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ABSTRACTS OF ACC CONFERENCE PROCEEDINGS

PLATFORM PRESENTATIONS

Paraspinal muscle function and pain sensitivity following exercise-induced delayed-onset muscle soreness

Jacques Abboud, Catherine Pauze-Brodeur, Arianne Lessard, Martin Descaurreaux

Objective: To evaluate the effectiveness of an exercise protocol designed to induce delayed-onset muscle soreness (DOMS) in paraspinal muscles. **Methods:** Fourteen healthy participants were asked to perform four series of 25 trunk flexion-extension in a prone position (45-degrees inclined Roman chair). The protocol was performed using loads corresponding to 10% of the participant's trunk extension maximal voluntary contraction (MVC). Perceived soreness and pain were assessed using a 10-points visual analogue scale 3 times a day during 5 days post-DOMS protocol. Pressure pain thresholds (PPT) in paraspinal muscles (L2 and L4 bilaterally) and the vastus medialis (control site), and trunk extension MVC were assessed 24 to 36 hours post-protocol and compared to baseline (t-tests). **Results:** Peaks of muscle soreness (3.5/10) and pain (2.2/10) were observed 24 to 30 hours post-protocol. A significant reduction in trunk extension MVC was observed post-protocol ($p=0.04$). Significant reductions in PPT were observed post-protocol for all trunk extensor sites ($ps<0.01$), but not for the control site ($p=0.52$). **Conclusion:** The exercise protocol efficiently led to back muscle DOMS, reduced functional capacities and increased pain sensitivity. Such protocol could be used as an alternative to experimental low back pain in mechanistic studies. (This is a conference presentation abstract and not a full work that has been published.)

Clinical accuracy of orthopedic tests used in a chiropractic college health center

Steve Agocs, Mark Pfefer, Dani Steffen, Nathan Hoover, Rachel Gilmore, Jackson Berg

Objective: Many orthopedic tests are commonly used by chiropractors during physical assessment to evaluate the neuromusculoskeletal system; however, the clinical accuracy of various tests is not always understood by providers. The aim of this study is to inform providers about clinical accuracy of commonly used orthopedic tests and highlight needs for future research. **Methods:** All unique orthopedic tests found in the Future Health Smart Cloud electronic health record (FHSC-EHR) were entered into a spreadsheet. A search of listed orthopedic tests was performed using MEDLINE and Index to Chiropractic Literature databases using keywords: named/listed orthopedic tests and/or reliability, specificity, and sensitivity. Included literature described clinical accuracy of all available orthopedic tests listed within the FHSC-EHR. **Results:** Eighty-six unique orthopedic tests were listed for use in the FHSC-EHR. Peer-reviewed, published information related to clinical accuracy was identified for 21 orthopedic tests, comprising 24.4% of total, unique orthopedic tests reviewed. **Conclusion:** The current shift toward evidence-based practice highlights the need to understand and use diagnostic tests appropriately. The limited amount of supporting data for many orthopedic tests demonstrates the need for additional research to improve clinical utility and accuracy when using orthopedic tests. (This is a conference presentation abstract and not a full work that has been published.)

Practice and patient characteristics of wellness chiropractic practice: results from a PBRN

Joel Alcantara, Jeanne Ohm, Junjoe Alcantara

Objective: To characterize chiropractors and their patients under the paradigm of wellness care. **Methods:** In addition to socio-demographic information from our DC and patient responders, we inquired about practice characteristics (i.e., years in practice, reimbursement) and clinical correlates (i.e., clinical presentation, motivation for care),

respectively. **Results:** A convenience sample of 206 chiropractors (150 females; average age=33.75 years; average years in practice =6.07 years) indicated their practice, on average, was 46.98% wellness with mean reimbursement as cash (58.17%) and insurance (40.97%). The convenient sample of patients (N=2943; females=2011; average age=42.64) are highly educated with 87% having some college or higher. Fifty-nine percent indicated currently experiencing symptom care while 41% were asymptomatic. Current motivation for care were: to promote general health or wellness care (50%); to relieve symptoms (67%) and to improve their quality of life (57%). Fifty percent of the patients indicated paying with cash while 11% indicated paying wholly by insurance and 39% with cash and insurance. Thirty-seven percent indicated their medical doctor recommended wellness care. Eighty-two percent utilized exercise, 75% dieted and 64% used nutritional supplements as adjuncts to wellness care. **Conclusion:** Wellness care is predominantly cash reimbursed but not necessarily involve asymptomatic care. (This is a conference presentation abstract and not a full work that has been published.)

The interpersonal process of care experience of parents with children attending chiropractic care

Joel Alcantara, Jeanne Ohm, Junjoe Alcantara

Objective: To determine the interpersonal process of care (IPC) experience of parents with children under chiropractic care. **Methods:** We utilized the interpersonal process of care questionnaire (IPC-18) to measure communication, patient-centered decision-making, and interpersonal style experienced by parents with their child's chiropractor. Responses to the 18 items were on a Likert scale and linearly transformed (i.e., 1=never; rarely=2; sometime=3; usually=4; always=5) for analysis. Descriptive statistics (i.e., frequencies, means) was utilized with higher scores to the IPC-18 (range:1-5) indicating a better interpersonal experience. **Results:** A convenience sample of 138 parents (126 females; average age=36.49 years) participated in this study with similarly numbered children (75 females; average age=6.14 years) under chiropractic care. The average number of visits attended by the children was 26.07 (SD= 34.79). The mean scoring to the IPC-18 survey are the following: communication (i.e., lack of clarity (1.29±0.52), elicitation and concern of patient problems (4.87±0.31) and explanation of clinical findings (4.43±1.04)), decision making (i.e., decided together (4.48 ±0.88) and interpersonal style (i.e., compassionate and respectful caregiver (4.88±0.34), discriminated against (1.01±0.17) and disrespectful staff (1.03±0.14). **Conclusion:** Parents of children under chiropractic care experienced good interpersonal process of care with their child's chiropractor and office staff. (This is a conference presentation abstract and not a full work that has been published.)

The construct validity of the PROMIS Global Health compared to the PROMIS-29

Joel Alcantara, Jeanne Ohm, Junjoe Alcantara

Objective: To determine the construct validity of the PROMIS global health items based on correlations with the PROMIS-29. **Methods:** In addition to socio-demographic information, the PROMIS-29 and PROMIS Global Health were implemented to measure domains of quality of life (QoL) and global physical health (GPH) and mental health (GMH) (respectively) to chiropractic patients. Statistical analysis utilized descriptive statistics and Pearson's r to determine linear correlation of the QoL domains. **Results:** Our convenience sample (N=148) comprised of 125 females and an average age of 35.5 years. PROMIS mean T scores were: physical functioning (56.01), anxiety (47.13), depression (43.56), fatigue (45.42), sleep disturbance (43.98), satisfaction with participation in social roles (56.13), pain interference (43.78), GPH (55.69) and GMH (56.60). The mean pain NRS score was 1.01/10. GPH correlated most strongly with fatigue ($r = -0.72$), pain interference ($r = -0.50$), and satisfaction with social role ($r = 0.44$) while GMH correlated most strongly with fatigue ($r =$

- 0.51), anxiety ($r = - 0.51$) and depressive symptoms ($r = - 0.50$). Conclusion: There is support for the construct validity of the PROMIS Global Health relative to the PROMIS-29. (This is a conference presentation abstract and not a full work that has been published.)

Construct validity of the PROMIS-29 compared to the RAND SF-36

Joel Alcantara, Jeanne Ohm, Junjoe Alcantara

Objective: To determine the construct validity of the PROMIS-29 to the RAND SF-36.

Methods: In addition to obtaining socio-demographic information, the PROMIS-29 and the RAND SF-36 were implemented to measure the quality of life (QoL) of patients presenting for chiropractic care. Statistical analysis utilized descriptive statistics (i.e., frequencies, means) and Pearson's r to determine linear correlation of the QoL domains. Results: Our convenience sample ($N=2943$) comprised of 2011 females and an average age=42.64 years. PROMIS mean T scores were: physical functioning (50.86), anxiety (50.67), depression (46.91), fatigue (49.97), sleep disturbance (49.06), satisfaction with participation in social roles (52.3), and pain interference (51.82). The mean pain NRS score was 3.006. The mean scores from the SF-36 domains were: physical function (82.26), role limitations due to physical health (70.58), role limitations due to emotional problems (72.16), fatigue (56.9), emotional wellbeing (76.94), Social functioning (82), pain (70.49) and general health (72.09). Conclusion: High correlations were found with physical functioning, fatigue and pain interference reflecting good construct validity of the PROMIS-29. (This is a conference presentation abstract and not a full work that has been published.)

Examining medical claims data on the utilization of chiropractic services vs primary care for treatment of neck pain to determine risk of treatment escalation- Results from a pilot study

Brian Anderson, Steve McLellan

Objective: To determine if members who present to chiropractors (DC) are at lower risk of utilizing advanced diagnostic and treatment methods for neck pain, as compared to those who present to primary care providers (PCP). **Methods:** Secondary analysis of medical claims in a self-insured workplace. We determined the prevalence of treatment escalation in each group. A previously developed treatment escalation model was modified and used in this project. Results: Between the years of 2012-2016, there were 2,218 DC members and 2,149 PCP members. Utilization of advanced diagnostic and treatment methods for all DC members over 5 years occurred as follows: Injections (124/5.6%); ER visits (69/3.1%); Imaging (387/17.4%); Surgery (100/4.5%). Utilization for PCP members occurred as follows: Injection (301/14%); ER visits (813/37.8%); Imaging (1955/90.9%); Surgery (207/9.6%). 6.1% of DC members escalated, while 30.4% of PCP members escalated. Conclusion: For every metric, the risk of escalation was significantly less in DC members vs PCP members. This discrepancy was most obvious when evaluating ER visits and imaging utilization. (This is a conference presentation abstract and not a full work that has been published.)

An overview of the medical specialties most relevant to chiropractic practice

Lauren Austin-McLellan, Anthony Lisi

Objective: Interprofessional collaboration has been known to improve health care processes. Interprofessional education is a known facilitator of interprofessional collaboration. Yet during chiropractic undergraduate training and continuing education, most chiropractors receive little exposure to or education about other healthcare providers. This foundational educational research project seeks to provide an overview of key medical and surgical specialties that may contribute to improved learning. Increasing chiropractors' knowledge about other healthcare providers, particularly medical physicians, can be a key factor for improving interprofessional collaboration. **Data Sources and Selection:** This was a synthesis of published data from the American Board of Medical Specialties and individual specialty boards, supplemented by qualitative input from

subject matter experts. Data were entered into tabular format for review and analysis. Results: We propose the medical and surgical specialties most relevant to typical chiropractic practice are: primary care (internal medicine or family medicine), psychiatry, pain medicine, rheumatology, neurology, radiology, orthopedic surgery and neurosurgery. Conclusion: A deeper understanding of the similarities and differences in the training and typical practices of these medical providers can enhance a chiropractor's competence to collaborate and increase participation in team-based care. (This is a conference presentation abstract and not a full work that has been published.)

Antimicrobial properties of and clinical indications for monolaurin: a review of the literature

Lisa Barker, Barclay Bakkum, Cynthia Chapman

Objective: Monolaurin, known as glycerol monolaurate (GML), is a monoester of lauric acid and glycerol. It has been approved by the FDA as generally recognized as safe and is used in the food and drug and cosmetic industries. Monolaurin has been touted as a dietary immune system enhancer. The authors chose to investigate the antimicrobial properties of GML, its safety and bioavailability, and the clinical indications for its usage. **Data Sources and Selection:** Pertinent articles were located with Pubmed searches. Reference sections of newer articles were searched for other relevant articles. 23 articles were located. Results and Conclusion: In vitro, GML is antimicrobial for several viruses and gram positive and negative strains of bacteria. This seems to be accomplished by permeating lipid membranes, retarding exotoxin production, and blocking signal transduction. GML also inhibits the mobility and motility of sperm and has anti-inflammatory and anti-erythematous properties. In the majority of studies, monolaurin was found to be safe. In vitro, GML was not found to be bioavailable due to low solubility and stability. No studies were found that supported the oral administration of GML on human subjects. Future research would ideally focus on this population and bioavailability. (This is a conference presentation abstract and not a full work that has been published.)

Got Stress? A descriptive study of chiropractic students' stress and confidence levels in years 1, 2 and 3

Judy Bhatti, Elissa Twist, Josh Bernstein, Dustin Derby, Katherine Manley-Buser

Objective: Presenters will describe academic stress and student confidence, and assess their effects within a sample of graduate chiropractic students. **Methods:** Demographic information was collected and the Academic Self-Efficacy sub-scale survey, a measure of student described stress of academic tasks, and student confidence in these activities was administered to year 1-3 students in a chiropractic college. Results One hundred seventy-three students from years 1 ($n=47$), 2 ($n=70$), and 3 ($n=56$) completed the survey; the population mean (SD) age was 25.7 (4.3) and 52.6% were men. Students reported their top stressors as [doing well in tough classes; Y1 and Y3], [having multiple tests in the same week; Y2]. They reported the lowest confidence with [doing well in tough classes; Y1] and [keeping up with required reading; Y2 and Y3]. Conclusion Stress and confidence have an inverse relationship in many constructs, with some notable exceptions. There is high stress to do well in tough classes in all years, but students report more confidence as they progress through the years. Keeping up with required reading is low-stress for all three years, but students in 2nd and 3rd year have low confidence in this area. (This is a conference presentation abstract and not a full work that has been published.)

Biological and clinical outcomes of chiropractic spinal manipulative therapy in the treatment of patients with acute inflammatory radiculopathy secondary to lumbar disc herniation: A pilot study

Paul Bishop, Jeffrey Quon, John Street, Brian Arthur, Melissa Nadeau, Tamir Allon, Nicolas Dea, Charles Fisher, Marcel Dvorak, Scott Paquette, Brian Kwon, Gabriella Petrolinni

Objective: To evaluate the feasibility of conducting a randomized controlled trial (RCT) of the effects of chiropractic spinal manipulative therapy (CSMT) on in vivo inflammatory cytokine (IC)

expression and clinical outcomes in patients with acute sciatica and lumbosacral disc herniation (AS/LDH). Methods: Patients with AS/LDH of less than 16 weeks duration were randomized to 6 weeks of CSMT or the surgical wait list. Standardized neurological and lumbar spine examinations, VAS and Roland Morris Disability scores, and serum IC levels were assessed at baseline, 6, 12 and 24 weeks. ICs were also measured in disc tissue, nerve root and disc lavagate collected during surgery. Research ethics approval was obtained. Results: 40 of 44 (91%) invited patients participated and were randomized. 13 patients avoided surgery. Post-CSMT improvement was associated with longer duration of sciatica, absence of cross-over sign and motor deficit, reduced lumbar flexion increment and lower IC levels at baseline. Conclusions: It appears feasible to conduct a RCT with patients randomized to CSMT or a waitlist control group. There may be a sub-group of AS/LDH patients who will significantly benefit from HVLA CSMT. A large scale clinical trial is now required to test this preliminary finding. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic care for TMJ and extreme tongue fatigue: A case report

Thomas Bloink, Charles Blum.

