plantar-

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flexion and by 10.5% ($p < .001$) during dorsiflexion. Fatigue occurred in the control groups as indicated by a decrease in the MPF for the soleus EMG (9%, $p = .04$) and a significant decrease in absolute MVC force during plantarflexion (11.4%, $p = .03$) and dorsiflexion (6.2%, $p = .02$). The within-group mean change scores were all significantly different between interventions ($p < .001$). **Conclusion:** These studies suggest that a single session of chiropractic care not only increased muscle strength but also prevented fatigue in ankle dorsiflexor and plantarflexor muscles. (This is a conference presentation abstract and not a full work that has been published.)

Complementary and alternative-medicine techniques for breech correction

Julie Hartman

Background: When a baby presents in the breech position, standard obstetrical protocol often involves a cesarean section. External cephalic version, a manual attempt to rotate the baby into vertex position, may also be suggested. Most women are not offered other options performed by nonallopathic providers. **Objective:** This review provides information about complementary and alternative-medicine therapies for correcting breech presentation. **Methods:** Search terms included complementary and alternative-medicine treatments in conjunction with breech presentations, including aromatherapy, homeopathy, hypnotherapy, chiropractic, maternal position, acupuncture, and moxibustion. All searches in PubMed; Index to Chiropractic Literature; Manual, Alternative and Natural Therapy Index System; and Allied and Complementary Medicine Database were conducted from inception to April 2014 and included only articles presented in English. **Results:** Of 779 papers found, 36 were included for review. **Discussion:** Several papers on complementary and alternative-medicine techniques discussed breech correction, including homeopathy, hypnotherapy, maternal positioning, chiropractic (including Webster Technique and Bagnell System), and acupuncture, moxibustion, or combinations of both. While all studies reported positive outcomes, only acupuncture and moxibustion had significant evidence to support regular use for breech correction. **Conclusion:** Complementary and alternative-medicine therapies offer alternatives to standard obstetrical practices to correct breech presentation. (This is a conference presentation abstract and not a full work that has been published.)

Baseline survey of online course content in a chiropractic program

Glori Hinck, Kate Quale

Introduction: Information regarding the amount and type of online course content offered in chiropractic education is limited, with little data available on university Web sites or in the literature. As chiropractic institutions implement online learning, it is important to track this information so that it can be accurately communicated to stakeholders. **Methods:** Faculty in the college of chiropractic were surveyed regarding the amount and type of online content utilized in each of their courses. The study design was approved by the university institutional review board process. **Results:** Of the core chiropractic teaching faculty, 32 of 36 (89%) completed surveys for 82 courses. The estimated amount of course content on Moodle ranged from 11 courses (13%) posting the syllabus only to 3 courses (4%) with more than 90% of course content online. Some 53 of 82 courses (65%) had less than 25% of course content online. **Discussion:** The majority of our faculty present at least some of their course content online. However, much of this content is supplemental and does not replace face-to-face contact. **Conclusion:** This study takes an important first step in identifying the amount and type of online content in a chiropractic program and highlights issues with tracking and documenting such content. (This is a conference presentation abstract and not a full work that has been published.)

The evaluation of active-learning techniques for the review of basic sciences and the impact of these methods by multiple-choice exam assessment

Aimee Hollander

Background: Active learning strategies in the classroom improve learning of complex topics that are presented. During review of previously presented material, active-learning techniques can foster critical thinking and develop self-directed learning. **Objective:** To evaluate active-learning techniques for the review of basic sciences and their impact on multiple-choice exam assessment. **Methods:** Three consecutive cohorts of students were administered a pretest consisting of equal number of questions from each category of National Board of Chiropractic Examiners Part 1 (NBCE 1) NBCE 1. Results were utilized as an assessment tool for curriculum development. The lowest-scoring categories of the pretest were reviewed with active-learning techniques and peer-to-peer tutoring. Results of the posttest were compared to the pretest and NBCE 1 scores. **Results:** All subject areas except spinal anatomy showed improvement in scores between pretest and posttest, with increase in scores ranging from 6% to 22%. **Discussion:** Active-learning techniques improved students' ability to critically think and apply basic science concepts when examined through a multiple-choice exam format. Improvement in posttest scores supports NBCE pass rates at or near the national rate. **Conclusions:** Utilizing active-learning techniques for review of basic science courses improves student recall of material as demonstrated by improved posttest scores. (This is a conference presentation abstract and not a full work that has been published.)

Education technology and psychomotor skill development: Teacher thinking versus student thinking

Loretta Howard, John Triano, Marion McGregor, Dom Giuliano

Introduction: Effectiveness of pedagogical practices on perception of confidence and competence among interns and their supervisors were studied. **Methods:** Both quantitative and qualitative methods were employed. A control group (183) of interns was compared with 186 interns trained with Force Sensing Table Technology (FSTT) at 3 months and 6 months into clinic. Intern and supervisor ratings were compared using 2-way analysis of variance by academic year and exposure to FSTT. Emerging themes of conversation about skilled performance were assessed through textual Crawdad analysis. **Results:** Clinicians rated interns lower than interns rated themselves ($p < .0000$), but both increased over time. The simulation experience was associated with slightly lower ratings by interns of themselves. Conceptualization and attitudes toward confidence and competence in the themes of commentary were more skill focused for learners and supervisors who had the simulation experience. Interns without the simulation experience focused more on skill acquisition, while their clinicians focused on clinical application. **Discussion/Conclusion:** Attitudes reflected by discourse can be shifted by conscious effort in curriculum design. Future work must continue to extend the application in order to enhance the teaching/learning of skilled performance and optimize the care provided to patients. (This is a conference presentation abstract and not a full work that has been published.)

A new model to derive patient low back loads during high-velocity, low-amplitude spinal manipulation

Samuel Howarth, Kevin D'Angelo, John Triano

Background: Recent technological advancements in instrumentation and biomechanical software have facilitated the process whereby low back kinetics can be readily derived from high-velocity, low-amplitude spinal manipulation (HVLA-SM). **Objective:** This investigation presents the experimental setup, as well as the development and implementation, of a new model that is capable of efficiently handling the large amount of data required to determine low back kinetics during HVLA-SM. **Methods:** The model to derive low back kinetics during HVLA-SM was implemented in Visual3D software. All contact forces between the patient and the external environment, patient upper-body kinematics, and inertial properties were used as input. Spine kinetics and kinematics were determined from a single HVLA-SM applied to 1 healthy participant. **Results:** The participant's spine underwent left axial rotation, combined with extension, and a reduction in left lateral bending during the HVLA-SM. These movements applied a leftward axial twisting moment of 58 Nm to the participant's low back. **Discussion:** This model can be easily applied in future studies on patient safety, clinician education, and patient outcomes from HVLA-SM. Advantages of this model include the brevity of data collection (<1 hour) and adaptability for different patient anthropometries and clinician–patient contacts. (This is a

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Measurements of innominate vertical length in assessing leg length discrepancy in idiopathic scoliosis patients

Xiaohua He, HanSuk Jung, JooHyun Ham, KyeongAh Min

Objective: Leg length discrepancy (LLD) has been noticed in some scoliosis patients, and LLD may result from pelvic inclination. However, the involvement of innominate bone in scoliotic LLD is unknown. We hypothesized that innominate vertical length (IVL) might play a role. The purposes of this investigation were to compare bilateral IVLs and to assess intraobserver and interobserver variability using digital radiographic techniques. **Methods:** Twenty radiographs from scoliotic patients with LLD were chosen for IVL measurements with the software. Seven trained observers compared bilateral IVLs and estimated intraobserver and interobserver variations using Student *t* test and intraclass correlation coefficients (ICC). An ICC value >0.75 was taken to indicate satisfactory measurement reliability. **Results:** Overall mean right IVL was 191.99 ±3.93 mm, and left IVL was 189.97 ±3.95 mm, which had a statistical significant difference ($p > .05$). Interobserver ICC was 0.824, and intraobserver ICC was 0.874. **Conclusion:** Scoliosis patients with LLD may have asymmetrical IVLs, which may be used for clinical scoliotic LLD assessment. On the other hand, digital measurements among different observers showed excellent reliability for the majority of IVL measurements, making it a useful method for the analysis of scoliosis pathology on radiographs. (This is a conference presentation abstract and not a full work that has been published.)

A review of organizational structure when developing a practice-based research network

Janice Hubbard, Dana Lawrence

Background: Practice-based research networks (PBRNs) have been used in primary care medicine since the 1970s. A PBRN is a system providing research relevant to clinical practice. Those who develop PBRNs emphasize the importance of organized infrastructures. **Objective:** To review the literature about creating PBRNs. **Methods:** PubMed; Manual, Alternative and Natural Therapy Index System, and Index to Chiropractic Literature were searched. Limits included MeSH terms "practice-based research networks" and "practice-based and chiropractic." Articles were also identified via manual search of article references. **Results:** Of 460 papers found, 12 met the inclusion criteria. Information regarding creating a PBRN was extracted from the articles. The articles discussed the creation of PBRNs, challenges, and restructuring current networks. **Discussion:** A strong infrastructure is vital to the success of a PBRN. Infrastructure components such as academic affiliations, personnel, administration, and communication are essential. Integrating these steps into the development of chiropractic PBRNs may help new networks have a strong foundation. **Conclusion:** This review examines the creation of PBRNs. This will aid researchers and clinicians in developing chiropractic PBRNs. Future efforts should help develop written guidelines for creating networks. (This is a conference presentation abstract and not a full work that has been published.)

Survey of students' perception of the Palmer College of Chiropractic preceptor program

Roger Hynes, Alana Callender, Rachelle Hynes

Introduction: The preceptorship functions as a bridge between the academic world and actual practice. The concept is not unique to chiropractic and is well documented in other health care fields. Despite many chiropractic colleges sending students out on preceptorships, the activity is not documented in the literature. **Methods:** A Web-based system called SurveyMonkey was used to survey the opinions of participating former student externs. The survey asked about their perceived competence in various skills and asked opened-ended questions about their strengths and weaknesses. **Results:** A total of 64 former student externs participated in the survey. Former student externs had diverse responses as to their capabilities. **Discussion:** Externs perceived themselves to be academically qualified but felt they were weaker in the clinical application of procedures learned. They also reported they felt unprepared to run a business. **Conclusion:** Results from this survey suggest that the preceptor program can be beneficial to the Palmer chiropractic extern and may lead to an easier transition from the academic to the practice world. Further studies are necessary in order to establish standardized guidelines for preceptor programs. (This is a conference presentation abstract and not a full work that has been published.)

Glucose metabolic changes in the brain and muscles of neck pain patients treated by chiropractic spinal manipulation: [18f]fdg pet study

Akie Inami, Takeshi Ogura, Shoichi Watanuki, Mehedi Masud, Katsuhiko Shibuya, Masayasu Miyake, Kotaro Hiraoka, Masatoshi Itoh, Kazuhiko Yanai, Manabu Tashiro

Introduction: The purpose of this study was to examine the effect of chiropractic instrument-dependent spinal manipulation (CISM) on regional glucose metabolic changes in the brain and muscle utilizing positron emission tomography (PET). We have already reported the analysis for the 12 subjects. We collected additional data and have analyzed total samples of 21 subjects. **Methods:** Participants were 21 male volunteers. We compared the 2 conditions of post-CISM intervention and resting control by PET imaging. In addition, subjective pain, muscle tone of trapezius muscle, and salivary amylase as an indicator of sympathetic nerve activity were measured. **Results:** We found that the anterior cingulate gyrus (ACC) and cerebellar vermis (CV) were activated after CISM, and the prefrontal cortex and occipital and temporal lobes were deactivated. The PET analysis showed a tendency to reduced muscular glucose metabolism after CISM intervention, although the difference was not significant. Subjective pain score and measurement of cervical muscle tone and salivary amylase also showed a decrease after CISM. **Conclusion:** The results of PET analysis revealed the regional activation in ACC and CV following CISM. These areas may be involved in some physiological responses. (This is a conference presentation abstract and not a full work that has been published.)

Instrument-assisted spinal manipulation enhances recovery following sciatic crushed nerve–injury rats

HanSuk Jung, JooHyun Ham, SungEun Kim, JinOk Choi, HyeRin Cho

Background: While the clinical usefulness of spinal manipulation has been suggested, the molecular biological mechanisms of spinal manipulation have not been documented. **Objective:** The purpose of this study was to elucidate the molecular biological mechanism of impulsive spinal manipulation in sciatic crushed nerve–injury rats. **Methods:** Thirty-five adult female Sprague-Dawley rats were randomly assigned into five groups ($n = 7$): sham operation group, sciatic crushed nerve injury group, sciatic crushed nerve injury and single-impulse thrust-treated group, sciatic crushed nerve injury and 5-impulse thrust-treated group, and sciatic crushed nerve injury and 10-impulse thrust-treated group. After induction of sciatic crushed nerve injury, impulsive spinal manipulation was applied to the L6-S1 level using an impulse adjusting instrument once per day for 7 consecutive days, and functional recovery of the sciatic nerve was measured. **Results:** Application of impulse spinal manipulation improved the value of sciatic function index and increased MBP expression, and the 5 impulse thrusts significantly strengthened expressions of GAP-43 and neurofilaments in the injured nerve. **Discussion:** Impulsive spinal manipulation significantly enhanced axonal growth, remyelination, and expression of neurofilament. **Conclusion:** Impulse spinal manipulation may contribute to functional recovery after sciatic crushed nerve injury. (This is a conference presentation abstract and not a full work that has been published.)

Impact of a single interprofessional education intervention on nutritional competency

Gena E. Kadar, Elizabeth O'Toole, H. Garrett Thompson, David Kilgore

Background: Coordinated interprofessional health care supports prevention and management of complex conditions. With poor nutrition considered a leading cause of preventable death in the United States, health care providers must achieve competence in clinical nutrition during preclinical training. **Objectives:** To measure the impact of a single short-term, interprofessional education (IPE) intervention on nutritional competency and self-care practices of CAM and medical students and a medical resident. **Methods:** doctor

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of chiropractic (DC) ($n = 11$), master of arts in oriental medicine (MAOM) ($n = 2$), and doctor of medicine (MD) ($n = 15$) students and 1 medical resident participated in a "Culinary Medicine Workshop." A 21-question survey measuring the impact of the intervention was distributed prior to, immediately following, and 6 weeks after the workshop. **Results:** Improved confidence in ability to deliver evidenced-based nutrition advice to patients with type 2 diabetes and short-term improvement in self-care practices were observed. **Discussion:** A single IPE intervention has lasting benefits on self-assessed nutritional competency and short-term benefits on self-care practices. Similarities between DC and MD students highlight an alignment of attitudes between students of these disciplines. **Conclusion:** A single intervention results in lasting benefits in the ability to deliver nutritional support and short-term improvements in self-care practices, and reveals aligned attitudes toward interprofessionalism, the importance of nutritional counseling, and self-assessed nutritional competency. (This is a conference presentation abstract and not a full work that has been published.)

Community-based free clinics: Opportunities for interprofessional collaboration, health promotion, and complex-care management

Martha Kaeser, Cheryl Hawk, Michelle Anderson, Richard Reinhardt

Background: Free or outreach clinics offer students the opportunity to work with diverse patient populations. **Objective:** To describe the demographics and clinical characteristics of a sample of chiropractic patients at a free community-based clinic in order to assess opportunities for students to work with diverse populations, collaborate with other professions, and practice health promotion. **Methods:** A descriptive cross-sectional study was conducted over 2 months. The university's institutional review board approved the study. Data on demographics, health status, and health risks were collected from patients and their interns. **Results:** Of the 114 patients, 55.3% were women and 50.0% African American; only 20.2% were employed full time. Of the 24.6% who were tobacco users, 46.4% expressed interest in cessation. Of 79.8% who were overweight or obese, 41.8% expressed interest in weight loss. Of the total, 18.4% reported being diabetic, 21.1% were taking hypertension medication, and 21.1% took medications for mental health. **Discussion:** Since 21% reported using medication for mental health, an opportunity for collaboration is already present. A high proportion of patients who used tobacco or were overweight or obese expressed interest in information on those topics. **Conclusion:** This clinic provides opportunities for students to work with diverse populations, collaborate with other professions, and practice health promotion. (This is a conference presentation abstract and not a full work that has been published.)

The impact of a course-content creation tool (Educreations) on student learning in a physiology course

Ahmad Kashif, Glori Hinck

Introduction: Videos are often an integral part of a flipped classroom. However, videos appropriate to specific course objectives are not always readily available. Educreations is a free digital-whiteboard application that can be used to create and share custom video content. **Methods:** One hundred forty-three students enrolled in 2 graduate-level medical physiology courses participated in a survey regarding their perceptions of online course content created with Educreations. Study design was approved by the university institutional review board process. **Results:** Of the respondents, 82% found Educreations lectures "very helpful," and none found lectures "not helpful." Eighty-eight percent would like to see more Educreations videos in their courses. **Discussion:** With Educreations, students can review select course content at their own pace, where and when it is convenient. The recordings are short and can be paused to accommodate time for critical thinking or reflection. Videos can serve as a backup for missed lectures and can be accessed from the device of choice, including an iPad, computer, or phone. **Conclusion:** The Educreations app can be used with an iPad to easily and affordably create and share customized videos for basic science courses in a chiropractic program. Student satisfaction with these videos is high. (This is a conference presentation abstract and not a full work that has been published.)

Cortical thickness in S1 following acupuncture predicts long-term symptom improvement in idiopathic hand pain

Norman Kettner, Yumi Maeda, Jieun Kim, Stephen Cina, Cristina Malatesta, Jessica Gerber, Claire McManus, Alexandra Libby, Pia Mezzacappa, Leslie Morse, Joseph Audette, Vitaly Napadow

Introduction: Idiopathic hand pain (IHP) is median nerve pain and paresthesia; unlike carpal tunnel syndrome (CTS), nerve conduction is normal. We reported maladaptive neuroplasticity in CTS, with acupuncture reducing pain and paresthesia while improving neuroplasticity, but IHP lacks a defined pathophysiology. **Methods:** Cortical morphology in 14 IHP patients was measured with T1-weighted magnetic resonance imaging at 3T before/after 8 weeks of acupuncture. Pain and paresthesia were evaluated with the Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ, 1–5 scale) at baseline, after acupuncture, and at 3 months. Treatment included 2-Hz electrical stimulation at acupuncture points PC7 and TW5 near the affected wrist; 3 additional acupuncture points chosen by the acupuncturist were stimulated manually. A paired-difference map was calculated and cluster corrected for multiple comparisons ($p = .05$). The most significant thickness vertex points were correlated with BCTSQ scores. **Results:** Symptoms assessed through the BCTSQ decreased post-acupuncture and at 3 months ($p < .05$). Cortical thickness was reduced in S1 contralateral to the affected hand. S1 cortical thinning after acupuncture was inversely correlated with long-term reduction in BCTSQ symptoms ($r = -0.78$, $p = .01$). **Conclusion:** The neuroplastic structural response of acupuncture reduced cortical thickness of the S1 hand area in IHP patients that inversely correlated to clinical improvement. (This is a conference presentation abstract and not a full work that has been published.)

Patient sexual abuse: Comparing the rate of discipline for chiropractic, massage therapy, medicine, and physical therapy professions

Stuart Kinsinger

Background: Health care professionals have an obligation to provide care in the best interests of the patient, honoring the fiduciary covenant. While any inappropriate conduct is detrimental to the therapeutic encounter, sexual abuse is considered the most egregious. **Objective:** We sought to determine rates of discipline. Chiropractors were compared with physiotherapists, medical doctors, and registered massage therapists in the Canadian provinces of British Columbia and Ontario in the years 2004–2012. **Methods:** This retrospective study gathered archived data from the respective regulated health professional colleges between 2004 and 2012 for these four professions. Usual and conventional statistical analyses were employed. **Results:** The incident rate of sexual abuse cases per year for chiropractors in Ontario was higher than registered massage therapists, medical doctors, and physiotherapists in the years 2004–2012. **Discussion:** While patient sexual abuse is rare, the impact on all parties is of significance. Mandatory prevention education for students and practitioners should be considered. **Conclusion:** In both Ontario and British Columbia, chiropractors had a higher discipline rate regarding sexual abuse as compared with registered massage therapists, medical doctors, and physiotherapists. (This is a conference presentation abstract and not a full work that has been published.)

Perceived stress and fatigue among doctor of chiropractic students

Anupama Kizhakkeveettil, Andrew Vosko, Marissa Brash, Michael Philips

Objective: The main objectives of this study were to identify sources of, student coping mechanisms for, and the relationship between students' perceived stress and fatigue. **Methods:** The Perceived Stress Scale, Piper Fatigue Scale, and Undergraduate Source of Stress questionnaires were administered among chiropractic students of different levels in a doctoral program. Data were analyzed with 1-way analysis of variance and Pearson correlation test. **Results:** A direct correlation between stress and fatigue was found. Higher levels of stress and fatigue were observed in women than in men. A nonsignificant difference among stress scores and a significant difference among fatigue scores were observed based on program term. Sources of stress were correlated with levels of fatigue and

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academic demands, and sources of fatigue were correlated with psychological health and academic demands. **Discussion:** The results of the study suggest there are differences in the reporting of perceived stress and fatigue levels in a chiropractic student population based on sex. The correlation between fatigue and stress also suggests that measures that may alleviate one may likely affect the other. **Conclusion:** Future studies involving multiple chiropractic colleges will be necessary to generalize these findings. (This is a conference presentation abstract and not a full work that has been published.)