Objective: A 57-year-old male presented to this office with extreme tongue fatigue and significant neck pain. Clinical Features: A month-prior the patient saw his general practitioner who prescribed antibiotics for possible throat infection and then 2-weeks later was seen by neurologist who diagnosed a cervical spine dysfunction and prescribed muscle relaxants, without any relief. Due to this condition lasting over a month, aside from coming to this office, he was referred to the UCSF neurology department to be assessed for amyotrophic lateral sclerosis (ALS). A few-years-prior he had extensive dental restorations, with bridgework, implants, and an over-the-counter bite-guard. Interventions/Outcome: Treatment consisted of sacro occipital technique category one (pelvic torsion reduced sacral nutation), left-temporal internal rotation, sphenomaxillary craniopathy, and TMJ care for significant malocclusion - co-treated with dentist to develop/fabricate a lower dental splint. The patient was treated for 9-office visits for two-months and received the dental care (1-visit per week for 3-weeks) in the first-month. At 2-months the patient's symptoms had completely resolved and ALS was ruled out. Conclusion: Further research is needed to determine if this type of chiropractic care might be helpful for similar types of presentations, working closely with neurologists and dentists. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic care of a rock climber's shoulder with forward head posture: A case report

Charles Blum

Objective: A 27-year-old male rock/boulder climber presented for chiropractic care due to weakness and discomfort upon shoulder loading, particularly when rock-climbing. Clinical Features: This was a gradual onset chronic type injury, taking place over 6-9 months of elite indoor and outdoor rock climbing. Rock-climbing typically causes overuse syndromes affecting the myofascia of the anterior shoulders and cervicothoracic regions leading to forward head posture presentations and secondary cervicobrachial type syndromes. Intervention/Outcome: Treatment essentially consisted of sacro occipital technique (SOT) and extremity techniques to reduce the anterior/posterior fascial line tensions to minimize the forward head posture presentation on any thoracic outlet syndrome, re-position the humeral head in a posterior/anterior position and stabilize with, kinesiotape, and exercises to stretch the anterior shoulder girdle and strengthen the posterior scapula stabilizers. Following the initial office-visit the patient reported improved strength and could sleep without pain or stressed shoulder positions. The patient was treated in this manner two-times a week for two-weeks, and then once-a-week for two-weeks at which time he was able to return to rock-climbing. Conclusion: This case study presents a patient with gradual onset, chronic shoulder weakness and pain secondary to rock climbing successfully treated with a conservative method of chiropractic care. (This is a conference presentation abstract and not a full work that has been published.)

Sagittal spinal kinematic evaluation comparing internal frame and frameless backpacks during walking

Lori Beth Bryson, Jonathan Bryson, Brent Russell, Ronald Hosek

Objectives: Most backpack models commonly used by students are frameless packs (FLP), have no structural support, and are carried on the shoulders. Internal frame packs (IFP) are ergonomically designed to shift 90% of the load to the pelvis. Until recently, recording spinal data while wearing a backpack was difficult. We developed an IRB-approved protocol using inertial measurement units (IMUs) to quantify postural differences between the styles. Methods: Ten university students outfitted with IMUs walked on a treadmill under 3 conditions: no pack, pack loaded with 15 pounds, and after 15 minutes loaded walking. Participants wore an FLP the first day and an IFP the second. Results: With the FLP, most individuals moved progressively through the 3 conditions toward lumbar flexion and thoracic extension. For the cervical region, some reacted with extension and others with flexion. Spinal motions, and head and pelvic pitch, showed progressive increases in step-to-step variability with the FLP. Participants showed little change with the IFP. Conclusion: Outcomes from this study document sagittal postural adaptations to the FLP and suggest step-to-step inconsistency when compared to the IFP. We will expand this study to include additional participants and analysis of transverse and frontal planes. (This is a conference presentation abstract and not a full work that has been published.)

Transitioning clinic systems for effective tobacco use identification and treatment referral

Kelly Buettner-Schmidt, Donald Miller, Brody Maack, Mary Larson, Megan Orr, Becky McDaniel, Katelyn Mills

Objective: Conduct a pilot study improving public health through intervention development implementing sustainable health systems changes based upon the U.S. Public Health Service: Clinical Practice Guidelines for Treating Tobacco Use and Dependence. Methods: We used an adaptive feasibility method and recruited practitioners outside of large healthcare systems. Prior to intervention development, a chiropractic advisory board was organized and practitioner assessments were completed. The intervention included educational sessions, patient materials, standard patient scenario, and onsite academic detailing. Pre- and post-intervention measures included educational effectiveness and three levels of outcomes: systems/clinics, provider, and patient. Study approved by university IRB. Results: Post-intervention, all clinics had systems present to Ask-Advise-Refer users and the majority of clinics: met the health systems change definition for new episode-of-care patients; had systems asking about secondhand smoke exposure and e-cigarettes; and changed to office environments to include cessation materials. Chiropractors reported increased confidence to counsel patients, including referral. The majority of patient respondents at 30-day and 3-month follow-ups either quit or had attempted to quit since their appointment. Conclusion: While a 6-month intervention is a short time for systems change, the study resulted health systems change and chiropractors expressed enthusiasm for ongoing collaboration. (This is a conference presentation abstract and not a full work that has been published.)

Comparing a traditional lecture course to an inverted classroom format for clinical microbiology: student performance and perception

Kara Burnham, James Mascenik

Objective: Student satisfaction and performance are of primary concern when classroom pedagogy is changed. The intent of this study was to determine the equivalence of two teaching methodologies in a clinical microbiology course using test scores as the measure of student performance. Methods: The two teaching methodologies examined were a traditional lecture-based face-to-face (F2F) method and an inverted classroom method (ICM). Using a course survey, satisfaction with the ICM method was obtained by asking students to compare the ICM class experience with their experiences in traditional F2F classes. Classroom exams were administered in the same way in both pedagogies. The student test averages obtained were compared for equivalence using regression analysis. Results: Test performance of students in the ICM was equivalent to that of students receiving

traditional F2F lectures. The mean difference between test scores for the ICM and the traditional F2F groups was 1.9 (95% CI= -4.0 to 0.14). Survey responses indicate that respondents feel positively about self-learning in ICM and prefer the flexibility provided by ICM. Conclusion: This study provides evidence that the ICM method of teaching clinical microbiology can replace the traditional F2F method without loss of student performance. (This is a conference presentation abstract and not a full work that has been published.)

Spinal manipulative therapy for the management of low back pain: A guideline from the Canadian Chiropractic Guideline Initiative

Andre Bussieres, Gregory Stewart, Fadi Al Zoubi, Philip Decina, Martin Descarreaux, Danielle Haskett, Cesar Hincapie, Isabelle Page, Steven Passmore, John Srbely, Maja Stupar, Joel Weisberg, Joseph Ornelas

Objective: To develop a clinical practice guideline on the management of acute and chronic low back pain (LBP) in adults. This guideline addresses the use of spinal manipulative therapy (SMT). Methods: Topics were chosen based on an AHRQ comparative effectiveness review on SMT and non-pharmacological interventions. We updated searches in MEDLINE and Cochrane database, and assessed the quality of admissible randomized controlled trials and systematic reviews. We used GRADE to summarize judgments of the evidence quality and link recommendations to the supporting evidence. The panel determined the certainty of evidence and strength of recommendations. An 8-member external committee reviewed the guideline. Results: For acute LBP, we suggest: SMT, other commonly used interventions or a combination of SMT and commonly used interventions in addition to advice (posture, staying active), reassurance, education and self-management strategies to improve pain and disability. For chronic LBP, we suggest: SMT over minimal intervention or SMT as part of a multimodal therapy (exercise, advice and education, soft tissue therapy). For patients with chronic back related leg pain, we suggest SMT with home exercise and advice. Conclusion: A multimodal approach is an effective treatment strategy for back pain, with or without leg pain. (This is a conference presentation abstract and not a full work that has been published.)

The effects of chiropractic care on oculomotor control in children with attention deficit hyperactivity disorder: A pilot study

Alice Cade, Kelly Jones, Kelly Holt, Abdul Moiz Penkar, Heidi Haavik

Objective: To assess the feasibility of studying the effects of chiropractic care on oculomotor control in children with ADHD. The secondary aim was to assess preliminary efficacy of chiropractic care on oculomotor control in children with ADHD. Methods: 30 children (8-15 years) participated in a randomized controlled crossover pilot study. Feasibility assessed recruitment, randomization, retention, eligibility, data collection, equipment and intervention tolerability. Oculomotor function was tested pre/post chiropractic/control intervention measuring target acquisition, reading speed, fixation time, and saccade length. Results: Recruitment was timely, 27 participants completed the study and retention rate was 100%. 30.4% completed the post-study questionnaire with 85.7-100% agreeing/strongly agreeing with positive study statements regarding the study. Efficacy findings revealed significant reduction ($p=0.03$) in total reading time post-chiropractic (mean reduction: 646ms (SD = 1508.91ms)) when compared to post-control intervention (mean reduction: 108ms (SD = 1971.01ms)). Post-hoc analyses suggest intervention order (receiving chiropractic intervention first) affected control-second baseline values. Conclusions: It is feasible to perform a study on the effects of chiropractic care on oculomotor outcomes in children with ADHD. Study findings suggest chiropractic care may reduce reading time in children with ADHD, however future studies are recommended to fully investigate this finding. (This is a conference presentation abstract and not a full work that has been published.)

Perceptions of Ontario Chiropractors on Business Education in Chiropractic Schools

Michael Ciolfi, Ayla Azad, Mohammed Al-Azdee

Objective: Chiropractic, as a business in the health care system, has a component of entrepreneurship and, therefore, it is important to have

business education in chiropractic schools. This study examines perceptions on business education in chiropractic schools, as evaluated by Ontario practicing chiropractors. Methods: We conducted a series of interviews with 20 of Ontario practicing chiropractors. Questions aimed at analyzing two levels of chiropractors' perceptions on the quality of business education they received. The first level focused on general perceptions on strengths, weaknesses, experiences, and improvements. The second level focused on specific perceptions on accounting and finance, organizational behavior and human resources, legal and ethical issues, strategic management, managerial decision-making, and operational management. Results: The interviews show that Ontario practicing chiropractors' need for business skills is both broad and essential, embracing most if not all major business domains, and that the current status of business education in chiropractic schools is contributing to only minimal business skills. Conclusion: Producing chiropractors with entrepreneurship skills requires better business education in chiropractic schools. Perceptions of Ontario chiropractors reveal a significant gap between skill-oriented business training in chiropractic education and the skills needed to practice in the profession. (This is a conference presentation abstract and not a full work that has been published.)

Leading factors contributing to dietary choices in chiropractic students

Katrine Colton, Lia Nightingale

Objective: As future health and wellness professionals, chiropractic students will play a special role in influencing patients through modeling of healthy behaviors. The goal of this research project is to determine the main factors that influence chiropractic students' eating patterns.

Methods: A survey was distributed to two cohorts of students enrolled in first trimester to assess positive and negative factors influencing student diets. Descriptive statistics were used to analyze the data. Results: The response rate for the survey was 86% (n=179). Data showed that eating a plant-based diet was important to students (61%), who were concerned about preventing disease by eating healthily (85%). Only 9% strongly agreed that they were satisfied with their diets. It was important for students to model a healthy diet for their patients (98%), yet the majority of students consumed less than 2 servings each of fruits and vegetables daily (66% and 58%, respectively). The leading barriers to healthy eating included lack of time (81%) and insufficient funds (69%); students wished they had access to weekly meal plans. Conclusion: First trimester chiropractic students wish to model healthy behaviors, but fail to apply their knowledge and attitudes to their own dietary intakes. (This is a conference presentation abstract and not a full work that has been published.)

Change in female veterans' neck pain following chiropractic care at a hospital for veterans

Kelsey Corcoran, Andrew Dunn, Bart Green, Lance Formolo, Gregory Beehler

Objective: To determine if female veterans had demonstrable improvements in neck pain after chiropractic management within a VA hospital. Methods: This was a retrospective cross-sectional study of medical records from female veterans attending a VA chiropractic clinic for a chief complaint of neck pain. Patients who received chiropractic care during the period 2009-2015 were included if they had received at least two chiropractic treatments and baseline and discharge outcome measures were obtained using the numeric rating scale (NRS) and Neck Bournemouth Questionnaire (NBQ). Paired t-tests were used to compare baseline and discharge outcome measures (NRS & NBQ) with a minimum clinically important difference (MCID) set at a 30% change from baseline. Results: Thirty-four veterans met the inclusion criteria and received a mean of 8.8 chiropractic treatments. For NRS, the mean score improvement was 2.7 (95%CI, 1.9-3.5, $p<0.001$). For the NBQ, the mean score improvement was 13.7 (95%CI, 9.9-17.5, $p<0.001$). For the MCID, the average percent improvement was 45% for the NRS and 38% for the NBQ. Conclusion: Female veterans with neck pain experienced a statistically and clinically significant reduction in NRS and NBQ scores over a short course of chiropractic management. (This is a

conference presentation abstract and not a full work that has been published.)