The regenerative potential of notochordal cell conditioned media in ligament injury

Anna Korpela, William Mark Erwin

Background: Ligament injuries are a frequent cause of pain and disability that compromise joint stability and function. **Objectives:** We investigated the restorative effects of notochordal cell conditioned media (NCCM) in an in vitro model of ligament injury under proinflammatory conditions. **Methods:** Fibroblasts obtained from rat medial collateral ligaments were cultured under pro-inflammatory cytokines with and without NCCM. Next, we determined the expression of salient proteins related to ligamentous healing using Western blotting methods. **Results:** There was a dramatic increase in the expression of lysyl oxidase homolog 3 (LOXL3) plus a trend towards increased collagen type III (Col III) and collagen type I (Col I) under NCCM treatment conditions. Furthermore, NCCM induced a complete abolition of the expression of connective tissue growth factor (CCN2/CTGF). **Discussion:** Increased expression of major molecules involved with ligamentous repair (LOXL3 and Col III) suggests that NCCM induces a robust repair response under proinflammatory conditions. The abolition of CTGF expression in IL-1β +TNF α-treated fibroblasts suggests a suppression of this profibrotic growth factor–like molecule. **Conclusion:** Harnessing the regenerative factors secreted by notochordal cells could lead to a novel, molecular treatment for ligament injuries. (This is a conference presentation abstract and not a full work that has been published.)

Pain reduction and costs of spinal manipulation therapy for chronic neck pain in older adults: A cost-effectiveness analysis conducted alongside a randomized clinical trial

Brent Leininger, Christine McDonough, Gert Bronfort, Roni Evans

Background: Chronic neck pain is a common and persistent problem in older individuals, with a substantial individual, societal, and economic burden. **Objective:** The objective of this presentation is to detail the cost-effectiveness of spinal manipulative therapy combined with home exercise (SMT+HE), exercise therapy combined with home exercise (ET+HE), and home exercise alone (HE) from the societal perspective using pain as the primary outcome. **Methods:** Cost and pain outcomes were collected within a randomized clinical trial including men and women 65 years or older with a primary complaint of chronic mechanical neck pain. **Results:** From the societal perspective, the SMT+HE group accumulated fewer mean costs than the ET +HE or HE groups. The SMT+HE group also experienced less pain over 1 year than either the ET+HE or HE groups. **Discussion:** The economic analysis conducted alongside a randomized clinical trial demonstrated SMT+HE to be less expensive and more effective than ET+HE and HE alone from the societal perspective. Future research to determine the relative costs and effects of SMT and HE compared with usual medical care is much needed. **Conclusion:** From the societal perspective, SMT+HE is less expensive and more effective than ET+HE and HE alone. (This is a conference presentation abstract and not a full work that has been published.)

Radiologists as educators: A descriptive review of the literature 1990–2012

Kathleen Linaker

Introduction: The concept of effective teaching has begun to appear in radiology education literature over the last two decades, as radiology faculty learn to embrace modern teaching and learning methods. **Methods:** This article provides a descriptive exploration of literature from 1990 through 2012, describing the training and preparation of radiologists to function as teachers. Retrieval of articles from MEDLINE, ScienceDirect, ERIC, and ICL databases was followed with manual review of the references listed on said articles. **Results:** Research suggests that faculty teaching skills are set during residency. This is likely due to a failure to include scholarship of teaching and learning in the education of residents and faculty development. Preliminary research shows creating opportunity for faculty development is beneficial; much of this literature focused on explaining educational concepts to radiologists. **Conclusions:** The literature examining faculty training in the area of radiology education is sparse. Several articles address the need for more academic radiologists and the need for better training of academic radiologists. The few articles aimed at providing insight to radiologists in this area introduce basic educational concepts, such as lecture creation, examination writing, and learning styles, or simply delineate what makes an effective educator. (This is a conference presentation abstract and not a full work that has been published.)

Radiology undergraduate and resident curriculum: A narrative review of the literature 1930–2012

Kathleen Linaker

Introduction: Radiology education consists of different pedagogy, assessment, and administration mixed with beliefs about what should be taught, when, and how to teach the information. **Methods:** This narrative review was compiled from literature retrieved using MEDLINE, ScienceDirect, ERIC, and ICL, along with manual review of references. Literature about radiology educational curricula of undergraduate and graduate levels is included, providing a comprehensive foundation of knowledge for informing future curricular research. **Discussion:** What little literature exists demonstrates that undergraduate radiology education, radiology curriculum, and radiology pedagogy vary widely between disciplines and between colleges within disciplines. **Conclusions:** The only consensus in the literature is that radiology education is important in undergraduate and residency programs. However, formal radiology education is not taught at all medical programs, and little radiology training is incorporated into nonradiology residencies. This inadequate education results in half of medical graduates being unable to interpret basic radiology images. Additionally, these graduates do not understand contraindications and indications for ordering diagnostic imaging tests. There are no definitive studies examining how to effectively incorporate radiology into the curriculum, how to successfully teach radiology to either undergraduates or residents, or how to assess this clinical competency. (This is a conference presentation abstract and not a full work that has been published.)

Radiology education student evaluations, outcomes, and national licensure examinations: A narrative review of the literature through 2012

Kathleen Linaker

Introduction: Little literature examines how radiology is taught, learned, or evaluated at the resident level, and even fewer articles examine undergraduate radiology education specifically. This literature review examines the literature surrounding student evaluation and outcome assessments, including national board examinations, in order to provide a foundation of knowledge for future research. **Methods:** This article reviews literature though 2012 retrieved using MEDLINE, ScienceDirect, ERIC, and ICL databases and includes manual review of article references. **Results:** Student grade point average (GPA) correlates with board scores in nursing, chiropractic, and medical professions. Scores on the CCAT and undergraduate GPA correlate with success in professional college. An early study suggests there is a correlation between board scores and college attended. Board preparation programs do not appear to affect board exam scores. **Conclusions:** While evaluations can be effective teaching tools, they are not utilized by many radiology programs. Programs often have inadequate evaluations and do not allow students to review their evaluations. There are no definitive links between mastery of radiology and specific evaluations, outcomes, or preprofessional/clinical grades. Studies suggest that board examination scores reflect long-term mastery of knowledge rather than short-term memorization of facts. This area of research is understudied. (This is a conference presentation abstract and not a full work that has been published.)

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Pedagogical approaches to diagnostic imaging education: A narrative review of the literature through 2012

Kathleen Linaker

Introduction: Few radiology educators have explored questions relating to how students learn and how to teach effectively. Accordingly, there is little in the radiology education literature exploring these areas of study. **Methods:** This article examines literature though 2012 surrounding how radiology is taught and learned by radiology residents and undergraduates, retrieved using MEDLINE, ScienceDirect, ERIC, and ICL databases and includes manual review of references. **Results:** The literature explored pedagogical approaches to teaching radiology, including problem solving, technology as teacher, independent-learning tools, visiting lectureships, case-based teaching, and conferences. There was also some exploration of the relative effectiveness of educational formats. **Conclusions:** Radiology is a clinical skill that requires integration science, clinical information, clinical experiences, and information recorded on diagnostic imaging studies. The little research in this area focuses on problem solving, the use of algorithm/scripts, introducing uncertainty in clinical scenarios, incorporating technology in learning environments, active-learning techniques, and methods of independent learning. The writing of literature in this area is still in its infancy, and the research examining the relative effectiveness of these various educational formats is often contradictory, suggesting this is a complex area of study with numerous factors influencing student learning. (This is a conference presentation abstract and not a full work that has been published.)

Spinal manipulation learning: Is error detection capability correlated to expertise?

Michel Loranger, Julien Treboz, Jean-Alexandre Boucher, Francois Nougarou, Claude Dugas, Martin Descarreaux

Background: Most studies on spinal manipulation learning demonstrate the relevance of including motor learning strategies in the chiropractic curriculum. A major outcome of practice is the improved capability of learners to evaluate their own motor performance. **Objective:** The goal of this study is to evaluate the error detection skill of force application during a high-velocity, low-amplitude spinal manipulation between groups of chiropractors with different degrees of expertise. **Methods:** Three groups of students and 1 group of experts completed 10 thoracic spine manipulations on an instrumented device with the specific goal of reaching a maximum peak force of 300 N after a brief period of practice. After each trial, participants were asked to give an estimate of their maximal peak force. **Results:** No significant difference was found between groups (all p values $>$ .05). **Discussion:** The lack of significant effects related to error detection capabilities with expertise could be related to the specificity of the task and how the training process is structured. **Conclusion:** Feedback based on error detection could be implemented in chiropractic programs to allow future clinicians to increase their skills at detecting error and potentially improve procedure safety. (This is a conference presentation abstract and not a full work that has been published.)

Current practices in lumbar surgery perioperative rehabilitation: A scoping review

Andree-Anne Marchand, Julie O'Shaughnessy, Claude-Edouard Chatillon, Karin Sorra, Martin Descarreaux

Background: Despite increasing rates of intervention use, functional disability due to low back pain fails to improve. Surgery may be an option for patients with persistent and disabling symptoms despite conflicting long-term effectiveness. Preoperative and postoperative rehabilitation may be used to improve function and to minimize the risk of persistent dysfunction. **Objective:** To identify current practices and relevant patient-reported outcome measures in lumbar spine perioperative rehabilitation protocols. **Methods:** Two independent literature searches were performed in MEDLINE, CINAHL, the Cochrane databases, PEDRO, and PubMed using terms related to surgical interventions, rehabilitation, and lumbar spine. **Results:** Twenty-eight studies met inclusion criteria. Frequently reported improvements in patient-reported outcome measures were those pertaining to pain, disability, and physical capacity. Rehabilitation protocols encompassed multimodal approaches, including exercises, education, group exchange, and ergonomics. **Discussion:** Analysis of results revealed that postoperative rehabilitation plays a favorable role in minimizing dysfunction following lumbar surgery, despite heterogeneity of reported interventions. **Conclusion:** Rehabilitation following lumbar surgery seems to improve patient recovery, but little is known on the effects of prehabilitation, and the impact of its implementation outside of an integrated program of care remains unknown. (This is a conference presentation abstract and not a full work that has been published.)

Are the peak forces taught in the curriculum at a chiropractic institution for a prone thoracic spinal manipulation effective in producing a cavitation in asymptomatic chiropractic students with a thoracic joint restriction?