The role of trust on the success of interorganizational collaborations in health care education. *Renee DeVries*

Objective: To examine the impact of trust on the success of collaborations between institutions of higher education in the health care arena. **Methods:** A multiple case-study design was used to examine three partnerships created through the National Center for Complementary and Integrative Health CAM Practitioner Research Education Project Grant Partnership (R25). Data was collected through interviews of 11 key participants and surveys of 101 faculty and administrators. **Results:** The findings suggest that interpersonal trust, specifically the role of boundary spanners, plays an important role in the formation of collaborations. The degree to which individuals perceive the priorities of the project as similar to their own was the most significant theme regarding willingness to participate in project activities. Organizational trust ($b = .60, t = 4.17, p < .001$), interorganizational trust ($b = .30, t = 2.52, p = .01$), and interpersonal trust ($b = .16, t = 2.74, p = .01$) emerged as statistically significant explanatory factors in perceptions of project success. **Conclusion:** Expansion of interprofessional education and practice will require strong relationships. Administrators looking to expand partnerships, would be wise to consider the important role of trust on the success of these collaborations. (This is a conference presentation abstract and not a full work that has been published.)

The quality of life of pregnant patients under chiropractic care: a retrospective file review

John Edwards, Joel Alcantara, Allison Union

Objective: To determine the quality of life (QoL) of pregnant patients under chiropractic care.

Methods: A retrospective file review was performed to determine QoL of pregnant patients. Inclusion criteria for file review included: (a) completed PROMIS-29 surveys at clinical presentation, pre- and post-partum. PROMIS-29 raw scores were converted to T scores using a scoring manual. In addition to descriptive statistics, Analysis of Variance (ANOVA) was performed to contrast the 3 categories of measures. Statistical significance set at $p < 0.05$

Results: Forty women (average age=30.65; mean parity=0.95) met the inclusion criteria. Indicated primary providers were: obstetrician (N=17), midwife (N=20) and other (N=3). Baseline (i.e., clinical presentation) and prior to birth PROMIS-29 measures were performed at mean gestation of 21.65 (SD=10.25) and 36.8 (SD=3.95) weeks, respectively. The baseline, pre-partum and post-partum mean T scores were: physical function (46.48;43.29;38.58), anxiety (46.66;45.80;49.19), depression (43.32;41.94;46.06), fatigue (56.93;53.82;55.22), sleep disturbance (50.38;52.62;52.28), satisfaction with social role (49.72;49.60;45.29) and pain interference (55.17;52.11;58.88). Statistically significant differences in mean T scores were found with physical function, depression, satisfaction and pain interference

Conclusion: This study may mitigate the declining QoL of pregnant women and highlights their poor QoL in the post-partum period. (This is a conference presentation abstract and not a full work that has been published.)

The medium-term effect of spinal manipulative therapy for chronic obstructive pulmonary disease: a randomized controlled trial

Roger Engel, Peter Gonski, Subramanyan Vemulpad, Petra Graham

Objective: Chronic obstructive pulmonary disease (COPD) is characterized by declining lung function (LF) and decreasing exercise capacity (EC) with EC a prognostic indicator for long-term survival. Recent evidence suggests that spinal manipulative therapy (SMT) can deliver short-term benefits to LF and EC in moderate COPD. The aim of this study is to investigate whether SMT produces improvements in LF and EC over the medium-term in COPD. **Methods:** 30 participants aged 50-65 years with COPD were randomly allocated to two groups: Exercise (Ex; n=15) and SMT+Exercise (SMT+Ex; n=15). Both groups received a 16-week exercise program with the SMT+Ex group also receiving eight SMT sessions in weeks 5-8 of that exercise program. Lung function and exercise capacity were measured

by a blinded assessor at baseline, 4, 8, 16 and 24 weeks. **Results:** There were clinically meaningful improvements in EC in the SMT+Ex group at 8 ($p=0.0061$), 16 ($p=0.0001$) and 24 weeks ($p=0.0089$). There were no improvements in LF at any of the time points in either group. There were no reports of moderate or severe adverse events following SMT. **Conclusion:** The increase in EC in the SMT+Ex group has the potential to improve long-term prognosis in COPD. (This is a conference presentation abstract and not a full work that has been published.)

A survey of chiropractic students' extracurricular professional development activities and plans

Matthew Funk

Introduction: Some chiropractic students take profession-related extracurricular courses. This research sought to describe the courses and frequency by semester at our college. This information may help administrators design curricula and continuing education programs. **Methods:** A survey asked students their semester and extracurricular courses taken or planned on line, on- and off- campus. Other questions concerned their current enrollment and plans to take other on campus graduate health degree programs. Descriptive statistics were utilized. IRB granted exempt status. **Results:** 47.13% took extracurricular courses. Reasons for not taking included: new to program (45.65%), unaffordability (28.26%), lack of interest (26.09%), and not knowing about courses (23.91%). 19.51% reported 12 on line courses. 25 students (64.10%) took courses on campus, with FAKTR most. 17 students took off-campus courses with Rocktape most popular. Extracurricular adjusting technique courses were uncommon both on- and off- campus.

Conclusion: Early semester students took more courses than those in upper semesters; however, response rates for semesters 5-8 were low. Students frequently took hands-on seminars on soft tissue treatment, functional screening and taping. Educational institutions may introduce kinesthetic learning earlier in the curriculum and organize additional hands-on weekend or elective classes on campus. (This is a conference presentation abstract and not a full work that has been published.)

Comparison of chiropractic lexicon at two chiropractic institutions: a cross-sectional study

Brian Gleberzon, Katherine Pohlman, Eric Russell

Objective: To evaluate student perceptions of chiropractic lexicon and cultural authority at two institutions. **Methods:** Electronic surveys were administered to Year 2-3 students (n=387) at one institution. The other institution administered paper-based surveys to trimester 4-5 (comparison with Year 2) and 6-7 (comparison with Year 3) (n=277). The survey assessed the likelihood of using eight different chiropractic terms and three chiropractic cultural authority. **Results:** Response rates were 36.2% and 78.1%. Both institutions felt that chiropractic cultural authority was 'neuromusculoskeletal' (88% and 74%); however, one institution favored authority in 'musculoskeletal' (65% vs 39%), while the other favored 'wellness' (63% vs 45%). The institution favoring 'musculoskeletal' was more likely to use 'impingement' (85% vs 56%) and 'joint dysfunction' (95% vs 75%). The institution favoring 'wellness' was more likely to use 'innate intelligence' (65% vs 16%) and 'vertebral subluxation' (88% vs 25%). Both institutions were equally likely to use 'spinal lesion'. **Conclusion:** This survey found some similarities in cultural authority and corresponding chiropractic terms. The main difference was the institution favoring 'wellness' culture authority also used more traditional chiropractic lexicon. Further studies could be done to investigate the impact of these differences. (This is a conference presentation abstract and not a full work that has been published.)

Description and outcomes of a novel chiropractic secondary and tertiary prevention program for chronic/recurrent spine pain

Jordan Gliedt, Nathan Campbell, Aram Mardian, Clinton Daniels

Objectives: This study describes a novel chiropractic secondary and tertiary prevention program (CSTPP) for patients with chronic/recurrent spine pain. We additionally report on associated clinical outcomes in a sample of veterans who elected to participate in a

minimum of six CSTPP sessions. Methods: Keele STarT Back Screening Tool (SBT), PROMIS Pain Interference Short Form 6b (PPI), PROMIS Physical Function Short Form 10a (PPF), and PEG Pain Screening Tool (PEG) were used as primary outcome measures. Secondary outcome measures included review of blood pressure, body-mass index (BMI), medication change, and self-reporting of participation in healthy lifestyle activities. Results: For SBT, a 49.1% improvement from baseline was recorded. A 25.2% and an 11.2% improvement was recorded for PPI and PPF. For PEG, a 13.0%, a 34.7%, and a 26.8% improvement from baseline was recorded. No appreciable change was realized in blood pressure, BMI, or medication regimen. Most patients (75%) self-reported an increase in active healthy lifestyle activities. Conclusions: Innovative clinical care models with an emphasis on active care for chronic/recurrent spine pain warrants greater attention. Further study is needed to identify optimal prevention and management strategies for chronic spine pain in clinical practice. (This is a conference presentation abstract and not a full work that has been published.)

A scoping review of risk factors and determinants of osteoporosis and vertebral osteopenia

Bart Green, Claire Johnson, Scott Haldeman, Erin Griffith, Michael Clay

Objective: To identify risk factors and comorbidities associated with spinal osteoporosis and vertebral osteopenia. Data Sources and Selection: We used a comprehensive search strategy of Medline and PubMed for meta-analyses and systematic reviews for osteoporosis risk factors and comorbidities through September 2016. Information was extracted for prevention strategies, risk, and prognostic factors. Results: After review, 22 meta-analyses and 1 systematic review were included. Risk factors for fracture or low bone mineral density (BMD) included: type 1 diabetes, hyperprolactinemia, anticoagulant medications, selective serotonin reuptake inhibitors and antidepressants, proton pump inhibitors, and smoking. Three meta-analyses of dietary calcium and calcium supplements showed no association with reduced fractures or increased BMD. No reduction in vertebral fracture or improvement in vertebral BMD was associated with Vitamin D supplementation. Low-dose Fluoride supplementation showed reduction in vertebral fractures. Supplementation with phytonadione and menaquinone-4 reduced bone loss; supplementation with menaquinone-4 only was associated with a reduction in vertebral fractures. Isoflavone supplements were equally effective to hormone replacement therapy in reducing vertebral fracture. Conclusion: This study identified risk factors for spinal osteoporosis and vertebral osteopenia. These modifiable determinants give healthcare providers information and opportunities for public health and prevention efforts for osteoporosis. (This is a conference presentation abstract and not a full work that has been published.)

Does faculty demonstration of clinical skills impact student performance on a clinical examination in a chiropractic program?

Joseph Guagliardo

Objective: The clinical skills of interviewing and physical examination remain vital to effective patient care, yet the literature demonstrates significant deficiencies with these among students. Many faculty have employed alternative teaching methods to address this, including case simulation and faculty demonstration. The purpose of this study was to determine if the addition of weekly faculty demonstration of patient interviewing techniques had an effect on student learning. Methods: A retrospective study comparing student interview scores ($n=510$) during the 2nd year of our program, of three academic terms before (Cohort A, $n=274$) and after (Cohort B, $n=236$) the change. Data analysis includes descriptive statistics, one-way ANOVA, t-test and Cohen's d calculation. Results: There was an improvement in overall scores in Cohort B (mean=85.0) as compared to Cohort A (mean=80.6). One way ANOVA revealed $F=19.48$ and $p<.001$ revealing no variances between groups. The t-test ($t=4.41$, $p<.001$) demonstrated a difference in means between groups. Cohen's d was calculated to be $d=0.392$ demonstrating a mild to moderate effect with observed power of 0.997. Conclusion: This study demonstrated faculty demonstration of skills has a positive effect on student learning and this type of delivery should be investigated more in the

future. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic care alters TMS induced I-wave excitability and cortical silent period duration

Heid Haavik, Imran Khan Niazi, Jens Duehr, Muhammed Samran Navid, Fady Alhajjar, Kemal Turker

Objective: The objective of this study was to construct peristimulus time histograms (PSTH) and peristimulus frequencygrams (PSF) using single motor unit recordings to further characterize previously documented immediate sensorimotor effects of spinal manipulation. Method: Single pulse transcranial magnetic stimulation (TMS) via a double cone coil over the tibialis anterior (TA) motor area during weak isometric dorsiflexion of the foot was used in fourteen subjects. On two separate days several hundred stimuli were delivered at a frequency of 0.3Hz and the intensity set at active motor threshold before and after either a spinal manipulation of dysfunctional spinal segments or a control intervention. TA electromyography (EMG) was recorded with surface and intramuscular fine wire electrodes. From the averaged surface EMG data motor evoked potentials (MEPs) and cortical silent periods (CSP) were constructed and analysed. Results: Following spinal manipulations there was a shortening of the silent period and an increase in the single unit I-wave amplitude. No changes were observed following the control condition. Conclusion: The results provide evidence that spinal manipulation of dysfunctional spinal segments reduces the TMS-induced cortical silent period, and increases low threshold motoneurone excitability. (This is a conference presentation abstract and not a full work that has been published.)

SOT cranial therapy for the treatment of abnormal sensations of the tongue, tinnitus, TMD and neck pain

Rachel Hamel

Objective: A 34-year-old male patient presented to this office for care of a chronic TMJ dysfunction, neck pain, tinnitus and abnormal tongue sensations. Clinical Features: The patient reported a four-month history of abnormal tongue sensations, tinnitus, clenching/bruxism, paresthesia in fingers and toes, muscle fasciculation, headaches, fatigue, IBS, anxiety, hiatal hernia and right quadratus lumborum myofascial pain radiating along the kinematic chain to ipsilateral shoulder and cervical spine. Intervention/Outcome: Examination revealed narrow dental arches with an anterior premature contact, poor TMJ translation, and evidence of clenching/bruxism. Palpatory pain was noted in the muscles of mastication and cranial assessment revealed left temporal bone and sphenomaxillary imbalance. Prior history of a dental upper night-guard and Invisalign was noted. Treatment consisted of five chiropractic treatments (over 4-weeks) incorporating sacro occipital technique (SOT) cranial, craniobiotic technique and craniofacial adjustments. Following care, the patient reported significant reduction in all symptoms, no tinnitus, tongue sensations normalized, and improved outcome assessment scores on the Central Sensitization Inventory and TMD Disability, Symptom Intensity and Symptom Frequency Scales. Conclusion: Greater study is needed to identify if other patients presenting with chronic complex TMJ, facial, and tongue disorders might benefit from SOT and cranial/craniofacial adjusting interventions. (This is a conference presentation abstract and not a full work that has been published.)

Manual therapy use and fetal malposition: a systematic review

Julie Hartman, Alberto Doria, Natalie Doria, Lindsay Doria, Katherine Pohlman

Objective: To conduct a systematic review, including all available literature, on manual therapy use during pregnancy with fetal malposition. Data Sources and Selection: Four databases were searched for MeSH terms 'breech presentation' and 'musculoskeletal manipulations,' references and experts were checked for additional studies. CARE and STROBE content guidelines were used for quality assessment of case reports and cross-sectional surveys respectively. Results: From the 109 articles retrieved, 20 met our inclusion criteria (15 case reports, 3 case series reporting on 14 cases, 2 cross-sectional surveys). Of the 30 individual cases, 29 babies were positioned vertex after manual therapy (96.7%). The surveys collected data from

practicing doctors that identified 175 cases with 142 turning vertex after manual therapy (81.1%). Quality assessment found only 2 met all CARE criteria. Critical missing details identified for case reports on this topic were: pregnancy-specific patient information, adverse events, and delivery outcomes. Conclusion: While available evidence demonstrates the potential for favorable outcomes for resolution of fetal malposition with manual therapy, the majority of studies were anecdotal evidence of average to low quality. We recommend more rigorous study designs and future case reports use reporting guidelines and include items identified in this study. (This is a conference presentation abstract and not a full work that has been published.)

Training chiropractic students in weight management using standardized patients

Cheryl Hawk, Michael Ramcharan, Carla Kruger

Objective. To describe and assess a standardized patient-based activity introducing chiropractic students to counseling on weight management. **Methods.** This descriptive study used mixed methods, both quantitative and qualitative. Classroom instruction was provided on application of health behavior theory to weight management counseling, emphasizing the “5 A’s” and the transtheoretical model. The standardized patient encounters were assessed in two ways: 1) Standardized patients answered a questionnaire about the students’ performance. 2) Students answered a questionnaire about the utility of the intervention. Numerical data were extracted from the audiovisual management platform into an SPSS (version 24) database. Descriptive statistics were computed for each question. Comments were analyzed using content analysis.

Results. There were a total of 102 students. Evaluation of their was uniformly high, with over 90% “yes” responses to all but two questions. The key issue identified in the comments by standardized patients was that students tended not to connect weight management with their chief complaint (low back pain). Nearly all students (97%) thought the activity would be useful to their future practice. **Conclusion.** This experiential activity appears to be useful to students’ future practice and to enhance their patient communication skills related to weight management. (This is a conference presentation abstract and not a full work that has been published.)

Students’ perceptions of paper testing vs. computer testing and real test results between two methods

Shawn He

Objective: Students use variable resources to learn anatomy. The outcomes are usually measured by test results. However, it is unknown whether the testing format would affect the outcomes. The aims of this study were to get students’ perception on testing formats and to analyze its impact on real test results. **Methods:** A purposive sample of 128 students participated in a survey about their preference of test format with three rationales, who were also randomly selected to take 4 tests using either paper or computer methods. The data were statistically analyzed. **Results:** Most students (97%) preferred paper method. The top three reasons were easy reviewing, less anxiety and physical marking. The top 3 reasons in favor of computer testing were quick to know results, environment friendly and no difference. However, when comparing test results between students using either method, there was no statistical difference. **Conclusions:** Although most students were in favor of paper method, there was no statistical difference in test results between two methods, suggesting that testing methods had less impact on test results as perceived. Faculty should help students to overcome their perception and get skills on computer testing before taking Board Exams. (This is a conference presentation abstract and not a full work that has been published.)

MRI Utilization Pathway: an opportunity for spine care practitioners

Nathan Hinkeldey, Michael Kramer, Kevin Percuoco

Objective: Early imaging (MRI) has been assessed as one of the contributing factors to the exponential increase in the cost of healthcare. Guidelines for use are present, but fail to be fully implemented. Our purpose is to report a case of system implementation of the ACR guidelines with radiologist review, and immediate system access to physical therapy and chiropractic evaluation and

management. **Clinical Features:** A VA medical center organized a work group to analyze MR imaging practices vs. guideline recommendations. **Intervention and Outcomes:** A template was created that included the American College of Radiology Guidelines, and a radiologist was dedicated to review all MRI incoming consultations. A mandatory course of six weeks of chiropractic care or physical therapy services for non-compressive or pathologic symptoms was implemented. MRI utilization decreased by 500 (26%) studies over one year. Patient access decreased from 23 days to 2 days. Indirect effects included a 21% decrease in neurosurgical consultations and 49% decrease in interventional pain management consultations. Active sedation could now be offered one site. **Conclusion:** Guideline implementation with access to radiologist review and conservative therapy evaluation and treatment decreased MRI utilization and contributed to decreasing consultations to other specialties. (This is a conference presentation abstract and not a full work that has been published.)

Longitudinal tracking of program goals for improved curriculum alignment

Dennis Homack

Objective: To improve communication between classroom and clinic faculty regarding the use of data for curriculum alignment. Create an examination using multiple content experts and peer reviewed by faculty. Administer examination prior to students entering clinical service. Tag curriculum objectives within an electronic assessment platform. Use longitudinal analysis to strengthen programmatic goals. **Methods:** We developed a hybrid multi-station OSCE and written examination with various station revolving around a single patient case study. Tagging questions and performance criterion allowed tracking of course goals, CCE meta-competencies, national board subjects and other institutional goals. Reports and statistical analysis were generated within the electronic assessment platform and Excel. Faculty throughout the program used feedback to improve curriculum alignment. Milestone performance was compared between iterations to evaluate point by point changes of performance markers. External measures included comparison of administration cohorts to board scores. **Results:** Seven administrations of the Milestone exam have been administered to date (N=420). Performance on milestone and board scores have trended higher since the first administration. **Conclusion:** The ability to tag past administrations allowed us to analyze all previous exams as new criterion emerge, including meta-competency revisions. Longitudinal tracking has been effective in reaching programmatic goals. (This is a conference presentation abstract and not a full work that has been published.)

A feasibility study of teaching reproducible force-time profiles of the toggle-recoil and Blair upper cervical spinal manipulative procedures (adjustments)

Todd Hubbard, Emily Speer, Loni Olstad

There has been research on how visual force-time profiles affect clinicians’ proficiency to deliver adjustments in distraction technique. However, there has not been research conducted on visual force-time feedback in toggle-recoil or Blair Upper Cervical techniques. **OBJECTIVE:** The purpose of this study is to measure the effect of personal visual data feedback on students learning to perform reproducible standardized toggle-recoil and Blair Upper Cervical adjustments. This study evaluates the possibility of creating a reproducible standardized teaching method of toggle-recoil and Blair Upper Cervical techniques through offering students personal visual force-time profiles. **METHODS:** 10 student participants in their third year of chiropractic school were asked to complete a total of 28 thrusts (4 baseline thrusts pre-visual feedback, 24 test thrusts after feedback). These 28 thrusts were recorded as force-time profiles. The participants were instructed to compare their personal force-time profiles to an instructor’s force-time profiles. Participants were then instructed how to alter their thrusts so that three consecutive reproducible thrusts could be achieved. **RESULTS AND CONCLUSION:** The researchers hypothesize it will take participants six or less repeated thrusts to achieve three consecutive reproducible thrusts with force-time profile feedback. (This is a conference presentation abstract and not a full work that has been published.)

Spinal manipulation alters conduction velocity and force within the Tibialis Anterior Muscle

Taha Al Muhammadee Janjua, Imran Khan Niazi, Kelly Holt, Syed Omer Gilani, Muhammad Nabeel Anwar, Ernest Kamavuako, Heidi Haavik

Objectives: The objective of this study was to investigate the effects of chiropractic care on tibialis anterior (TA) muscle strength and to investigate muscle fiber conduction velocity (MFCV) during dorsiflexion. **Methods:** Twelve volunteers attended two experimental sessions, spinal manipulation (SM) and control in random order. Force produced during maximum voluntary contraction was recorded pre- and post-intervention. Conduction velocity was recorded while the subject dorsiflexed at 10% of maximum force. This task was further divided into sustained and dynamic contraction exercises. High Density Surface Electromyography was used to calculate the conduction velocity. **Results:** Force profile tests showed an increase in the force produced by the TA muscle during MVC in the SM group by $10.46 \pm 7.8\%$ while the control group decreased by $6.24 \pm 7.33\%$ ($p < 0.05$). Conduction velocity in the SM group increased by $22.11 \pm 11.69\%$ while no differences were seen following the control intervention ($p < 0.05$). During dynamic contraction, MFCV increased by $4.52 \pm 4.58\%$ in the intervention group while the control decreased by $2.19 \pm 2.94\%$ ($p < 0.05$). **Conclusion:** A single session of spinal manipulation alters neurological processing in the TA muscle, particularly increasing the force output and the conduction velocity. (This is a conference presentation abstract and not a full work that has been published.)

Relationship evolution between chiropractic and the American Public Health Association: An analysis of 90 years of APHA literature

Claire Johnson, Bart Green

Objective: Publications can demonstrate how perceptions change over time. The purpose of this study was to analyze the representation of the chiropractic profession in the American Public Health Profession (APHA) literature and how this depiction changed over time. **Methods:** A literature search was performed in PubMed and PubMedCentral of the APHA publications, American Journal of Public Health Nations Health (AJPHNH) (1928 – 1970) and American Journal of Public Health (AJPH) (1971 – 2/2017). The keyword chiropractic was searched and all types of publications were obtained. Information was extracted from the articles and themes organized across time. **Results:** There were 19 articles in AJPHNH and 18 in AJPH. Initially, chiropractic was described as a “cult” and enemy to public health. In the 1960s, the American Medical Association campaigned to contain and eliminate the chiropractic profession and an APHA policy banned chiropractors from membership. After the initiation of the Wilk vs AMA trial, publications became more objective. In the 1980s, the APHA reinstated chiropractic membership. Publications became more scientific, were done by chiropractors, and focused on public health issues. **Conclusion:** APHA publications reveal how the relationship between the APHA and the chiropractic profession has evolved over time. (This is a conference presentation abstract and not a full work that has been published.)

Development of a public health model and educational tool for chiropractic

Claire Johnson, Bart Green, Lori Byrd, Michael Clay, Kim Khauv, Dana Madigan, Mitchell Haas, John Hyland, Michael Haneline, Jason Napuli

Objective: The traditional and outdated model of public health that focuses on “worms and germs, sewage and sludge” is not readily translatable to the practice of chiropractic. The purpose of this study was to develop a model that would help to communicate public health concepts and how chiropractic may participate in public health related activities. **Methods:** A 2-stage Delphi process resulted in ranked public health topics that 22 panel members had identified as important and that the chiropractic profession could positively influence. The University IRB deemed this study exempt. Consensus topics were developed into a diagram. Following rounds of review and revision, the model was approved by the Chiropractic Health Care section of the American Public Health Association. **Results:** The model includes 3 interactive tiers: people/population, action, and public health priorities. The people/populations include youth,

workers/military/athletes, adults, special populations, and seniors. The actions include education, promotion, and advocacy. The public health priorities range from prevention and reduction of diseases to the promotion of healthy living. **Conclusion:** This model provides a structure by which to communicate and promote public health, focus limited resources, and prioritize communications and research projects that are relevant to chiropractic. (This is a conference presentation abstract and not a full work that has been published.)

A Delphi consensus process to identify public health priority issues for chiropractic

Claire Johnson, Bart Green, John Hyland, Mitchell Haas, Lori Byrd, Michael Haneline, Jason Napuli, Michael Clay, Kim Khauv, Dana Madigan

Objective: The purpose of this study was to develop consensus regarding public health related issues relevant to the chiropractic profession. **Methods:** Twenty-two APHA Chiropractic Health Care section (CHC) members volunteered to participate in this IRB exempted study. The first open-ended questionnaire identified public health issues. In the following surveys, participants rated items that the chiropractic profession could most likely influence and identified stakeholders. **Results:** The open-ended comments were organized into 25 general, 9 population specific, and 7 neuromusculoskeletal issues. The ranked “general” issues were: obesity, nutrition/healthy diet, health screening/primary prevention, physical activity, environmental health, injury/violence prevention, sleep health, heart disease/stroke prevention, occupational safety, tobacco/smoking. The “neuromusculoskeletal” issues were: arthritis, back pain, extremity pain, injury prevention, neck pain, neurological health/stroke prevention, and osteoporosis. The “population specific” issues were: age-related complaints, minority populations health issues, infant/child/adolescent health, physical activity, children, reduce elder injuries, sports injury prevention, women during pregnancy. Stakeholders identified included: public/patients, APHA groups/members/leaders, national health organizations, state/local health organizations, educational institutions, faculty, students, health care industry, health care providers, and policy makers. **Conclusion:** The CHC developed consensus regarding opportunities to positively influence public health issues and collaborate with relevant stakeholders. (This is a conference presentation abstract and not a full work that has been published.)

Academic experiences of students with visual impairment in a chiropractic program: A qualitative study

Aditi Joshi, Suzanne Ray

Objective: The purpose of this study is to document the academic experiences of students with visual impairment in a Doctor of Chiropractic program. **Methods:** Upon approval from the Institutional Review Board, the study recruited ten participants: a) Students who are ‘legally blind’ ($n=3$). b) Student note-takers ($n=2$). c) Faculty members who taught students with visual impairment ($n=3$). d) Staff from the Disability Services Office ($n=2$). The students were recruited through the Disability Services Office. The participants were audiotaped during approximately one-hour interviews conducted in a semi-structured manner within a private setting (a quiet office) on the campus during office hours. The data were analyzed qualitatively using a deductive method for codes and an inductive method for themes. **Results:** The study identified facilitators and barriers to the education of students with visual impairments. Notable facilitators were planning for accessible educational materials, accessibility of workable space, and support systems, such as note-takers and close interaction with faculty. Notable barriers were VI student attitudes toward their education, lack of personnel training, and lack of disability awareness in the campus community. **Conclusion:** Meticulous planning of resources and communication are key to enriching academic experiences of students with visual impairment. (This is a conference presentation abstract and not a full work that has been published.)

Obesity bias among pre-clinical and clinical chiropractic students and faculty at an integrative health care institution: a cross-sectional study

Gena Kadar, H. Garrett Thompson

Objective: Assess the prevalence of obesity bias among pre-clinical and clinical chiropractic students and faculty at an academic

institution. Methods: A cross-sectional quantitative, single-method survey with group comparison using combined self-completed, validated survey instruments: the Beliefs about Obese Persons scale (BAOP) and the Attitudes toward Obese Persons scale (ATOP). The 28-question survey was administered via email to 450 students and 46 faculty members. Statistical significance determined by two tailed t-tests assuming equal variance. Results: 143 DC students, pre-clinical (n=65) and clinical (n=78), and 30 DC faculty, pre-clinical (n=15), clinical (n=15) completed the survey. Both students and faculty harbor anti-obesity attitudes and anti-obesity beliefs. Comparing student and faculty groups revealed that students demonstrated slightly more positive attitudes towards obese persons than pre-clinical faculty. Although pre-clinical faculty did not demonstrate more biased attitudes than pre-clinical students ($p=0.057$), they were more biased than clinical students ($p=0.026$). On the BAOP, pre-clinical faculty scored significantly higher than both pre-clinical students and clinical students ($p=0.013$ and 0.017 , respectively). Conclusion: Obesity bias is common among students and faculty at an academic institution. Embedding related competencies into the DC curriculum can support intentional development and assessment of these attitudes in future practitioners. (This is a conference presentation abstract and not a full work that has been published.)