Richard McFadden, David Starmer, Daniel Klerer

Objective: To investigate if the target peak forces of 400 N, 600 N, and 800 N taught in the chiropractic curriculum are comfortable and capable of producing a cavitation during prone thoracic manipulations. **Methods:** An experienced chiropractor performed a series of up to 3 prone thoracic spine manipulations on asymptomatic chiropractic students using target forces of 400 $\pm$75 N, 600 $\pm$75 N, and 800 $\pm$75 N. The series of manipulations ended when cavitation was recorded by an accelerometer or if the participant reported discomfort. **Results:** A total of 85 subjects were included in this study; 65.88% ($n = 56$) of subjects cavitated with 400 $\pm$75 N peak force, 20.00% ($n = 17$) required 600 $\pm$75 N, 10.59% ($n = 9$) required 800 $\pm$75 N, and 3.53% ($n = 3$) did not cavitate. No subjects reported discomfort with any of the applied forces. **Conclusion:** This study demonstrates that the peak force targets taught within the chiropractic curriculum are comfortable and effective at producing cavitations amongst the student population when forces are modulated from lower to higher as required. The results of this study reinforce that force modulation may be an important characteristic of a comfortable and effective manipulation. The ability to modulate between targeted forces could be beneficial in practice. Further research is required using different populations. (This is a conference presentation abstract and not a full work that has been published.)

A case study in patient chart review process improvement

Patricia Merkle, Jonathon Egan

Background: New York Chiropractic College has been conducting patient chart reviews for over 10 years, but the outcome data have never been actionable. The previous chart review system did not provide individual faculty–clinicians' data or the ability to trend deficiencies across the health centers or over time. **Objective:** The objectives were to develop a streamlined, repeatable chart review process that gives actionable data to multiple levels. The data needed to be trended both across health centers and over time. **Methods:** A cross-functional team was formed, and survey software was used for the collection, analysis, and distribution of the data. **Results:** New York Chiropractic College has used the new electronic checksheet and reporting at all levels for 2 years. Data are discussed at a trimesterly review meeting. Results are used for programmatic review and posted for the college community. **Discussion:** Each chart review area has a description and explains what specifically would make the item deficient, with an area to comment after each deficiency. **Conclusion:** This material is used to train both faculty–clinicians and students. The college will be using this process in clinic courses, so that students can see the importance of proper chart documentation. (This is a conference presentation abstract and not a full work that has been published.)

The effectiveness of manual therapy in patients diagnosed with neck pain and whiplash-associated disorders: A systematic review

Silvano Mior, Kristi Randhawa, Heather Shearer, Pierre Cote

Purpose: To update Bone and Joint Decade review on Neck Pain and Its Associated Disorders (NAD). **Study Design:** Best-evidence synthesis comparing effectiveness of manual therapy to other or no interventions. **Methods:** We systematically searched databases from January 1, 2000, to March 21, 2013. RCTs, cohort, and case-control studies were appraised using SIGN criteria and categorized using the

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IDEAL framework. **Results:** We identified 1139 articles; 11 were critically appraised and 9 were scientifically admissible. Efficacy studies suggest (1) randomly or specifically targeted neck mobilizations yield similar outcomes, (2) cervical manipulation and Kinesio tape lead to similar outcomes, (3) thoracic manipulation with or without cervical mobilization may provide short-term benefit, and (4) a single session of thoracic spinal manipulation yields similar results to placebo manipulation. Effectiveness studies suggest (1) cervical manipulation and mobilization provide similar outcomes in recent NAD, (2) spinal manipulation added to supervised exercise provides no added benefit in persistent NAD, and (3) traction adds no benefit to multimodal care in cervical radiculopathy. No serious adverse events were reported. **Conclusions:** Our review suggests that manipulation and mobilization provide similar outcomes; therefore, choice should include patient preferences. The evidence does not support the use of traction for cervical radiculopathy. (This is a conference presentation abstract and not a full work that has been published.)

A collaborative project examining faculty and intern attitudes and behaviors toward smoking cessation interventions in a chiropractic teaching clinic: A qualitative analysis

Kenice Morehouse-Grand, Bahar Sultana

Background: Cigarette smoking is the leading cause of preventable morbidity and mortality in the world. Low back pain has been correlated with tobacco use. Patients seek chiropractic help for musculoskeletal and chronic back pain. Chiropractors are in a position to positively impact smoking behavior. **Objective:** The objective was to assess current attitudes and behaviors of clinicians and student interns towards smoking cessation interventions, with the goal of developing a health promotion program for tobacco cessation. **Methods:** Focus groups were designed and conducted in a collaborative manner between a master of public health student and a college clinician. The focus groups consisted of faculty clinicians and student interns. **Results:** Both groups assessed smoking status regularly but did not feel adequately trained or supported to provide smoking cessation counseling. **Discussion:** Although recognizing tobacco use as a contributor to chronic pain and the need for smoking cessation counseling, the participants related multiple barriers to its effective delivery. **Conclusion:** Increased training and infrastructure would appear to enhance employment of smoking cessation counseling in this clinic. (This is a conference presentation abstract and not a full work that has been published.)

Effect of vibration on cervical proprioception in normal subjects

Joseph Morley, David Sikorski

Objective: Establish a normative database for neck proprioception in asymptomatic subjects, with and without vibration. **Methods:** Seventeen subjects wore a bicycle helmet with a laser pointer attached while standing on a vibration platform. After aligning the laser beam to their determined neutral position, they closed their eyes. They were instructed to flex their neck maximally and return to where they thought the neutral position was. This was marked on the chart. This sequence was repeated for the other 5 cervical movements. Then the vibration platform was turned on and the process was repeated. **Results:** In normal and vibratory trials, *t* tests showed significant differences (.05) for intersubject pooled data between men and women, as well as normal and vibration data for all cervical movements except extension. Intrasubject data showed consistent differences between normal and vibratory means, but large variances negated statistically significant results in most trials. **Discussion:** Data indicated that vibration had a significant effect on cervical proprioception in normal subjects. **Conclusion:** This project was the first step in establishing a normative database for cervical proprioception. With further research the data could be used for diagnosis of cervical problems and to assess treatment efficacy. (This is a conference presentation abstract and not a full work that has been published.)

Impact of review timing on student performance

Stephanie Mussmann, Kathleen Linaker

Objective: The purpose of this study was to evaluate how the timing of classroom reviews impacted student performance. **Methods:** Material taught in a graduate radiology class was divided into 4 groups: 3 in which material was reviewed at various times throughout the course and a control group in which material was not reviewed. Students were reexamined 6 weeks after the initial examination to evaluate for long-term retention. Paired *t* test of means was performed to evaluate for significant differences between the review and control groups. Students also completed a survey regarding their preferences for various review methods. **Results:** Reviews had the greatest impact on students' performance on more difficult material. Though any review method resulted in an improvement of student performance in this area, the greatest improvement was achieved when material was reviewed throughout the course (43% improvement and 53% greater long-term knowledge retention). **Conclusion:** Any form of reviewing material in the classroom produced improved student performance and was deemed helpful by the students. Reviewing material throughout the course resulted in both improved examination performance and long-term retention. The students expressed that the most helpful methods of review were laboratory activities and comparison slides. (This is a conference presentation abstract and not a full work that has been published.)

General practitioner referral for musculoskeletal therapies: Why physiotherapy and not chiropractic?

Gurjit Nahal, Adrian Hunnisett, Christina Cunliffe

Introduction: Historically general medical practitioners (GPs) have referred their patients with musculoskeletal conditions to physiotherapists rather than chiropractors. The aim of this study is to consider the reasons and how to improve referral rates to chiropractors. **Method:** Following ethical approval, a cross-sectional survey was undertaken using a self-administered questionnaire sent to GPs across Birmingham, Oxford, Leicester, and Ipswich in the United Kingdom. **Results:** The results showed that GP preference of service was heavily weighted toward physiotherapy, with 80% choosing it over chiropractic, and in practice 96% referring musculoskeletal conditions to physiotherapy. However, it is clear that a majority of GPs have a positive view of chiropractic (76%), and 72% indicate possible change in chiropractic referral if it were available within the UK National Health Service (NHS). Although the Any Qualified Provider (AQP) scheme, allowing use of chiropractic in the NHS, is available in some areas, the majority of respondents (92%) were unaware of it. **Conclusion:** GPs prefer physiotherapy for musculoskeletal conditions but have a positive view of chiropractic. The principle reasons are better availability through the NHS and familiarity. GPs also lack awareness of schemes available to facilitate the use of chiropractic, such as AQP. (This is a conference presentation abstract and not a full work that has been published.)

The role of chiropractic care in the treatment of dizziness and balance disorder: Analysis of the 2008 National Health Interview Survey data

Harrison Ndetan, Cheryl Hawk, Steven Pulvino, Vishaldeep Ka Sekhon, Miguel Chiusano

Background: Evidence for chiropractic care for balance and dizziness is still emergent. **Objective:** To assess the role of chiropractic for dizziness and balance disorders. **Methods:** This secondary data analysis of the 2008 National Health Interview Survey was approved by the institutional review board. Using SAS 9.2, national population estimates and odds ratios (ORs) with 95% confidence intervals (CIs) were calculated using binary logistic regression models for the likelihood of being helped by those who saw chiropractors. **Results:** Eleven percent reported balance or dizziness problems; 35% were aged 65 and older. Although only 4.2% reported chiropractic care, the OR of perceiving being helped was the highest, 1.73 (CI 0.92–3.24). For respondents aged 65 and older, the OR for perceiving being helped by a chiropractor was 4.36 (CI 1.17–16.31). For those reporting neurological or muscular conditions as the cause of their problem, the OR for being helped by a chiropractor was 13.78 (5.59, 33.99). **Discussion:** For older adults and those whose cause of balance and dizziness is trauma or neurological or musculoskeletal issues, the OR of perceiving that chiropractic helped was higher than for other practitioners. **Conclusion:** Respondents who report using chiropractic are more likely to report being helped compared with other practitioners in the analysis. (This is a conference presentation abstract and not a full work that has been published.)

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Chiropractic use among active-duty military or military veterans: Access to care and payment options

Harrison Ndetan, Wills Evans, Steven Pulvino, Adrita Rahman, David Walters, Julie Swartz

Background: Musculoskeletal conditions are a common cause of disability in the military, and chiropractic care has been known to be effective in treating these conditions. **Objective:** To assess use of chiropractic services among active-duty military and veterans and to evaluate access to care and payment options. **Methods:** Analysis was performed using the 2012 National Health Interview Survey data. Using SAS 9.2, national population estimates and odds ratios (ORs) with 95% confidence intervals (CIs) were calculated using binary logistic regression models for the likelihood of active-duty military and veterans using chiropractic services. **Results:** About 9.2% of active duty military and veterans reported seeing a chiropractor, 5.9% as their personal health care provider and 0.7% on a routine basis. They were slightly less likely than nonmilitary personnel to seek this care (OR [95% CI] = 0.89 [0.74, 1.07]). About 48% noted their care was covered by insurance; 8.2% were delayed in getting care and 3.9% were unable to get care due to cost. Conditions they sought care for were back, neck, and musculoskeletal related. **Discussion/Conclusion:** There seem to be no significant differences in the use of chiropractic services among active-duty military and veterans compared with the general public. More research should be done to determine the role chiropractic could play in military readiness and care. (This is a conference presentation abstract and not a full work that has been published.)