Brain correlates of cLBP treatment with manipulation versus mobilization

Norman Kettner, Dan-Mikael Ellingsen, Ekaterina Protsenko, Ishtiaq Mawia, Matthew Kowalski, David Swensen, Deanna O'Dwyer-Swenson, Vitaly Napadow, Marco Loggia

Objective: Spinal mobilization (mob) and manipulation (manip) may be mediated by different CNS mechanisms. Methods: Arterial spin labeling (ASL) of non-specific cLBP (N=14, 8 female) was obtained immediately pre- and post- mob and manip, on separate days. Fourteen matched healthy controls were scanned pre-and post-manip. Results: ASL data were collected on a 3T Siemens Skyra MRI scanner with 32 channel head coil to obtain regional cerebral blood flow (rCBF) maps. Both mob ($p<0.01$) and manip ($p<0.001$) reduced cLBP, and were not statistically different ($p=0.12$). In patients and controls, manip induced significant ($p<0.05$ corrected) rCBF reductions in S1 and M1 cortices, increases in thalamus, basal ganglia, hypothalamus and anterior cingulate cortex. In patients only, manip also increased rCBF in dmPFC. Mob demonstrated a different pattern of brain changes, mostly increased rCBF in frontopolar regions. Comparison of rCBF changes after manip and mob at a more lenient threshold ($p<0.01$, uncorrected) suggests manip induced larger increases in thalamic, hypothalamic and pallidum compared to mob. Conclusion: Our data suggests that manip and mob exert beneficial effects on cLBP by modulating functional activity in different brain regions, suggesting different mechanisms of action. (This is a conference presentation abstract and not a full work that has been published.)

Doctor-patient boundary crossing

Stu Kinsinger

Objective: This paper summarizes a review of the literature in the domain of professional boundaries within the clinical milieu with specific attention to the more recent scholarship on how and why the health care professional may choose to cross the well-understood doctor-patient boundary. Discussion includes basic ethical concepts including the social contract between society and the professions, boundary setting and maintenance and examines the growing evidence that good patient care may be enhanced by judicious crossing by the practitioner. Data sources and Selection: A literature search gathered published articles seeking "boundary crossing" in addition to guidelines published by health care professions. These were analyzed as to the definitions of: boundary, crossing, violation, and issues related to the importance of health care practitioners' ability to manage boundaries in clinical practice. Results and Conclusion: While the total number of citations and publications is limited, there is growing evidence that contrasts with previous professional guidelines for health care professionals generally prohibiting crossing. Numerous examples of the efficacy of selective boundary crossings with patients are offered as in humanizing the patient's clinical encounter and facilitating outcomes. A model for

selective boundary crossing is proposed. (This is a conference presentation abstract and not a full work that has been published.)

Development of a clinical skills remediation program for chiropractic students at a university

Suzanne Lady, Leslie Takaki

Objective: An important goal of chiropractic education is to ensure that all graduates reach an acceptable level of clinical competency and be equipped to offer traceable remediation when skills fall below certain benchmarks. Methods: Working with key individuals in the faculty, administration, and assessment, a process of remediation was created and a document was produced that can be used by faculty and assessment staff to focus on students' lack of knowledge, technique or documentation in specific clinical skill areas (history taking, physical examination, treatment and management, adjusting technique, diagnosis and clinical thinking and special studies). The primary goal is to create an individualized remediation plan that suite the specific needs of the student. Results: Doctor of Chiropractic Program utilization of remediation center continues to increase (FY15, 16 & 17 referrals to center were 60, 125 and 126 respectively). Success rates after re-testing deficiencies continue to be high (FY15, 16 & 17 were 98.3%, 95.2% and 95.8% respectively). Conclusion: It is the hope of these authors that by sharing this process and document it can serve as an example for other programs and begin to create a culture of sharing remediation ideas in chiropractic education. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic care of a pediatric patient with twin to twin transfusion syndrome

Jenny Lane, Allison Union, John Edwards

Objective: To describe the care of an infant patient with twin to twin transfusion syndrome.

Clinical Features: A 3.5-month old infant girl presented with her mother with a medical diagnosis of Twin to Twin Transfusion Syndrome. Her chief complaints were hypotonia of the head and trunk, suspected food sensitivities, the inability to latch and breastfeed, difficulties bottle-feeding, and infrequent bowel movements. Intervention and Outcome: The patient received care utilizing a combination of Sacro Occipital Technique, Logan Basic Technique, and Thompson. Notable improvements were observed within the first visits and within one month of chiropractic care, the patient was able to meet developmental milestones such as rolling over, a milestone her patients were told it would take years to meet. Conclusion: This case study suggests that individuals diagnosed with Twin to Twin Transfusion Syndrome may benefit from chiropractic care. (This is a conference presentation abstract and not a full work that has been published.)

Effect of an 8-week physical exercise program on spinal manipulation biomechanical parameters in a group of first year chiropractic students

Arnaud Lardon, Megane Pasquier, Delgis Garcia, Yannick Audo, Florian Barbier-Cazorla, Martin Descarreaux

Objective: To determine the effect of a physical exercise program on spinal manipulation (SM) learning in first year chiropractic students. Methods: One hundred thirteen students were assigned, according to their school, to one of two groups: exercise(EG) for school A or control-no training(CG) for school B. All students participated in two one-hour experimental sessions added to the usual technique curriculum which is identical between these schools. At the beginning and end of each session, SM time-to-peak and preload release were recorded during five trials performed on a force-sensing table. The session consisted of several exercises during which augmented feedback was provided to students to improve their SM skills. The EG performed physical exercises (push-up, core stabilisation, speeder board exercises) three times per week for a 8-week period, between the two sessions. Results: Both groups showed a significant decrease in SM time-to-peak ($F(3,333)=3.131;p=0.026$) and preload release following the feedback session ($F(3,333)=9.525;p<0.001$). Between group differences were observed only for preload force release ($F(3,333)=4.662;p=0.003$). Post-hoc analyses showed that students in EG were the only ones showing improvement following the second

feedback session. Conclusion: These results suggest that an exercise program can potentiate feedback training in students learning SM. (This is a conference presentation abstract and not a full work that has been published.)

The management of back pain with concurrent mental health disorders: A case review

James Leonard, Nathan Hinkeldey, Trevor McArthur, Jeffrey Kinderditz

Objectives: Depression, PTSD, and low back pain are common comorbidities within chronic pain populations. We present a case demonstrating the mutual maintenance model where alleviating the patients physical symptoms in conjunction with pain education provided self-awareness of the systemic effects of PTSD and depression and motivation for treatment. Clinical Presentation: A 32-year-old male Veteran presented to the clinic with central low back pain. Clinical testing revealed the back pain was predominantly mechanical; however, an affective component to pain was also identified. He was unaware of how his mental health could contribute to his overall pain. Intervention and Outcomes: Mechanically, the patient experienced complete functional improvement and a decrease on the PROMIS Pain Interference 6B of 8 points (14 to 6). He experienced increased pain that correlated with aggravation of his PTSD and depression rather than correlating with injury or hindrance in ROM. This self-realization led the patient to voluntarily admit himself to an inpatient program for suicidal ideations. Conclusion: Literature has illustrated a strong relationship between depression, PTSD, and low back pain. Therefore, healthcare providers treating low back pain need to be cognizant of mental health diagnoses that impact pain presentations when making treatment recommendations. (This is a conference presentation abstract and not a full work that has been published.)

Receipt of an opioid prescription among Veterans of recent wars using chiropractic care

Anthony Lisi, Lori Bastian, Kelsey Corcoran, Eric DeRycke, Christine Goertz, Cynthia Brandt

Objective: This study aims to examine patient factors associated with opioid use among Veterans of Operations Enduring Freedom/Iraqi Freedom/New Dawn (OEF/OIF/OND) who receive chiropractic care. Methods: Cross-sectional analysis of a cohort study of OEF/OIF/OND Veterans who had at least one visit to a Veterans Health Administration chiropractic clinic between 2001-2014. Pain intensity (+/-90 days of the most recent chiropractic visit), based on the 0-10 numeric rating scale, was categorized as no pain/mild (0-3) and moderate/severe (4-10). Opioid receipt was defined as at least one prescription fill +/-90 days of the most recent chiropractic visit. Results: We identified 14,025 OEF/OIF/OND Veterans with a chiropractic care visit: mean age was 38 years; 15.8% were women; 56% reported moderate/severe pain intensity; and 31.6% received one or more opioid prescription. In bivariate analyses, the following factors were associated with receipt of an opioid prescription: depression, PTSD, alcohol use, drug use, BMI, smoking status, and pain intensity ($P < 0.001$). Conclusion: Opioid use among Veterans receiving chiropractic care was common, and was associated with several clinical factors. This highlights the need to assess characteristics and treatment outcomes of Veterans receiving opioids before and/or after initiating chiropractic care. (This is a conference presentation abstract and not a full work that has been published.)

The effects of whole body rotation on brain function as measured by quantitative electroencephalography

Michael Longyear, Mitchell Ferguson, Dan Tuttle, Emily Drake, Stephanie Sullivan

Objective: The effects of whole body rotation on central nervous system (CNS) activity are largely unknown. Using quantitative electroencephalography (EEG), this study examined brain activity following application of whole body rotation with laser targeting. Methods: Five individuals with no history of vertigo underwent balance assessment, choice reaction time (RT) and resting-state EEG pre/post whole body rotation. To assess tolerance, participants underwent 3 sessions (2 rotations, 8 RPM): pitch, yaw, pitch and yaw. Pulse oximetry and verbal assessment of patient tolerance was completed after each session. Following tolerance tasks, participants

underwent whole body rotation in varying pitch and yaw directions (30s; 8 RPM) while performing a laser targeting task. Results: All participants successfully completed tolerance assessments. RT improved in 3 of 4 participants (Avg. 20ms) with RT accuracy and balance demonstrating mixed results. For EEG, the most significant changes were pre/post increases in alpha 1 (8-10 Hz) across the frontal lobes and the central strip (Fp1, F3, F4, F8, Fz, C4; $p < 0.01$) (Fp2, F7, C3; $p \leq 0.03$) Additional significant changes were noted in similar regions for beta and gamma ($p < 0.03$). Conclusion: Alterations in brain activity, like those observed in this study, may help in understanding the therapeutic effects of whole body rotation. (This is a conference presentation abstract and not a full work that has been published.)

Occupational health history taking of chiropractic interns

Dana Madigan, Erin Quinian-Ruof, Jerrilyn Cambron, Linda Forst, Joseph Zaroni, Lee Friedman

Objective: This pilot study assessed the occupational history taking attitudes and behaviors of chiropractic interns for one year. Methods: Chiropractic interns at one clinic location participated by completing questionnaires regarding their attitudes and perceptions regarding occupational health history taking. Each intern enrolled in the study for two or more trimesters received an hour-long training session on occupational history taking. The supervising clinician independently evaluated charting behaviors of interns throughout the study. Results: Twenty interns participated in the study for 4 to 12 months and charting behaviors for 202 new patient or re-examination visits were assessed. A detailed occupational history was documented in only 11% despite the chief complaint being related to their occupation in 39% of visits. After training, documentation relating occupation and chief complaint increased from 20% of visits to 57%. When interns assessed their own recordkeeping practices, interns indicated their occupational history taking and documentation behaviors can vary. Conclusion: Detailed occupational information was not usually included in the chiropractic intern's documentation. Additional training on occupational history taking did not substantially change those charting behaviors, but did increase the interns relating the chief complaint to the patient's work. (This is a conference presentation abstract and not a full work that has been published.)

Impact of extremity manipulation on postural sway characteristics: a preliminary, randomized cross-over study

Christopher Malaya, Cody Powell, Joshua Haworth, Dean Smith, Katherine Pohlman

Objective: To evaluate postural sway characteristics after manipulation of the upper versus lower extremities using a randomized, crossover experimental design over two treatment days. Methods: As representation of the sensorimotor foci of postural control, anteroposterior (AP) and mediolateral (ML) rotations of the surface (floor or rocker-board) were measured using an inertial measurement unit (IMU) during 30 second trials, both pre and post manipulations. A two-way ANOVA (Manipulation-by-Surface) compared sample entropy (SampEn, in bits of information) during the middle 20 seconds of each trial. SampEn measures irregularity of the signal; increasing values indicate less organized behavior and decreasing values indicate more organized behavior. Results: From 18 students' data, manipulation did not cause a statistically significant change in SampEn in the floor surface condition, nor AP rocker condition. In the ML rocker condition, manipulation elicited a SampEn pre-post-difference ($p=0.002$), which differed according to site of manipulation ($p=0.025$): upper extremity manipulation increased by 0.082 bits; lower extremity manipulation reduced by 0.061 bits. Conclusion: The results indicate that extremity manipulation impacts the structure of sway behavior. Specifically, lower extremity manipulation improved the organization of sway behavior when needed most; on an unstable surface. (This is a conference presentation abstract and not a full work that has been published.)

Development of a multidisciplinary environments elective course

Barbara Mansholt, Nathan Hinkeldey, H. Michael Olson, Michael Tunning

Objective: Patient preference, evidence, and value-based healthcare models are driving healthcare collaboration and integration. As a

result, opportunities to work within interprofessional healthcare environments are expanding. Practicing within these environments requires additional perspective, attitude, and communication skills. We postulated that students would benefit from and participate in a course focused solely on enhancing their preparation for various multidisciplinary settings. **Methods:** Three doctors of chiropractic practicing in integrated settings developed a hybrid elective offered to mid and late program students, divided into one 12-hour online component and 2 live 12-hour weekends. Content focused on leadership and development of the interdisciplinary healthcare team, case study discussion, and co-management of common patient presentations, emphasizing collaboration, communication, and exploration of evidence supporting various interventions. **Results:** We designed a comprehensive course and syllabus with outcomes, evaluation methods, and required course references, including pre- and post-questionnaires regarding student perceptions. **Conclusion:** We created and piloted the course with the first class of students, collecting subjective and objective feedback for further refinement during the next term offering. Chiropractic colleges may consider further expanding interprofessional education into core curricula and/or offer advanced electives for those interested in pursuing such environments. (This is a conference presentation abstract and not a full work that has been published.)