Preferred instructional strategies for various learning styles in cell physiology: A pilot study

Lia Nightingale

Research has demonstrated that learners in first-year physiology and medical school programs are multimodal learners, while chiropractic students are kinesthetic multimodal learners. Kinesthetic learners have been shown to score the lowest in physiology courses. The goal was to determine which instructional strategies and note characteristics were believed to be helpful by students with various learning styles in a first-trimester cell physiology course. The VARK and Index of Learning Styles (ILS) surveys and questionnaire were administered during lecture. Questionnaire results were tabulated as means with standard deviations and sorted based on VARK and ILS categories. Sixty percent of all students were unimodal, and 34% were unimodal kinesthetic learners. Males were more likely to be kinesthetic learners, while females preferred aural or read/write modalities. All learning styles preferred concept maps and bolding/underlining of the notes. Visual learners preferred color coding, while aural learners did not find audio recordings to be helpful. Both kinesthetic and visual learners had the highest percentage of predicted As in the course. Overall, concept maps were the most helpful instructional material provided. Providing multiple tools for learning may have prevented kinesthetic learners from scoring poorly in this physiology course. (This is a conference presentation abstract and not a full work that has been published.)

Neuromechanical responses to spinal manipulation therapy: The role of the rate of force application

Francois Nougarou, Isabelle Page, Michel Loranger, Claude Dugas, Martin Descarreaux

Background: Spinal manipulation therapy (SMT) generates various neuromechanical responses depending on its biomechanical parameters dosage. The effects of rate of force application remain to be investigated in humans. **Objective:** Evaluate the role of rate of force application in neuromechanical responses to SMT in healthy adults. **Method:** Four standardized SMTs presenting different time to peak force and peak force but with constant rate of force application were applied on T7 to 25 participants. The effects of SMT force-time profiles on paraspinal muscle activity and vertebral displacement were assessed using 1-way analysis of variance. **Results:** There was no significant difference in paraspinal muscle activity between SMT force-time profiles (ps $>$ .05). Vertebral displacement of T6 to T8 increased when increasing peak force, although rate of force application was kept constant (ps $<$ .001). **Discussion:** Neuromuscular responses to SMT seem to be mostly modulated by the rate of force application, while vertebral displacement might depend on peak force. The relationship with changes in clinical outcomes is not known. **Conclusion:** Rate of force application is an important parameter in neuromuscular responses to SMT, while peak force operates on biomechanical responses. Further studies should evaluate the clinical implication of various SMT dosages. (This is a conference presentation abstract and not a full work that has been published.)

Health professional perspectives regarding the use of patient-reported outcome measures in an integrated primary care health center: A pilot project

Kirsten Olesen, Peggy Howard, Shirley Xing, Fok-Han Leung, Deborah Kopansky-Giles

Objective: To assess health professional perspectives surrounding the implementation of a standardized package of patient-reported outcome measures (PROMs) in an inner city, integrative primary health care center, and to identify specific PROMs recommended for package inclusion. **Methods:** This qualitative study involved semi-structured key informant interviews with health care practitioners working in the primary care health center. **Results:** Eleven practitioners participated. Responses were divided into major themes: attitudes around the use of PROMs, PROMs currently in use by the study participant, advantages and disadvantages of implementing a package of PROMs, barriers and facilitators to PROM use in the department, desirable attributes of PROMs to use, and specific PROMs identified for package inclusion. The key informants concurred that PROMs would be useful; however, there were concerns surrounding how the package would be implemented, the relevance to their profession, and how it would be used within and between professions. **Conclusions:** Participants generally agreed that implementing a standardized approach to the use of PROMs in our primary care setting was desirable. They made recommendations for PROMS to consider. There were some barriers identified, which participants felt could be resolved by a careful planning and implementation strategy. (This is a conference presentation abstract and not a full work that has been published.)

Developing training targets for lumbar spine high-velocity, low-amplitude adjustments in a chiropractic program

Edward Owens, Ronald Hosek, Stephanie Sullivan, Brent Russell, Linda Mullin, Lydia Dever

Introduction: Our college developed an adjusting bench with a force plate supporting the lumbar portion to measure loads transmitted during lumbar manual adjustment. It will be used to provide force feedback to enhance student learning in technique labs. The study goal is to define the learning target loads and speeds, with instructors as expert models. **Methods:** Eleven technique faculty members provided consent in the institutional review board–approved study. Each performed 81 simulated adjustments of a mannequin on the force plate. Adjustments were along 9 lumbopelvic "listings" at 3 load levels: light, normal, and heavy. We analyzed the thrusts to find preload, peak load, duration, and thrust rate. **Results:** Analysis of 891 thrusts showed wide variations between doctors. Peak loads ranged from 100–1400 N. All doctors showed clear distinctions between peak-load levels, but there was overlap between high loads and low loads. Thrust rates were more uniform across doctors, averaging 3 N/ms. **Conclusion:** The teaching faculty deliver a range of thrusts, not unlike those seen in the literature. We have established at least minimum force and speed targets for student performance, but more work needs to be done to create a normative adjustment to guide refinement of student learning. (This is a conference presentation abstract and not a full work that has been published.)

Correction of abnormal flexion–relaxation phenomenon in chronic low back pain: The benefit associated with biofeedback training

Isabelle Page, Andree-Anne Marchand, Francois Nougarou, Julie O'Shaughnessy, Martin Descarreaux

Background: Biofeedback training is recommended in the treatment of chronic pain conditions such as chronic low back pain (LBP). **Objective:** Evaluate the changes in neuromechanical responses and clinical outcomes over 4 sessions of biofeedback in chronic LBP

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patients. **Method:** Twenty-one patients participated in a biofeedback training consisting of ~46 trunk flexion–extension per session (divided into 5 blocks). The effects of training blocks and sessions on flexion–relaxation ratio (FRR) lumbar and pelvic range of motion (ROM) were assessed as well as change in clinical outcomes. **Results:** A significant block effect was observed and indicated an increase in FRR and lumbar ROM between block 1 and the other blocks for sessions 1 and 2. Fear of movement decreased significantly between baseline and the fourth session, but no significant session or interaction effect was observed. **Discussion:** The results suggest that the increase in FRR is associated with an increase in ROM originating from either the lumbar or pelvic region. Although a decrease in fear of movement was observed, how biofeedback impacts this outcome is not known. **Conclusion:** Biofeedback helps chronic LBP patients to achieve a healthy-like neuromechanical pattern during a trunk flexion–extension. (This is a conference presentation abstract and not a full work that has been published.)

An exploratory, descriptive study of consumer opinions and behavior regarding health products sales at 4 chiropractic practices in a large western Canadian urban center

Stacey Page, D. Gordan McMorland, Jaroslaw Grod

Purpose: To describe the opinions and behaviors of chiropractic patients in a large western Canadian urban center regarding the sale of health products by chiropractors. **Methods:** A brief, descriptive survey was distributed by clinic reception staff at 4 chiropractic offices. **Results:** After a 10-week recruitment interval, a convenience sample of 103 participants was obtained. Most participants supported the sale of health products by chiropractors ($n = 101$; 98.1%) and most had made health product purchases from a chiropractor at some point ($n = 73$; 70.9%). Products relating to muscular care, exercise/rehabilitation products, and pillows were most often purchased (>40%). Consistent with this, consumers were most supportive of chiropractors selling products they perceived to be directly related to musculoskeletal care. Some participants believed there should be limits placed on the range of products sold; the products had to be consistent with the practitioner's area of expertise and had to have some demonstrated level of effectiveness. **Conclusions:** Participants were supportive of health product sales by chiropractors, assuming certain conditions were met. Consumers believed that product sales should be undertaken with integrity and should be consistent with the chiropractor's area of expertise. Consumer beliefs appeared to impact their purchasing behaviors. (This is a conference presentation abstract and not a full work that has been published.)

The impact of body position and walking on neurophysiological outcome measures

Steven Passmore, Michael Johnson, Mina Aziz, Jeanmarie Burke, Mary Balliett, Paul Dougherty

Background: Physical activity and body position changes exacerbate/relieve lower-extremity pain in pathological conditions such as degenerative lumbar spinal stenosis. Neurophysiological outcome measures provide objective clinical assessment. Previous research explored exercise and neurophysiological tests; less is known regarding whether patient position impacts neurophysiological tests. **Objective:** Determine if acute exercise and/or body position changes impact latencies and amplitudes of central and peripheral neurophysiological outcome measures. **Methods:** In a cross-sectional, within-group experimental design, healthy participants ($N = 18$) had transcranial magnetic stimulation to elicit motor evoked potentials (MEPs) of the abductor hallucis, and tibial nerve H reflexes from the soleus before and after treadmill walking. A progressive-exercise treadmill test induced acute exercise effects. The MEPs and H reflexes were recorded in 2 positions (supine or seated) before and after walking. All procedures were institutional review board–approved. **Results:** Significant amplitude ($F[1,12] = 4.880$, $p = .047$), and latency ($F[1,12] = 14.141$, $p = .003$) effects were found for H reflex data before and after walking. Analysis of H reflex latency also yielded a significant position effect ($F[1,12] = 5.633$, $p = .035$). **Discussion/Conclusion:** Neurophysiological outcome differences attributed to acute exercise in a healthy population are due to peripheral factors. Position changes only impacted peripheral reflex latency, with an advantage for latency noted while patients were supine (no spinal/extremity flexion). (This is a conference presentation abstract and not a full work that has been published.)

Pediatric chiropractors' attitudes and opinions about patient safety culture

Katherine A. Pohlman, Linda Carroll, Lisa Hartling, Ross Tsuyuki, Sunita Vohra

Background: There are currently gaps in the literature regarding the safety of chiropractic care for children. **Objective:** To evaluate pediatric chiropractors' patient safety attitudes and opinions. **Methods:** This cross-sectional survey was sent to members of 2 chiropractic pediatric councils (n = 400). Data analysis included composite average and mean/95% confidence interval for each dimension. **Results:** Response rate was 29.5% ($n = 118$). Chiropractors with a pediatric certification were 2 times more likely to respond ($p < .001$), but few differences were found in responses between those with and without certification. Almost a third of the patients were pediatric; the most common presentation was a female with musculoskeletal complaints. All patient safety dimensions had high scores; clinical organizational learning was the highest and work pressure and pace had the most room for improvement. The average overall patient safety rating score was "Very Good." **Discussion:** Compared with medical offices, pediatric chiropractors appear to have a robust patient safety culture. Limitations include survey generalizability and the potential for nonresponse bias due to the low response rate. **Conclusion:** Pediatric chiropractors were found to have a very good patient safety culture. Future patient safety studies need to prospectively evaluate safety performance with direct feedback from patients. (This is a conference presentation abstract and not a full work that has been published.)