Feasibility and efficacy of a prehabilitation program on the postoperative recovery of patients following surgery for spinal stenosis: a randomized controlled pilot trial

Andree-Anne Marchand, Julie O'Shaughnessy, Claude-Edouard Chaitillon, Vincent Cantin, Martin Descarreaux

Objective: To assess the feasibility and primary efficacy of a preoperative intervention program on the improvement of clinical parameters and physical capacity in patients awaiting surgery for lumbar spinal stenosis. **Methods:** Forty patients were allocated to either a 6-week supervised preoperative rehabilitation program or a control group. The intervention consisted of three 30-minute sessions per week, aiming to improve strength, muscular endurance, and spinal stabilization with intensity and complexity of exercises being increased gradually. Feasibility and efficacy outcomes were considered. Data were collected at baseline, 6 weeks later and again 6 weeks after surgery. **Results:** Eighteen participants (90%) completed the full 6-week exercise program and 36 and 34 were evaluated at the preoperative and postoperative assessment respectively. Sixty-one percent of participants reported improved global status following the intervention compared to 20% in the control group. Significant improvements were found in favour of the experimental group at the preoperative assessment for leg pain intensity, lumbar extensor muscle endurance and walking capacities. No adverse events were encountered. **Conclusion:** Prehabilitation is feasible and can be used to safely improve both clinical status and physical capacities. The significant improvements seen preoperatively did not translate into short-term improved postoperative recovery. (This is a conference presentation abstract and not a full work that has been published.)

Faculty and student attitudes towards key elements of excellence in teaching

J. Dale Marrant, Mark Pfefer, Rachel Gilmore

Introduction: Proposed elements related to excellence in teaching include student engagement, instructor knowledge, instructor feedback skills, classroom management, instructor assessment skills, teaching strategies, course design, and use of technology. The aim of this IRB approved study was to compare student and faculty attitudes toward identified elements of excellence in teaching. **Methods:** A sample of faculty and student volunteers from a single chiropractic college participated in focus groups to assess and discuss attitudes toward identified elements of excellence in teaching. Faculty and student focus groups rated the importance of each individually identified element and ranked elements in order of importance. **Results:** Highest mean ranked scores for faculty (n=9) included classroom management, instructor assessment skills, and use of technology, whereas highest student (n=9) rankings included feedback skills, instructor assessment skills, and use of technology. **Conclusion:** There was consensus that all eight elements are important but differences existed between faculty and students in ranking of the elements. Focus group discussions revealed that faculty, especially

clinical faculty are open to professional development sessions aimed at improvement of teaching strategies and use of technology. Clinical faculty may have unique professional development needs due lack of traditional teaching experience. (This is a conference presentation abstract and not a full work that has been published.)

Treatment of degenerative disc disease with a novel molecular therapy: long-term evidence in a pre-clinical animal model of disc disease

Ajay Matta, Muhammed Zia Karim, Hoda Gerami, Xiaomei Wang, Mark Erwin

Objective: Here we demonstrate that a single injection of a novel molecular formulation based upon the notochordal cell secretome, mediates the progression of degenerative disc disease (DDD) over a long-term period of 16 weeks post-injection. **Methods** We induced DDD in four contiguous discs/animal in three groups of 12-week old female Wistar rats using a 26-gauge needle under fluoroscopic guidance and then injected the IVD NPs four weeks post injury with the formulation. Controls included phosphate buffering saline (PBS) injections and no treatment groups. We assayed the discs using histological, immunohistochemical and Western blot assays 16 weeks later. **Results:** Formulation injections resulted in retained disc height, near normal phenotype and morphology in a similar fashion to no treatment controls but PBS injected discs extensively degenerated. **Conclusions:** A single injection of a novel, injectable formulation into the injured rat-tail IVD NP prevents degeneration of the IVD NP in needle punctured injured IVDs at least 16 weeks post injection with preservation of disc height, cellularity, and extracellular matrix expression and near normal morphology and cellular phenotype. These observations pave the way for the implementation of a minimally invasive molecular therapy for the treatment of advanced degenerative disc disease. (This is a conference presentation abstract and not a full work that has been published.)

Classification of lumbar radiculopathy: a case for collaborative care

Trevor McArthur, Nathan Hinkeldey, Tamara Ransdell, Clay Ransdell, Courtney Goodchild

Objective: To report the use of collaborative care in the treatment of a patient with acute low back pain without a directional preference. Following an epidural steroid injection (ESI), a directional preference was found with an end-range loading exam and symptom resolution followed. **Clinical Features:** A 28-year old Veteran reported to a hospital-based chiropractic clinic with radiating acute low back pain of 3 weeks. Upon examination, the patient did not demonstrate a directional preference. Signs of nerve compression were lacking, however, he had a positive SLR at 45 degrees and positive femoral nerve tension test. **Intervention and Outcome:** Following 4 visits in 2 weeks, there was no change in his condition. He was sent for an immediate epidural steroid injection (ESI) and received it a day later. Following the ESI, the patient noted great relief and a directional preference was found on the exam. With repeated end-range extensions, his pain was abolished. **Conclusion:** This report demonstrates the potential role of collaborative care when a patient with no directional preference presents with acute lumbar radiculopathy without directional preference. (This is a conference presentation abstract and not a full work that has been published.)

The measurable effects of an atlas adjustment on quantitative posturography

Jeremy Miller, Robert Rectenwald, Ronald Hosek

Objective: To determine changes in postural balance following Advanced Atlas Orthogonal (AAO) chiropractic adjustments, as a pilot study. **Methods:** Ten patients seeking treatment at a chiropractic clinic qualified for the study. Computer Dynamic Posturography (CDP) assessments were done utilizing the Vestibular Technologies (Cheyenne WY) Comprehensive Assessment of Postural Systems (CAPS®) Professional force plate. Data points collected included stability core (SS), length of sway path (SP), sway ellipse area (EA) and sway velocity (SV). Scan #1 was done prior to adjustment #1, following examination and x-ray. Scan #2 was done 2 days later and scan #3 was done 2 weeks after scan #1. Adjustments were performed when indicated per AAO protocol. **Results:** Nine participants completed the study; all showed improvement between scan #1 and scan #3 in SS, SP,

and SV. Eight showed improvement in EA. The average stability index score was a 75.1% for scan #1, 78.0% for scan #2 and 80.6% for scan #3, for a 7% increase amongst all subjects between the 1st and 3rd scans. Conclusion: AAO adjustments resulted in measured CDP balance improvement. A larger study, utilizing this method, with an added control group is warranted. (This is a conference presentation abstract and not a full work that has been published.)

Incorporating balancing exercises into side-posture adjusting labs to increase competency

Susan Miller

Objective: Learning new psychomotor skills requires strength, dexterity, and coordination. The purpose of this initiative was to develop and observe balance exercises to improve student competency in side-posture adjusting. Methods: The warm-up exercise had students stand on one straight-leg with arms, torso, and other straight-leg parallel to the ground, then repeat on the opposite leg until mastered sufficiently to walk in this fashion. The exercise mimicking the set-up on the patient asked students to begin in fencer's-stance, then transfer weight to superior leg, drop the opposite anterior-iliac and return to the ground in bowler's-stance. Results: This initiative was developed after students (n=126) were observed lacking strength, dexterity, and balance without balance exercises. After exercise initiation in a group of students (n=168), observation of the students showed marked improvement in all categories, as well as increased flexibility. In addition, the mock patient had fewer complaints of rib pain. Conclusion: Inclusion of balance-exercises may increase best practices when learning the complex psychomotor skill of the side-posture chiropractic set-up. Future studies should include quantitative and qualitative measurements to document if the observed effects are meaningful. (This is a conference presentation abstract and not a full work that has been published.)

Assessing perceived confidence in communication skills in second-year chiropractic students

Lia Nightingale

Objective: Communication skills of a doctor are at the heart of the doctor-patient interaction and often will dictate patient satisfaction. The goal of this project is to assess students' perceived confidence in communication skills in the year prior to beginning clinic. Methods: The IRB-approved survey assessed perceived communication skills at the beginning of the 4th trimester and then end of the 6th trimester. Three cohorts of students were assessed at each time frame. Students also evaluated the courses that aided in development of their communication skills. Students t-test was used to assess change in skill development ($p < 0.05$). Results: Overall, 72% of 4th trimester (n=237) and 74% of 6th trimester (n=200) students completed the surveys. Of the 11 communication skills evaluated, student confidence significantly increased in 5 skills during that year; including identification of a patient's stage of behavior change, demonstration of appropriate non-verbal behavior, and ability to use non-technical language. Courses identified as aiding in skill development include the Neuromuscular courses, Physical Diagnosis II, and Clinical Nutrition. Conclusion: Use of case-based courses significantly increased perceived confidence in student communication skills in the year prior to beginning patient interactions. (This is a conference presentation abstract and not a full work that has been published.)

Resolution of iatrogenic vocal cord paralysis following shoulder arthroscopy utilizing chiropractic intervention to release a recurrent laryngeal nerve entrapment

Harold Olson, Dawn Carlson

Objective: To describe the chiropractic management of left sided vocal cord paralysis which developed after shoulder arthroscopy. Clinical Features: A 55 year old female underwent arthroscopic surgery to repair a right torn rotator cuff. General anesthesia and an interscalene block were utilized while the patient was positioned in the beach chair position. Following surgery, she was diagnosed with left sided vocal cord paralysis. Intervention and Outcome:

Chiropractic management including cervical spine manipulation, instrument assisted soft-tissue mobilization, ultrasound, and therapeutic exercise was administered to release a myofascial entrapment of the left recurrent laryngeal nerve. Following the course of care, the patient regained complete vocal cord function. Conclusion: Neur-

apraxia following shoulder arthroscopy is a documented side effect. Literature describes neurapraxic injuries stemming from general anesthesia and patient positioning. This case demonstrates as case of neurapraxic injury to the Recurrent Laryngeal Nerve that resolved utilizing chiropractic intervention. (This is a conference presentation abstract and not a full work that has been published.)

Force sensing feedback decreased force variability after a coaching session during simulated, prone, thoracic adjustments on a manikin

Paul Osterbauer, Steven Lester, David Starmer

Objective: To determine the effect of a 2-hour force feedback training session on a cohort of trimester 2 (novice) students' performance during prone, thoracic spine manipulations. Methods: Pre and post measurements were collected with Force Sensing Table Technology® (FSTT®) while asking students to perform three light, typical and heavy, force manipulations on a Human Analogue Manikin®. Between data collection, a 2 hour educational lab was conducted for the students to take turns practicing selected tasks using the FSTT®. Tasks included emulation of a standardized force time profile of 200N, 400N, and 600N impulse forces. Results: Wide variability in the magnitude of impulse forces existed at preintervention, while, students (n=75) modulated between light (M=348.2N, SD=167.3N), typical (M=570.2N SD=212.2N), and heavy force (798.9N, SD=283.6 N) manipulations. Following intervention, an observable decrease in variability occurred, as students modulated their forces closer toward standardized targets of 200N, 400N, and 600N. On average, there were significant differences (p-value 0.01) between baseline and follow up measures. Conclusion: The results suggest that providing, even brief, intervention using force sensing feedback can reduce variability in impulse force modulation for prone, thoracic adjustments and provide value to learners. (This is a conference presentation abstract and not a full work that has been published.)

Mechanical properties of a lumbar spine mannequin with simulated intervertebral fixation

Edward Owens, Ronald Hosek, Brent Russell

Objective: To test the Posterior-to-Anterior stiffness (PAS) of a new lumbar spine training simulator under different conditions of "fixation." Methods: We constructed a lumbar spine physical model using 3-D printed vertebrae and pelvic bones linked together with elastic cords and straps. Each intervertebral joint is crossed by bilateral tensionable strings simulating rotatores brevis muscles to induce relative extension fixation. To simulate soft tissue, we embedded the posterior elements in silicone gel (Shore-A hardness 16). We tested PAS at 3 tension levels using a custom-built device to apply repetitive loads over the L3 spinous process while measuring load and displacement. Stiffness is calculated as the slope of the force-displacement curve from 10-60 Newtons. Results: The force-displacement relationship is non-linear with significant hysteresis. Stiffness in the zero tension condition ranged from 10-14 N/mm (Avg 12.0). String tension at 3/5 or 5/5 pairs of strings increased stiffness to 18.2 - 18.4 N/mm. Conclusion: Mannequin compliance in its unconstrained state is similar to that measured in humans using similar methods. The tension control system increases stiffness markedly (53%). The completed mannequin with these properties will be suitable for use in manual training of performing chiropractic adjustments or PAS examination. (This is a conference presentation abstract and not a full work that has been published.)

Tactile perception of stiffness and volitional thrust intensity modulate spinal manipulation dose characteristics

Steven Passmore, Geoffrey Gelley, Brian MacNeil

Objective: To examine clinicians' ability to modulate spinal manipulation (SM) thrust characteristics (a dose) based on tactile perception of stiffness and volitional intensity. Methods: In a cross-sectional, within-participants design, chiropractors (N=13) delivered SM thrusts of perceived least, appropriate, or highest intensity within their own therapeutic range on low-fidelity thoracic spine models of four different stiffness levels. SM was performed over 144 trials in a randomized order on combinations of thrust intensity and stiffness. Dependent variables included normalized: pre-load force, thrust force, thrust duration, peak acceleration, time-to-peak

acceleration, and displacement. For all dependent measures, two-factor within-participants ANOVA models with repeated measures on both factors were performed. Results: Pre-load force increased with intensity ($F_{2,24}=9.72, p<0.001$) and stiffness ($F_{3,36}=4.27, p=0.011$). Participants modulated thrust force and displacement as each also increased with intensity escalation ($F_{2,24}=22.53, p<0.001$; $F_{2,18}=45.20, p<0.001$). The highest accelerations were observed during the greatest intensity. Increased thrust force was delivered at higher stiffnesses ($F_{3,36}=6.43, p<0.001$). A significant interaction demonstrated that as volitional thrust intensity increased, greater displacement was attained, particularly on low stiffness models ($F_{6,54}=11.06, p<0.001$). Thrust duration and time-to-peak acceleration yielded no significant differences. Conclusion: Spinal manipulation thrust dosage is modulated by the clinician's tactile perception of stiffness and volitional intensity. (This is a conference presentation abstract and not a full work that has been published.)

Utilization of chiropractic care in U.S. children and adolescents: results from the 2012 National Health Interview Survey

Trent Peng, Baujiang Chen, Kelley Pettee Gabriel

Objective: To examine the socio-demographic characteristics associated with chiropractic utilization (C.U.), in a representative sample of U.S. children and adolescents aged 4-17 years.