Melanoma risk communication: Assessment of chiropractic students using standardized patients

Michael Ramcharan

Objective: The aim of the study was to explore the communication skills and dermatologic practices of sixth-trimester chiropractic students in the detection of melanoma during a nondermatologic simulated patient encounter. **Methods:** The study was a retrospective analysis of WebSP data during 2 standardized patient encounters. Standardized patient checklists were reviewed for evidence on the students' ability to detect the suspicious skin lesions and to manage appropriately. **Results:** The cohorts consisted of a total of 27 chiropractic students. The detection rate was 41% (11) for the skin lesion; 15% (4) managed the skin lesion appropriately, and 63% (17) of the students did not mention a clinical management. **Conclusion:** The low detection rate in this study and the lack of appropriate management for malignant melanomas is a significant teachable moment for chiropractic students. Increasing the clinical skills of students to screen and detect atypical skin lesions may theoretically result in reducing the incidence of potential pathological lesions. The use of standardized patients with moulage in clinical-skills examinations can build competence in melanoma screening among students. (This is a conference presentation abstract and not a full work that has been published.)

The addition of spinal manipulation to counseling by chiropractors for tobacco cessation: A feasibility study

Kevin Rose, Anupama Kizhakkeveettil, Gena Kadar, Mark Losack

Background: Tobacco use is the single largest cause of preventable illness and death in the United States. More-effective methods for tobacco cessation are needed. **Objective:** This feasibility study was conducted to collect preliminary data on the effectiveness of combining spinal manipulation (SM) with standard tobacco cessation counseling. **Methods:** Institutional review board approval was obtained. Participants in the intervention group received 2 months of counseling plus SM, while the control group received counseling alone. Primary outcome measures were smoking cessation as measured by a tobacco diary and urinary cotinine. **Results:** Ten participants completed the study. Although both groups showed improvement, intervention group participants were more likely to have achieved at least 7 days of complete cessation. **Discussion:** In this small feasibility study, chiropractors appeared to be capable of conducting effective smoking cessation counseling. The addition of

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SM may assist cessation efforts by mediating imbalances in the sympathetic and parasympathetic nervous systems and stimulating B-endorphin release. **Conclusion:** A combination of SM and counseling may be effective in helping smokers quit. Future studies that are adequately powered should be conducted and should consider using multiple locations and incentives to recruit participants. (This is a conference presentation abstract and not a full work that has been published.)

Perception of cheating in the classroom setting

Lisa Rubin

Introduction: The focus of this study is to examine the factors that deter students from cheating. This is a unique twist to the typical emphasis on academic integrity, since most of the research delineates how students have little academic integrity and that cheating is on the rise. **Methods:** Questionnaires were distributed in eighth- and ninth-quarter classes. Students and faculty were asked to fill out a questionnaire voluntarily and anonymously. **Results:** Students and faculty rated the following as the most helpful ways to deter cheating in the classroom: (1) no electronic devices allowed, (2) different test forms, and (3) more than 2 different test forms. The top choices of students as the most helpful way to deter cheating were also the top options chosen by faculty. **Conclusion:** The focus of the study was assessing student and faculty perceptions on ways to reduce cheating in the classroom setting. Further research is needed to help clarify the perceptions of students in the classroom, especially in chiropractic school, as such students face many ethical and moral integrity issues as health care providers. (This is a conference presentation abstract and not a full work that has been published.)

Distance education online intervention for evidence-based practice literacy

Michael Schneider, Roni Evans, Mitchell Haas, Cynthia Long, Cheryl Hawk, Matthew Leach, Greg Cramer, Corrie Vihstadt, Oakland Walters, Lauren Terhorst

Background: Complementary and alternative medicine (CAM) providers have traditionally not relied on scientific evidence within their practices; thus evidence-based practice (EBP) is a relatively recent emphasis. **Objective:** To survey US chiropractors about their attitudes, skills, and use of research evidence, using chiropractors as a representative subset of all CAM providers. **Methods:** A national online cross-sectional survey of US chiropractors was conducted using a validated EBP survey modified for the chiropractic profession. Three subscores of the survey were dichotomized into "high" and "low" at the mean: (1) attitudes, (2) skills, and (3) use of EBP. Logistic regression models calculated odds ratios from significant demographic, clinical decision, and barrier variables as predictors of having a higher subscore. **Results:** 1314 chiropractors completed the survey and demographically were representative of the US chiropractic profession. Lower attitudes were predicted by more years in practice and a nonmusculoskeletal focus. Lower skills and use were predicted by reporting difficulty with locating research evidence and applying research in clinical practice. **Discussion:** US chiropractors generally have positive attitudes about EBP but feel challenged with respect to their skills and use of EBP. **Conclusion:** There is a need for providing educational EBP resources to the chiropractic profession. (This is a conference presentation abstract and not a full work that has been published.)

Use of video to teach a biochemical concept in the doctor of chiropractic program

Kathy Shaw, Ali Rabatsky

Introduction: The use of videos as a teaching and learning tool is becoming more common in the educational process. This study examines the effectiveness of learning a biochemical concept by video in the doctor of chiropractic program. **Methods:** Students in the biochemistry class were taught the Krebs cycle through a video exercise and glycolysis in a traditional lecture format. They received a review of both concepts and were tested. Test performance was examined. Students answered a questionnaire following the exercise. Institutional review board exemption was granted for the study. **Results:** There were no significant differences in test performance on the topic learned by the video exercise. However, the students reported that they learned more from the review than they did from the video exercise. They also reported feeling that lecture was a more-effective learning tool. **Discussion:** The use of video combined with a review proved an effective teaching tool, but the role of the review is unclear. Student preference of the lecture format was not expected for a generation that is so comfortable with technology. **Conclusion:** The use of videos as a supplement to a traditional lecture is probably the most viable teaching option. (This is a conference presentation abstract and not a full work that has been published.)

The efficacy of collaborative instruction and its implications on interprofessional development

William Sherrier

Background: Emergent evidence of how adults learn best and the shift in the health care model toward patient-centered care requiring the physician and other health care providers to be part of a decision-making team has encouraged collaborative instruction. **Objective:** The purpose of this presentation is to establish the efficacy of collaborative instruction to improve its perception as a valuable learning strategy and offer insight into how this method of instruction fosters interprofessional collaboration. **Methods:** A systematic review of current literature regarding the efficacy of collaborative instruction in professional health care education was obtained for this presentation. **Results:** Learning outcome achievement and standardized test scores have shown to be statistically the same and sometimes higher with collaborative instruction. Increased group interaction, presentation, and communication skills have been observed. **Discussion:** Collaborative learning improves knowledge transfer by actively engaging in learning processes. Evidence exists supporting this instructional method as an effective framework in the development of critical thinking skills and interpersonal and interprofessional communications. **Conclusion:** Collaborative learning is a logical and integral component in creating an effective interprofessional health care team. Future research on institutional effectiveness will further improve the value of this instructional strategy. (This is a conference presentation abstract and not a full work that has been published.)

Evaluation of molecular phenotype of intervertebral disc nucleus pulposus cells

Jasleen Singh, Ajay Matta, William Mark Erwin

Background: Spinal degenerative disc disease (DDD) is a highly prevalent condition and is the most common and expensive source of disability in North America. It is characterized by the progressive loss of normal nucleus pulposus (NP) disc matrix and cellularity. Little is known about the molecular changes that ultimately lead to structural failure of the intervertebral disc (IVD). **Objective:** We seek to understand the underlying molecular phenotypic differences of NPs between healthy and degenerated IVDs. **Methods:** We compared histological sections of IVDs from rats and canines. We assessed for histological differences using Meyer's hematoxylin and eosin staining, safranin O staining, and immunostaining for the T transcription factor "Brachyury" and the master chrondrogenic transcription factor Sox9. **Results:** Healthy IVDs have NPs rich in notochordal cells that are nuclear positive for Brachyury. In contrast, the NPs of degenerated IVDs have few chondrocytelike cells that are nuclear positive for Sox9 within a dense, disorganized, fibrocartilaginous matrix. **Discussion:** Here we demonstrate key histological and architectural differences between healthy and degenerated discs shared by rat and canine models. **Conclusion:** Understanding molecular phenotypic changes that govern the process of degeneration is key to developing a regenerative therapy for DDD. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic student attitudes toward the Patient Protection and Affordable Care Act

Edward B. Smith, Mark T. Pfefer, Stephan R. Cooper, Rebecca J. Burkhalter, Simone Briand, Angela R. Segovia, Scott Runnels

Objective: To assess the attitudes of chiropractic students regarding the Patient Protection and Affordable Care Act (PPACA). **Methods:** An institutional review board–approved survey was distributed to 275 chiropractic students at 1 institution. **Results:** Students returned 124 surveys, for a response rate of 45%; regarding their assessment of their

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understanding of the PPACA, 29% agreed they understood the law while 37% disagreed. With respect to whether the PPACA improves the quality of health, 12% agreed, 50% disagreed. Agreement that the PPACA would provide expansion of access was indicated by 34%, while 26% disagreed. Only 9% agreed that the PPACA would contain health care costs, while 48% disagreed. A lack of support was indicated by 60% of respondents; 6% indicated that it failed to go far enough in providing health insurance, while 54% indicated it went too far. Support for the PPACA was indicated by 40%, 14% saying it went far enough while 26% identified a need for further reform. Repeal was supported by 35%, 17% did not support repeal, and 48% were neutral. The remainder of responses to all items was neutral. **Conclusion:** Chiropractic students appear to have a significantly different attitude toward the PPACA when compared with the limited data regarding allopathic medical students. (This is a conference presentation abstract and not a full work that has been published.)

Effectiveness of electroacupuncture on ganglion cysts: A pilot study

Brian Snyder, Dennis Enix, Chelsie Arnold, Aaron Welk

Background: Ganglion cysts are commonly found on the dorsum of the wrist. **Objective:** This study examines the use of electroacupuncture in the management of ganglion cysts of the wrist. **Methods:** Eight participants, 22 to 32 years old (mean age 27.5 ±4.9)—4 males (mean age 28 ±6.3) and 4 females (mean age 27 ±4.2)—received high-frequency electroacupuncture treatments to wrist ganglionic cysts. Diagnostic ultrasound verified cysts in the wrist prior to treatment. **Results:** Pain and wrist range of motion improved significantly after treatments; pain VAS scores decreased (5.6 ±2.3 and 1.4 ±1.6) ($p <$ .001); range of motion improved (30.0° ±11.9° and 79.3° ±10.2°) ($p <$ .001). Point tenderness decreased partially in 50% of subjects and completely in 50% of subjects. Data passed the Shapiro-Wilk normality test, VAS ($p = 0.269$) and ROM ($P = 0.081$). **Discussion:** Ganglionic cysts account for 50%–75% of all hand masses and commonly occur in women 20–40 years of age. The most-common cyst site is the dorsum of the wrist along the scapholunate joint. With high postsurgical recurrence rates, conservative management may be an option for these cases. **Conclusion:** Ganglionic cysts in the wrist can be effectively managed with electroacupuncture. (This is a conference presentation abstract and not a full work that has been published.)

Pairing preload force requirements with individuals of varying body mass index: A pilot study

Brynne Stainsby, Tyler Iveson, Bradley Abell, Paul Bondy, Shaun Maher

Objective: The objective of this pilot study is to determine the amount of preload force required to reach thoracic joint end range in patients with different body mass index (BMI). **Methods:** Chiropractic student subjects and faculty participants were recruited via e-mail and direct solicitation. The subjects were categorized based on their BMI. The participants were asked to find joint end range in the midthoracic (T4–T8) spine using a bilateral transverse-thenar diversified (Carver) contact. Descriptive statistics were analyzed. **Results:** Twenty-one participants performed a preload force to end range on 3 subjects of different BMI. The average preload forces on subjects 1–3 (lowest to highest BMI) are 262 N, 238 N, and 257 N, respectively. The difference in preload force between subjects 1 and 3 was the least. Analysis showed no statistically significant difference between the 3 BMI categories. **Conclusion:** This study determined a feasible protocol and parameters for future research regarding spinal manipulation therapy and BMI. A future study with a larger sample size would strengthen the current study results. (This is a conference presentation abstract and not a full work that has been published.)

Learning spinal manipulation: A best-evidence synthesis of teaching methods

Brynne Stainsby, Jade Egonia, Michelle Clarke

Objective: To evaluate the effectiveness of different teaching methods used to learn spinal manipulative therapy for chiropractic students as a population. **Methods:** We searched 5 electronic databases for studies from 1900 to 2013. Eligible studies were critically appraised using the SIGN criteria. The results of scientifically admissible studies were synthesized following best-evidence synthesis principles. **Results:** We critically appraised 20 articles, which consisted of 9 randomized clinical trials, 9 cohort studies, and 2 systematic reviews/meta-analyses. Eleven articles were accepted as scientifically admissible. **Conclusions:** We found evidence that several different teaching methods exist in the literature for instructing chiropractic students in spinal manipulative therapy techniques; however, future research in this developing area of chiropractic education is proposed. It is suggested that various teaching methods be included in the regular curriculum of chiropractic students to aid in efficiency, development of skills, and knowledge of performance to maximize technique mastery. It is also suggested that the transfer of these learned skills to future clinical practice may contribute to improved clinical outcomes for patient populations. (This is a conference presentation abstract and not a full work that has been published.)

Non-urgent emergency department visits and strategies employed to reduce them

Maxine Stewart

Background: Non-urgent emergency department (NUED) use puts a strain on staff, space, and resources and is associated with poor clinical outcomes. Efforts to reduce this strain have not been successful to date. **Objective:** This article presents the most common reasons for NUED use and reduction strategies that have been employed. **Methods:** A literature review was conducted using PubMed, CINAHL, and TRIP databases. Nineteen articles were selected for review: 4 cross-sectional analyses, 4 quasi experiments, 10 descriptive studies, and 1 systematic review. **Results:** NUED use was associated with lack of timely access to primary care, having a chronic illness and/or multiple comorbidities, and poverty. Case management was the most commonly employed intervention and had the greatest impact on NUED use. On-site primary care was another intervention used to reduce emergency department load. **Discussion:** Access problems and illness acuity were major determinants for NUED use. Promising reduction strategies included offering extended and weekend hours, case management, integrated health care services, and the availability of primary care in close proximity to the emergency department. **Conclusion:** Interventions to reduce NUED use and ease the strain on resources need to safely and comprehensively address consumer issues. (This is a conference presentation abstract and not a full work that has been published.)

A pilot study of the effects of whole-foods supplementation on adrenal fatigue syndrome

Rodger Tepe, Delia Hobbins, Lauren McVay, Sheri Williams

Background: Adrenal fatigue syndrome (AFS) is a frequently occurring condition that lacks a consensus for evidence-based diagnosis and treatment in the literature. **Objective:** To investigate the effects of a regimen of glandular and vitamin whole-foods supplementation on symptoms of AFS. **Methods:** This project was approved by the institutional review board. A battery of outcome measures related to AFS was administered before and after 30 days of whole-foods supplementation. **Results:** Twenty-six consenting participants with symptoms of AFS completed the trial (16 females and 10 males; age range 20–34 years old, mean = 24.6, SD = 3.7). Statistically significant differences (improvements) were found for pupillary response, perceived stress scales A and B, system survey, fatigue, stress rating scale, anxiety, depression, and sleep disturbance. No differences were found for blood pressure (standing postural hypotension). **Conclusion:** Thirty days of supplementation with Standard Process Drenamin and Cataplex C had a positive effect on symptoms of AFS. Statistically significant improvements were found for 9 out of 10 outcome measures used. Considering the possible benefits of a safe and effective treatment for AFS, further investigation with double-blind randomized controlled trials is recommended. (This is a conference presentation abstract and not a full work that has been published.)

Interexaminer and intraexaminer reliability of full-spine pressure pain thresholds in symptomatic and asymptomatic participants

Rodger Tepe

Background: Published evidence about methods for determining the site for applying spinal manipulation is equivocal. **Objective:** To

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determine interexaminer and intraexaminer reliability of full-spine pressure pain thresholds (PPTs) using algometry. **Methods:** This study was approved by the university institutional review board. A convenience sample of 40 consenting participants with (40%) and without spine-related symptoms was recruited from the student body at our university. Full-spine PPTs of the left and right transverse processes were taken on 2 consecutive days by 2 trained senior chiropractic interns. Interclass correlations (ICCs) were performed to determine interexaminer and intraexaminer reliabilities. **Results:** Interexaminer mean ICCs were Fair/Good (0.42, SD = 0.14); examiner A had Fair/Good mean ICCs (0.70, SD = 0.09), and examiner B had Fair/Good mean ICCs (0.51, SD = 0.14). Significant differences were found between PPTs of asymptomatic and symptomatic subjects ($p = .001$) and between the mean PPTs of the cervical, thoracic, and lumbar spinal regions ($p < .001$). **Conclusion:** Results showed that participants with spine-related pain had lower PPTs than asymptomatic participants and that cervical PPTs were lower than thoracic PPTs, which were lower than lumbar PPTs. Intraexaminer and interexaminer ICCs were within the Fair/Good range. Continued study is recommended with increased examiner training and outpatient participants. (This is a conference presentation abstract and not a full work that has been published.)

Effects of reflective practice on learning of defined manipulation performance parameters

John Triano, Dom Giuliano, Marion McGregor, Loretta Howard

Background: Reflection is a well-accepted process of learner self-evaluation. Little information exists on reflective practice for manual treatments. This work tested a structured reflection to observe the impact on learning high-velocity, low-amplitude (HVLA) manipulation. **Methods:** Baseline stability of performance of thoracic HVLA was tested using force-time profiles. Learners ($n = 374$) rehearsed with coaching for 1 hour and then reassessed. Daily elective hours were available for reflection using force measures. Time using reflection was recorded. A prelab formative assessment occurred after 5 to 7 months. Assessments gauged gains, retention, and effects of reflection based on groups who did and those who did not use it. **Results:** Baseline measures were stable. Short-term gains over session 1 were significant for learners ($.0000 < p < .0893$). Learners who chose to use reflection self-selected and had lower gains than peers. Reflection averaging 1 hour over 5 to 7 months showed strong gains ($.0000 < p < .0014$). Those who did not choose reflection showed no gains. **Discussion/Conclusion:** This is the first report on (1) retention of performance over longer periods and (2) effects of reflection practice. (This is a conference presentation abstract and not a full work that has been published.)

Do the clothes make the healer? A history of physician attire from prehistoric times to the present with implications for current practice

Stephan Troyanovich, Jennifer Troyanovich

Background: The topic of physician attire has been revisited in the indexed literature with implications for current practice. **Objective:** To review the history of physician attire and discuss the findings of survey studies that have investigated patient preferences regarding physician clothing. **Methods:** A hand search of historical texts and PubMed articles from the late 1990s through the present, using search terms such as clinical attire, formal attire, physician appearance, and physician image, was performed. **Results:** Modern studies indicate patient preference for a physician dressed in more-formal clothes with a white coat. Patient communication, compliance, and outcomes appear to be influenced by what a doctor wears in interactions with patients. **Discussion:** Up until the late 19th century, physicians wore black, considered a more formal color of attire. The white lab coat was adopted by medicine in the early 20th century to distance allopathy from the quackery of 19th-century medicine and to cloak allopathic medicine in the respected garb of laboratory science. **Conclusion:** In spite of the fact that modern culture has moved toward a less-formal atmosphere, patients seem to prefer a doctor that is more formally dressed and wears a white lab coat. (This is a conference presentation abstract and not a full work that has been published.)

Student perceptions of test effectiveness following a simulated objective structured clinical exam

Michael Tunning, Robert Rowell, Thomas Brozovich, Michael Van-Natta

Introduction: Simulation training may yield better results than traditional clinical education methods. Simulation and preparation are also shown to be factors in building student confidence and reducing anxiety. The authors looked to simulate an objective structured clinical exam (OSCE) in an effort to prepare for future high-anxiety events. Would preparing for this simulated exam impact student perceptions of preparedness for future clinical experiences? **Methods:** Students were exposed to 6 simulated OSCEs in the 2 preceding terms before the clinical OSCE. Immediately following the clinical OSCE, students were asked to take part in a survey to gather their perceptions of the effectiveness of the previous simulations. **Results:** Students overwhelmingly felt the simulations where beneficial to preparing them for the OSCE through improved confidence and reduced anxiety. We found no difference in opinion between high performers, age, or sex. **Conclusion:** Utilizing simulated OSCEs for skills assessments in courses prior to clinical OSCEs may improve student confidence and reduce student anxiety. (This is a conference presentation abstract and not a full work that has been published.)

What are the current structures and practices of institutional review boards of chiropractic institutions? A descriptive survey of institutional review board chairs

Elissa Twist, Dana Lawrence, Stacie Salsbury, Cheryl Hawk

Background: Federally funded chiropractic clinical trials conducted on human subjects require institutional review board (IRB) approval. To date, there is a paucity of published literature on IRB structures and procedures in chiropractic institutions. **Objective:** To describe current structures and procedures of IRBs in US chiropractic institutions. **Methods:** A cross-sectional, 46-question descriptive survey was performed, in which IRB chairs from a convenience sample of 15 colleges conducting chiropractic research were asked to participate. This study was approved by the institutional review board. **Results:** Eleven surveys (73%) were returned. A median of 8 (range 5–13) members serve on the IRBs, with a median of 4 females serving. The IRBs reviewed a median of 16 (range 4–56) studies in the past year. The IRBs meet as needed in 6 colleges, monthly in 3, and bimonthly in 1. Nine IRBs reported returning applications without approval for reasons including unacceptable risks, improper informed consent, failure to follow instructions, and poor study methodology. **Discussion:** Basic requirements outlined by the Department of Health and Human Services for composition of members of the IRB appear to be addressed by our sample. **Conclusion:** The structure, procedures, and number of research studies vary greatly among institutions conducting chiropractic clinical-research studies. (This is a conference presentation abstract and not a full work that has been published.)