Methods: 9,724 respondents from the 2012 National Health Interview Survey were analyzed. Age, sex, race/ethnicity, geography, family income, parental educational attainment, and other healthcare providers served as predictor variables. C.U. in the past 12 months (yes/no) was the targeted outcome. Weighted crude and adjusted logistic regression models, controlling for relevant covariates, were performed. Results: The 12-month prevalence of C.U. in U.S. children was 3.8%. The adjusted odds (95% confidence interval) of C.U. was higher among 11- to 17-year-olds [2.02 (1.41-2.90)] (versus 4- to 10-year-olds), Midwest residence [2.45 (1.36-4.44)] (versus Northeast), >\$100,000 family income [3.25 (1.87-5.66)] (versus <\$35,000), and ever visited other complementary and alternative medicine (CAM) practitioners [11.26 (7.19, 17.64)]. Blacks and Asians had lower adjusted odds of C.U. compared to Whites [0.17(0.06-0.47) and 0.17 (0.07-0.43), respectively]. Sex, parental education, and having an allopathic personal physician were not associated with C.U. Conclusion: While the prevalence of C.U. was low, a socio-demographic profile of child and adolescent users was identified. Future research should explore reasons for chiropractic care in this subgroup to improve utilization. (This is a conference presentation abstract and not a full work that has been published.)

Reasons and referral sources for chiropractic utilization in U.S. children and adolescents: results from the 2012 National Health Interview Survey

Trent Peng, Baujiang Chen, Kelley Pettee Gabriel

Objective: To investigate the reasons and patterns leading to chiropractic utilization (C.U.) in a representative sample of U.S. children aged 4-17 years. Methods: Respondents to the 2012 National Health Interview Survey were included ($n=9,724$). Respondents identified as chiropractic users were asked about the medical condition for which they sought chiropractic care, referral source, other medical treatments, reason for considering chiropractic, and information source regarding chiropractic. Weighted percentages for each factor were analyzed. Results: Chiropractic users comprised 2.6% of the analytic sample. Seven of the top-ten pediatric conditions resulting in C.U. were musculoskeletal. The top three conditions were low back pain [30.9%, (95% confidence interval: 21.7-41.8%)], neck pain [25.6%, (17.7-35.4%)], and joint pain/stiffness [11.7%, (5.9-21.8%)]. The most common referral source was family members [67.6%, (59.4-74.9%)]. Over-the-counter medications were the most common medical treatment option [33.5%, (24.5-44.0%)]. The top reason for choosing chiropractic was that it "treats the cause, not just symptoms" [62.9%, (55.6-69.7%)]. Print advertisements were the highest-reported information source on chiropractic care [9.78% (5.6-16.6%)]. Conclusion: While C.U. in children is low, future efforts targeting the importance of C.U. for musculoskeletal complaints through increased word-of-mouth, medical and media referral sources

may improve utilization for chiropractic care. (This is a conference presentation abstract and not a full work that has been published.)

Unresponsiveness to sacro occipital technique (SOT) procedures suggested possible pathological contribution to patient presentation: A case report

Kathi Perry

Objective: When a patient does not respond as expected the possibility that pathology might be contributory should be a consideration. Clinical Features: A 63-year-old male presented with low back/hip pain, difficulty walking, sleeping, and lower-extremity weakness after driving his truck (his occupation). A prior lumbosacral MRI was unremarkable. Intervention/Outcome: The patient's pelvis/lumbosacral region was treated with SOT care and his condition stabilized after three office-visits (2-weeks) incorporating the use of an SI support belt. He continued to drive his truck (financial reasons) though it would worsen his condition, leading to return office-visits. After one-month he had a flare-up with bilateral leg weaknesses/falls and was referred for another lumbosacral MRI that was unremarkable. At two-months he also had upper-left posterior thoracic pain with thoracic palpation-pressures worsening his lower-extremity condition. Due to his lack of responsiveness to the SOT care and thoracic spine sensitivity, an immediate referral for a thoracic CT scan was made, revealing a thoracic space-occupying lesion. Within 24-hours the space-occupying lesion was surgically removed with immediate reduction in pain and improvement in lower extremity strength. Conclusion: Unresponsiveness to care that usually leads to positive outcomes may suggest the need for ruling out possible pathology. (This is a conference presentation abstract and not a full work that has been published.)

Effects of nutritional supplements on concussion and traumatic brain injury: an umbrella review

Mark Pfefer, Rachel Gilmore, Nathan Hoover, Jon Wilson, Jackson Berg

Introduction: Concussions and traumatic brain injury (TBI) are common among athletes, yet, specific and effective therapy for this injury is limited. The aim of this study was to review evidence on nutritional supplements as treatment options for patients with concussion and TBI. Methods: A search was conducted of medical literature using MEDLINE, CINAHL, and Cochrane central register. All eligible articles were reviewed then scored using the methodology for Joanna Briggs Institute (JBI) Umbrella Reviews. Two independent reviewers performed the scoring of articles. Results: Six review articles were considered eligible for this JBI Umbrella review. No class I evidence is available for the effectiveness of nutritional supplementation. Supplementation with fish oil, especially DHA, has demonstrated promising improvement in outcomes for pre-clinical studies but clinical studies are lacking. Conclusion: A variety of neurological dysfunctions are associated with concussion/TBI and current treatment options are limited. Nutritional supplementation, including vitamins, have emerged as a promising therapeutic option for treatment of TBI. Clinical evidence for use of nutritional supplementation in concussion/TBI is lacking and future research is needed targeting biomechanical pathways with emphasis on evaluation of effectiveness, dosage, and safety. (This is a conference presentation abstract and not a full work that has been published.)

Informed consent: knowledge, opinion and application among the French chiropractic profession

Sylvain Pigeon, Arnaud Lardon

Objective: The purpose of this study is to describe the informed consent obligation knowledge, opinions and application in daily practice among a population of French chiropractors. Methods: For this cross-sectional survey, a specific 16 items questionnaire was created to assess (1) knowledge and opinion on the content concerning information, (2) knowledge about legal basis, and (3) the procedure that chiropractors use in practice to respect this obligation. Results: 232 participants of 807 answered the survey. The majority of chiropractors showed an acceptable knowledge and respect of informed consent obligation (close to 90%), except the two following items: risks (58%) and alternative to the chiropractic treatment (51%). Only few chiropractors knew legal basis (45.45%) and corresponding legal infringement (29.70%). Only 53% of chiropractors give information among which a fraction (4%) use

procedures that don't match legal framework. Conclusion: This study shows that when chiropractors have good knowledge about mandatory content of information, their opinion is in line with legal obligations. This body of knowledge is also link to the daily practice implementation. The profession needs to rethink this education duty both in undergraduate curriculum and continuing education. (This is a conference presentation abstract and not a full work that has been published.)

Assessment of student attitudes toward patient-centered care at a chiropractic college

Katherine Pohlman, Kent Stuber, Anser Abbas, Vanessa Morales, Silvano Mior

Objective: To assess the attitudes of students in a chiropractic educational program towards patient-centered care. Methods: We conducted an online cross-sectional study surveying all students at a chiropractic educational institution. Participants completed demographic questions and the Patient Practitioner Orientation Scale (PPOS). The PPOS is an 18-item validated instrument utilizing a 6-point rating scale where lower scores indicate that the provider's attitudes are more doctor- or disease-centered. Responses were calculated and averaged for an overall score and for two factors, sharing and caring. We also explored scores by trimester of study and gender. Results: The overall response rate was 49.8%, which varied by trimester (range: 9.2%-77.8%). The mean overall PPOS score was 4.0 (0.57SD; trimester range:3.5-4.2) with the caring factor score of 4.2 (0.56SD; trimester range:3.5-4.1) and sharing factor score of 3.9 (0.70SD; trimester range:4.1-4.4). Lower overall and factor scores were found in trimesters with the smallest response rates, and slightly higher scores were found for females. Conclusion: Overall scores for chiropractic students at this institution were similar to those reported amongst medical and doctor of physical therapy students, with the sharing factor consistently lower than caring factor, albeit to a slight degree. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic migraine patient and transient global amnesia: a case report

Paula Robinson, Lauren Tollefson

Objective: To describe a case of transient global amnesia in a patient under chiropractic care for migraines. Clinical Features: A 64-year-old female with a 28-year history of chiropractic treatment for migraines presents with disorientation and confusion after responding to an acute emergency. Witness reports patient also complained of a headache. Patient was transported to emergency department (ED) following an unremarkable rapid stroke assessment, but sustained disorientation. Diagnostic examinations performed at ED included: blood work, urinalysis, brain CT and MRI, ECG, ECHO, and chest radiograph. The only finding was a punctate focus of diffusion restriction in the left frontal lobe on MRI with repeat examination revealing an absence of diffusion restriction. Intervention and Outcome: After overnight observation, patient was released from hospital with a diagnosis of Transient Global Amnesia (TGA). No further follow-up necessary. Conclusion: TGA presents with sudden onset of anterograde or retrograde amnesia that can last up to 24 hours. Risk factors may include: migraines with and without auras; age 50-80 years; ischemic heart disease and hyperlipidemia; no prior history of ischemic stroke, diabetes or hypertension. Chiropractors should be aware of such condition for patients that are at risk. (This is a conference presentation abstract and not a full work that has been published.)

Patient and practitioner perceptions of osteokinematics and kinetics of supine cervical spine manipulation: a pilot study

Brent Russell, Shari Wynd, Ronald Hosek, Edward Owens, Katherine Hoiriis

Objectives: This project piloted a protocol to quantify rotational range of motion during supine cervical adjustments, and to compare these measurements with the practitioner's and the patient's perception of the motion. Methods: The participants were 6 licensed chiropractors in the roles of patient or doctor; 2 participants played both roles. Patient participants were outfitted with motion capture sensors overlying the forehead and sternum. Adjusting participants performed supine cervical adjustments, in

some cases wearing an index finger force sensor. Afterwards, both patient and doctor completed questionnaires to estimate rotation categorically, at 0, 30, 45, 60, or 90 degrees. The project was IRB-approved. Results: For 8 trials, the average peak cervical rotation was 28.8 ± 13.6 degrees (range 55.8 – 17.6). In 7 instances both doctor and patient perceptions (range: 30 to 60 degrees) were higher than the measured rotation; patient estimates were higher than doctors' in 4 instances. Forces measured during these preliminary tests ranged from 93-125 Newtons. Conclusion: Our results suggest that experienced participants have exaggerated perceptions of rotational magnitudes of cervical adjustment. Future studies will focus on increasing the sample size and participants with less cervical adjustment experience, and on refining the force sensor system. (This is a conference presentation abstract and not a full work that has been published.)

Patient safety culture attitudes of faculty clinicians in chiropractic academic health clinics: a cross-sectional survey

Stacie Salisbury, Ronald Boesch, Shane Carter, Greg Snow, Lance Corber, Martha Funabashi, Katherine Pohlman

Objective: Little is known about patient safety culture within the chiropractic profession. This study explored the attitudes and opinions of chiropractic college faculty toward patient safety.

Methods: This cross-sectional survey of 46 faculty clinicians from 4 academic health clinics of one chiropractic college used the SafetyNET Survey to Support a Patient Safety Culture. Results were compared to the Agency for Healthcare Research and Quality 2016 User Comparative Database Report of 2,584 medical physicians. Results: Compared with medical physicians, chiropractic faculty reported a statistically significant ($p < 0.05$) lower percentage of positive responses on all dimensions of patient safety culture, including Teamwork (chiropractic 76% vs. medical 91%), Communication Openness (51% vs. 81%), Staff Training (39% vs. 78%), Patient Care Tracking (39% vs. 77%), Office Processes (39% vs. 66%), Error Communication (38% vs. 78%), Work Pressure (29% vs. 49%), and Overall Perception of Patient Safety-Clinical (52% vs. 81%). Potential patient safety issues identified included electronic health records, equipment, medications, diagnostic tests, and adverse event monitoring. Conclusion: Chiropractic faculty clinicians demonstrated lower scores toward patient safety culture than medical physicians. Researchers should explore reasons for these attitudinal differences and develop interventions to enhance patient safety culture in chiropractic academic settings. (This is a conference presentation abstract and not a full work that has been published.)

Cervical radiculopathy and upper extremity motor preparation: using movement to measure function

Shelley Sargent, Quinn Malone, Steven Passmore

Objective: Performance-based measures are lacking for monitoring the motor challenges faced by those with cervical radiculopathy. Choice reaction time tasks have multiple stimulus response combinations, reduce anticipatory effects, and provide a window into deliberate movement preparation. Methods: Participants with cervical radiculopathy (N=11) and healthy controls (N=12) performed pointing movements with their index finger to a series of six squares of different sizes at different heights on a wall in a random sequence. Participants began a trial depressing a home button, and when the target appeared moved as quickly and accurately as possible to reach it. Choice reaction time was evaluated in milliseconds as the time between target appearance and button release. A two-group by six-target ANOVA model was applied to the dependent measure choice reaction time. Results: A significant between group main effect revealed that the cervical radiculopathy group was more adversely impacted in the duration of their movement planning $F(1,21)=7.76$; $p=0.011$, $\eta^2 = 0.270$. Conclusion: A choice reaction time task effectively captured movement preparation differences between cervical radiculopathy and healthy control populations. Future clinical intervention studies may wish to consider motor preparation performance measurement as a useful quantitative outcome measure. (This is a conference presentation abstract and not a full work that has been published.)

Intervertebral kinematics in the cervical spine before, during and after cervical spine manipulation

Michael Schneider, Tom Gale, Kris Gongaware, William Anderst

Objective: The purpose of this study was to identify changes in intervertebral range of motion (ROM) after cervical spine manipulation and to measure in vivo facet joint gapping during manipulation. **Methods:** Fifteen participants with acute mechanical neck pain consented to participate in this IRB-approved study. Synchronized biplane radiographs were collected at 30 images per second while participants performed full ROM flexion/extension, rotation and lateral bending of their cervical spine before and after cervical manipulation, and at 160 images per second while cervical manipulation was performed. Bone motion was tracked in the radiographs using a validated tracking process. Paired t-tests compared intervertebral ROM from before to after manipulation. Descriptive statistics characterized facet gapping during manipulation.