Response across multiple outcomes in a dose-response trial of spinal manipulation for the care of chronic low back pain

Darcy Vavrek, Mitchell Haas, Moni Blazej Neradilek, Nayak Polissar

Background: This secondary analysis assesses the effect of dose response across multiple outcomes for spinal manipulative treatment (SMT) of chronic low back pain (cLBP). **Methods:** Participants, 400 with cLBP, were randomized to receive 18 sessions of treatment over 6-weeks. Lumbar SMT was performed by a chiropractor at 0, 6, 12, or 18 of the visits, with other visits providing an attention control. Patients were followed for 52 weeks. Outcomes assessed included unpleasantness and pain and disability subscales from the modified Von-Korff 100-point scale. Outcomes were assessed across all time points utilizing generalized estimating equation to account for correlation between multiple outcomes. **Results:** Models favored SMT over attention control. At 12 weeks, the comparison of 12 SMT with 0 SMT showed an improvement over 7 subscales of 8.2 points on a 100-point scale, 95% confidence interval (CI) (2.7, 13.8; $p = .004$). Across all time points, the improvement was 5.0, 95% CI (1.0, 8.9; $p = .010$). **Conclusions:** Findings from this analysis substantiate a persistent, clinically beneficial effect of SMT sustainable to 1 year

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after treatment. Investigators may want to consider assessing studies of cLBP to assess outcomes across multiple domains to better capture the benefit of SMT. (This is a conference presentation abstract and not a full work that has been published.)

Development of an assessment tool to effectively evaluate intern clinical competence in a chiropractic academic clinical setting

Jeffrey Ware

Background: With the shift from time-based education to a competency-based curriculum and evidence-based practice education, developing a reliable interexaminer assessment tool to document intern competence is extremely important and challenging. **Objective:** The goal of this paper is to review the literature and develop a reliable and effective tool to assess the clinical competence of interns. **Methods:** After a review of the literature relevant to the assessment of intern competence, we developed an assessment tool and evaluated its effectiveness. **Results:** An assessment tool with good interexaminer reliability can be developed (t test = 0.25) to determine the competence of interns in performing clinical procedures. **Discussion:** Assessment of the competence in performing clinical procedures by interns in an academic clinical setting is difficult and challenging. Based on the current focus set by the 2012 standards of the Council on Chiropractic Education, it is not only important for an intern's practice success and the public's safety but also for a chiropractic program's accreditation. **Conclusion:** Due to the importance of intern competence assessment to current clinical training and the positive results of this study, further studies with larger cohorts are needed. (This is a conference presentation abstract and not a full work that has been published.)

Perceptual changes of Web-based cases

Jeffrey Weiss, Dorrie Talmage

Introduction: Design-A-Case (DAC) is a computer program used by students to give clinical relevance to basic sciences. In this study, DAC was introduced and students surveyed to obtain perception of DAC. The purpose of the survey was to determine if one group of students had any perceptual changes after progression through the curriculum. **Methods:** An 11-item survey was administered to a cohort at 2 different points (preclinical and clinical) within the curriculum. Averages were taken and the differences between the 2 points were calculated. A t test and p value analysis was performed for each question. **Results:** There was no statistical significance between the 2 points except for 1 question. However, other questions showed a positive perceptual change toward DAC. **Discussion:** A preliminary PubMed search did not reveal a study that compared perceptual changes of a cohort. Expectations would suggest that as students progress through the curriculum, they would value educational strategies that enhance their clinical education. **Conclusion:** Although there was no statistical significance in change in perception at 2 points in the curriculum, there was a positive trend. Continued use of DAC and comparison may lead to statistical significance and appreciation of Web-based cases. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractors' perception of occupational stress and its influencing factors: A qualitative study

Shawn Williams, Yarissa Williams

Background: With the increasing concern about job stress, there is a growing body of literature addressing psychosocial job stress and its adverse effects on health. **Objective:** The current qualitative research aimed to explore the experiences of doctors of chiropractic (DCs) and their perceptions of job-related stress. **Methods:** A sociodemographic questionnaire with 1 open-ended question was e-mailed to a randomized sample of licensed DCs. Cross-tabulation and chi-square statistical tests were conducted to match and couple the demographic data with the categorical themes. **Results:** Fourteen professional stress categories emerged from the 970 completed surveys. "Managed Care Organization Regulation," "Managed Care Reimbursement," and "Scope of Practice Issues" were the most common stressors that negatively influenced chiropractors' professional lives. **Discussion:** The qualitative approach contributed revealed culture-specific job stressors in DCs that may have been overlooked in Western-based stress research. Categorical and ordinal demographic variable outcomes were different for different themes that emerged in the content analysis of the open-ended question. **Conclusion:** These findings predict a directional association between third-party payer influences (increased regulation/decreased reimbursement) and increased job stress. Further research will be undertaken to refine the stress and satisfaction parameters and address stress interventions. (This is a conference presentation abstract and not a full work that has been published.)

Continuing professional development: A survey of the opinions of chiropractors in the United Kingdom

Christopher Woods, Adrian Hunnisett, Christina Cunliffe

Introduction: Continuing professional development (CPD) allows chiropractors to maintain and develop their skills throughout their careers. Currently, there are few studies about chiropractors' opinions about CPD or the types of activities they participate in. The aim of this study was to gain an overview of chiropractors' CPD activities and record their opinions to aid the future planning of CPD resources. **Method:** Following ethical approval, an online survey questionnaire was designed and distributed to chiropractors registered in the United Kingdom via the main professional associations. **Results:** A total of 208 valid responses were collected. Two-thirds of respondents undertook musculoskeletal CPD activities during the last 3 years. Improving technique skills, improving clinical and diagnostic skills, and keeping up-to-date with new developments were considered the important motivations for undertaking CPD activities. Cost and accessibility were considered the greatest barriers preventing participation in CPD. Evidence-based practices, philosophy, and research were considered important and integral to chiropractic education, but CPD participation in these subjects was low. **Conclusion:** This study shows there remains a significant difference between some subjects taught in the undergraduate curricula in the United Kingdom and how frequently they are undertaken as CPD activities. (This is a conference presentation abstract and not a full work that has been published.)

Cervical spine kinesthesia as an outcome measure in the management of cervical spine pain: A pilot study

Shari Wynd, Aladin Boriek, Brad McKechnie

Introduction: Cervical spine kinesthetics as indicated by head repositioning accuracy (HRA) may represent a potential quantitative outcome measure for assessing treatment efficacy. The purpose of this study was to examine HRA in patients with spine pain. **Methods:** Cervical kinesthetics were determined in patients with spine pain using a previously published HRA protocol. Changes in HRA were computed and analyzed using descriptive statistics. Comparisons in HRA between healthy subjects, patients with neck pain, and patients with midback or low back pain were assessed using 1-way analysis of variance. **Results:** Average change in HRA following treatment was -72.0 ± 94.3 cm^2, -96 ± 122.6 cm^2, and 69.6 ± 91.7 cm^2 for healthy subjects, patients with neck pain, and patients with low back pain, respectively. While there were no significant differences between the treatment groups, a potential trend was noted in the changes in HRA following treatment in those subjects with neck pain compared with either groups of subjects without neck pain or subjects with lower back pain. **Conclusions:** Our study highlights the utilization of cervical spine kinesthesia as a potentially viable clinical outcome measure in the management of cervical spine pain. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic student attitudes toward the basic science courses in their curricula

Shari Wynd, Martha Friesen, Ezzat Mikhail, Isis Zaki

Background: While basic science courses are required in the curriculum by the Council on Chiropractic Education, the applicability to clinical skills and the overall appreciation for the importance of these foundational courses is largely uncertain. Therefore, the purpose of this preliminary project is to identify the attitudes toward the basic science courses of students in their fifth and eighth trimesters of a doctor of chiropractic program. **Methods:** Chiropractic students entering the fifth trimester and eighth trimester were given a survey regarding the importance of each course toward their development as a chiropractor. Descriptive statistics were performed and an

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independent samples Student t test was used to compare the students' responses to each question for each course. **Results:** The students in trimester 8 agreed more strongly that the basic science courses are necessary for their development as chiropractors than students in trimester 5 ($p < .05$). **Conclusions:** Students in the later stages of the program appear to find the basic science courses more important to their development as doctors of chiropractic. (This is a conference presentation abstract and not a full work that has been published.)

The development of chiropractic technique systems that advocate radiography for subluxation analysis: A genealogy

Kenneth Young

Objective: The purpose of this paper is to describe the development of the chiropractic technique systems found to advocate radiography primarily for subluxation detection. **Methods:** Key words were searched in various sources to create a list of techniques using radiography for subluxation detection. The publicly available documents that resulted were examined to find the histories of the techniques' origins and potential links between them. **Results:** Twenty-three techniques were found: 6 in the full-spine category and 17 in the upper-cervical category, with 2 techniques generating further lineage. Over a third (8 of 22) of the technique originators were professionally inspired by chiropractic treatment of personal health issues. Most of the upper-cervical techniques (14 of 16) traced their origins to a time when the Palmer School was teaching this method, and all the full-spine techniques (6 of 6) originated before or after this phase. All the techniques attributed broad health effects to their methods. Many of the techniques (21 of 23) used spinal realignment on radiographs as their outcome measure. **Conclusion:** The chiropractic technique systems that were found to advocate radiography for subluxation detection were closely related by descent, by claims of broad health effects from osseous misalignment, and by radiographic paradigm. (This is a conference presentation abstract and not a full work that has been published.)

Effects of peer instruction–enhanced lectures on student recall and comprehension

Niu Zhang, Charles Henderson

Background: Active teaching strategies are increasingly advocated in academia. These share a common element, "Involving students in doing things and thinking about the things they are doing." **Objective:** To evaluate a cooperative peer instruction exercise at our chiropractic college. **Methods:** Third-quarter students participated across iterations of an immunology/endocrinology course. Each class offered 20 lectures of 50 minutes each. Classes were divided into an experimental group incorporating cooperative peer instruction and a control group receiving traditional lectures. Experimental group lectures were divided into 2 to 3 short presentations followed by a multiple choice question assessment (MCQ). Students recorded an initial answer and then had 1 minute to discuss answers with neighboring peers. Following peer discussion, students submitted an additional, possibly revised, answer. Control group classes received the same lecture material without MCQs or peer discussions. Final exam scores were also compared across study groups. **Results:** Recall and comprehension scores were significantly higher after peer instruction activities compared with before peer instruction, with differences being greatest for comprehension. Recall and comprehension scores for the experimental group were both greater than control group scores, but comprehension score increases were larger. **Conclusion:** Active peer instruction lectures increase student recall and comprehension compared with traditional lectures. (This is a conference presentation abstract and not a full work that has been published.)

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