Results: Intervertebral ROM increased at the C4/C5 ($p=.027$) and C6/C7 ($p=.012$) motion segments during flexion/extension and at the C6/C7 motion segment during rotation ($p=.044$). Facet joint gapping occurred across all tracked vertebrae. The facet gap increased an average of 0.98 ± 0.30 mm during manipulation. **Conclusion:** This is the first study to measure facet gapping during cervical manipulation on live humans. Manipulation appears to increase ROM in the middle and lower cervical motion segments. Manipulation affects the targeted and adjacent motion segments. (This is a conference presentation abstract and not a full work that has been published.)

Reliability study for assessment of crano-cervical junction hypermobility

Michael Schneider, Karthik Hariharan, Michael Timko, Christopher Bise, Kris Gongaware

Objective: Involvement of the mid/lower cervical spine and crano-cervical junction (CCJ) leading to latent symptoms following neck trauma is poorly understood. Clinical detection of segmental mobility dysfunction in these joints is often performed using manual palpation and other physical examination procedures. This study aims to establish the level of interrater reliability of these procedures.

Methods: Inter-examiner reliability study using a convenience sample of 51 patients between the ages of 16-70 years presenting with neck pain following trauma. Patients with evidence of fracture, dislocation or neck surgery were excluded. Two clinicians independently performed a series of cervical physical examination procedures. Reliability statistics, Kappa coefficients and Intra-class correlation coefficients (ICC), were calculated for levels of agreement. **Results:** Kappa and ICC coefficients suggest 'moderate' to 'strong' levels of agreement (range 0.76-0.93) for the Modified Lateral Shear, C2 Spinous Kick and flexion-rotation tests. Kappa coefficients suggest 'moderate' to 'strong' levels of agreement (range 0.64-0.86) for soft tissue palpation, P-A facet joint spring testing (motion palpation) and other segmental ROM assessments. **Conclusions:** The routine physical assessment procedures examined in this study demonstrated good to excellent inter-examiner reliability. Correlation with clinical findings is necessary to establish the applicability in clinical practice. (This is a conference presentation abstract and not a full work that has been published.)

Sacroiliac joint myoligamentous interrelationships: Implications of sacral nutation dysfunction on whole body kinematics

Rick Serola, Charles Blum

Objective: Muscles have recently been found to both move and stabilize the sacroiliac joint (SIJ), however generally this muscular component has attained minor relevance in SIJ diagnostic protocols. **Data Sources and Selection:** Multiple Pub Med literature searches were made for search terms such as "sacral nutation AND musc*," "sacral nutation and kinematic chain," and "sacroiliac and musc*." Abstracts were reviewed to determine which papers were pertinent for this review. **Results and Conclusion:** The SIJ related muscles (e.g., iliacus, piriformis, etc.), have an interrelationship with ligaments affecting the SIJ. The SIJ is considered a "core-structure" for much of body's kinematic chain so it would be anticipated that the whole musculoskeletal system might be affected by SIJ imbalance. Therefore

preliminary evidence suggests that the movements at the SIJ (sacral nutation and counternutation) may influence the entire structure. Axial forces induce SIJ nutation and excessive loading forces will tend to lead to sacral nutative sprain compromising ligamentous support. Theoretically a protective ligamento-muscular reflex is initiated to limit nutation on the side of SIJ compromise. A compensatory adaptation process occurs altering posture and joint angles, leading to asymmetrical patterns of motion and positioning affecting the musculoskeletal kinematic chain. (This is a conference presentation abstract and not a full work that has been published.)

High-velocity, low-amplitude spinal manipulation training of prescribed forces and thrust duration: a pilot study

Zacariah Shannon, Robert Vining, Maruti Ram Gudavalli

Objective: This study assessed high-velocity, low-amplitude spinal manipulation (HVLA-SM) training using objective force and time feedback. **Methods:** Students and doctors of chiropractic (DCs) from a chiropractic college were trained for 6, 30-minute sessions within 4 weeks consisting of HVLA thoracic region thrusts to a prone mannequin placed over force-plates. Target peak force goals were 350 and 550N. Thrust duration target was ≤ 150 ms. Peak force verbal and visual feedback occurred after each thrust. Blinded assessment comprised 10 consecutive thrusts for each force target before training, immediately following, and 1, 4, and 8 weeks post-training. Analysis included mixed-model regression. **Results:** Overall, participants (8 students and 8 DCs) showed no between-group difference in peak force mean absolute error (AE) from target. Immediately post-training, adjusted mean AE (SD), (adjusted 95% CI) were: 0.2N (41), (-22 to 22) at 350N and -6N (58), (-37 to 25) at 550N; 8 weeks post-training results were: 32N (53), (4 to 60) at 350N and 9N (87), (-38 to 55) at 550N. Median thrust duration was 117ms at baseline and 134ms immediately post-training. **Conclusion:** HVLA-SM training with the aid of force-sensing technology resulted in improved ability to apply prescribed forces. (This is a conference presentation abstract and not a full work that has been published.)

Feasibility of auditory evoked potentials as an outcome measure before and after chiropractic care delivered in a university teaching clinic

Stephanie Sullivan, Les Gilbert

Objectives: To assess feasibility of conducting a research study in a university teaching clinic and use of auditory evoked potentials (AEP) as an objective measure of CNS changes following chiropractic care. **Methods:** Twenty Student interns were asked by email to assist in a research study. Human subjects training was required. Interns sought patients with no neck pain and previous, but not current neck pain (subclinical). Upon consent, patients received AEP and BP (known to influence AEP) assessments pre/post chiropractic care. Control participants, recruited independently, received AEP and BP pre/post 30-minute wait period. Participants completed a post study survey. **Results:** Six interns completed training, 3 referred patients (5-no pain, 1-subclinical). Post survey revealed favorable overall satisfaction with study. AEP results were mixed; however, peak III latency (left stimulated ear) decreased in 5 of 6 chiropractic participants, compared to increase or no change in 3 of 4 control participants. Systolic BP increased in chiropractic group (5 of 6) and decreased in all control group participants. **Conclusion:** Conducting clinical AEP research in a university teaching clinic exhibited limited feasibility. While AEP showed promise as a CNS assessment pre/post chiropractic, use of novice adjustors may have limited the results. (This is a conference presentation abstract and not a full work that has been published.)

The effects of whole body rotation on brain function as measured by quantitative electroencephalography

Stephanie Sullivan, Emily Drake, Dan Tuttle, Ronald Hosek, Rachel Youkey

Objective: The effects of whole body rotation on central nervous system (CNS) activity are largely unknown. Using quantitative electroencephalography (EEG), this study examined brain activity following application of whole body rotation with laser targeting. **Methods:** Five individuals with no history of vertigo underwent balance assessment, choice reaction time (RT) and resting-state EEG pre/post whole body rotation. To assess tolerance, participants underwent 3 sessions (2

rotations,8 RPM): pitch, yaw, pitch and yaw. Pulse oximetry and verbal assessment of patient tolerance was completed after each session. Following tolerance tasks, participants underwent whole body rotation in varying pitch and yaw directions (30s;8 RPM) while performing a laser targeting task. Results: All participants successfully completed tolerance assessments. RT improved in 3 of 4 participants (Avg. 20ms) with RT accuracy and balance demonstrating mixed results. For EEG, the most significant changes were pre/post increases in alpha 1 (8-10 hz) across the frontal lobes and the central strip (Fp1,F3,F4,F8,Fz,C4;p < 0.01) (Fp2,F7,C3;p <= 0.03) Additional significant changes were noted in similar regions for beta and gamma (p < 0.03). Conclusion: Alterations in brain activity, like those observed in this study, may help in understanding the therapeutic effects of whole body rotation. (This is a conference presentation abstract and not a full work that has been published.)

Systematic review of studies suggesting errors in identifying lumbar spinal levels exhibit a systematic cephalad bias

Felisha Truong, Robert Cooperstein

Objective: While reviewing the accuracy of spinal palpation, the authors noted an apparent systematic bias for lumbar errors to be cephalad. The objective of this study was detailed accounting of this apparent bias. Data Sources and Selection: Included studies addressed the accuracy of manual palpation to identify lumbar levels relative to an imaging reference standard. PubMed, MANTIS, ICL, CINAHL, and AMED were searched. Search terms were combinations of: Identification of intervertebral spaces, Anatomic landmarks spine, Anatomic landmarks vertebral column, Spine palpation, Lumbar palpation, and Accuracy, Surgical landmarks. Results: Of 1084 retrieved studies, 62 abstracts were read; 41 full text articles retrieved; and 15 studies included. In 4, insufficient data precluded detection of cephalad bias. In one case lacking bias, palpators were biased by prior knowledge of previous research. In all remaining 10 studies, lumbar errors trended cephalad. Conclusion: Prior research suggests cephalad bias results from using the iliac crest to identify spinal levels. The spinal level of the palpated crest is approximately one level cephalad to the imaged crest. The reported accuracy rates lumbar palpation studies, reinterpreted in this light, understate the true accuracy attainable using palpatory methods. (This is a conference presentation abstract and not a full work that has been published.)

A clinical data registry within a chiropractic college teaching clinic: A 1-year demonstration project

Robert Vining, Elissa Twist, Ronald Boesch, Lance Corber, Cynthia Long, Christine Goertz

Objective: To report recruitment for a health record registry assessing chiropractic care utilization by active-duty military and other constituents outside Veterans Affairs or the United States military health system. Methods: This 1-year demonstration project recruited active-duty military personnel, military spouses, and veterans with 20% or greater service-related disability attending chiropractic college teaching clinics. Enrolled participants will also complete baseline and monthly patient-reported outcomes data for 1-year following enrollment through a password protected, web-based system. Results: After 1-year of recruitment, 65 of the 482 potentially eligible individuals chose not to participate. One hundred thirty-nine were ineligible, and study personnel were unable to schedule a baseline visit with 74 eligible individuals. Two hundred-four participants enrolled at a weekly mean (SD) rate of 3.9 (2.4). The sample included 66% males, 50% active duty, 19% military spouses, and 29% veterans. Mean (SD) age was 41 (9.6). Ten percent reported as Hispanic or Latino, 15% African American, 3% Asian, and 67% white. Sixty percent reported receiving care within the clinic for over 3 months. Conclusion: This demonstration project established the feasibility of recruiting for a long-term registry providing opportunity to assess practice patterns and utilization at chiropractic college teaching clinics. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic management of chronic neck pain, an alternative to radio-frequency ablation (RFA): a case study

Robert Walsh, Trevor Wendel, Greg Snow

Objective: To present the case of a patient with moderate constant neck pain and left arm pain managed with spinal manipulative

therapy (SMT). The result, a discontinuation of regular cervical RFA procedures. Clinical Features: A 71-year-old veteran presented with moderate constant neck pain with associated left arm pain. Prior to receiving SMT, pain was managed with Percocet and cervical RFA procedures. At initiation of SMT, pain was rated 5/10 on the numeric reporting scale (NRS) and neck pain disability index (NPDI) score was 28%. Objective findings included decreased and painful cervical range of motion (ROM) and exacerbation of symptoms with cervical compression and shoulder depression. Intervention and Outcome: Cervical SMT was provided on 15 occasions over 8 months. Pain reduced to 1/10, NPDI score reduced to 22% and cervical ROM increased in all planes. Since initiating SMT, the patient discontinued RFA procedures to the cervical spine and has not had a RFA for 1 year. Conclusion: Successful management of a patient with chronic cervical pain with SMT which resulted in discontinuing RFA procedures is presented. Further studies are warranted to determine if SMT should be performed prior to initiating RFA procedures. (This is a conference presentation abstract and not a full work that has been published.)

Restructuring a chiropractic principles and practice course

Simon Wang, David Starmer, Karin Hammerich

Objective: Create a Chiropractic Principles and Practice (CPP) course that meets the current needs of students and graduates. The process by which the course was restructured is chronicled and reflected upon to inform other departments and institutions contemplating curricular change. Methods: A retrospective cohort study. A collaborative working group process was used following an external review to restructure the CPP course and results of the student course satisfaction survey were analyzed after a newly designed course was implemented. Results: The working group determined “integrating systems science to create a modern and positive image of what chiropractors do must be integrated into the CPP curriculum” and played an instrumental role in redesigning a new course. Course evaluation from students was positive. Conclusion: This is the first article published that described the process by which a CPP course was developed and assessed by student survey. Based on student perceptions, the new course was successful in providing students with clinically relevant information in an appropriate manner. This course may serve as an important first step in development a ‘model’ curriculum. (This is a conference presentation abstract and not a full work that has been published.)

Improving diagnostic meta-competencies

Krista Ward, Monica Smith, Monique Andrews, Khalid Chaney

Objective: Our objective is to describe facilitators and barriers of Clinical Case of the Week (ClinCow), a program introduced in January 2017 to address CCE meta-competencies 1 & 2 through collaboration between multiple departments. Methods: We anonymously surveyed eight key stakeholders about their experiences and recommendations for improving ClinCOW. SWOT methodology, commonly used for strategic planning, was chosen to frame the formal and informal data gathering and for analysis. Results: Identified strengths of ClinCOW include fostering critical thinking; identifying knowledge gaps; and providing opportunities to practice tools used in clinic, exams and classrooms. Weaknesses include time-intensive program with limited ability to provide students individualized feedback. Teaching discrepancies between departments create challenges for student performance and grading. Opportunities exist for students and faculty to present case studies as scholarly activity and for using technology to streamline program and allow for application of clinical information literacy skills. Threats to the program include student and faculty time conflicts. Conclusion: We employed an evidence-based approach to the development, implementation, and evaluation of a team-based, innovative clinical training program at our institution. We also report on successes and challenges to horizontally and vertically integrate expertise and input from various stakeholders. (This is a conference presentation abstract and not a full work that has been published.)

Spinal kinematic assessment of a chiropractor performing side posture adjustments: pilot study using a motion capture system

Michael Weiner, Brent Russell, Linda Mullin, Edward Owens, Ronald Hosek

Objective: Side-posture adjustments (SPAs) are widely performed by chiropractors, but are blamed as a cause of low back pain for chiropractors themselves. We developed a protocol to track postural angles and angular velocities during the performance of SPAs. **Methods:** One experienced chiropractor performed Gonstead-style lumbar SPAs on 10 patients. We used a Myomotion system to record spinal 3-D angular motions. All procedures were IRB-approved. **Results:** Data collection was successful for all trials. Relative to neutral calibration, the DC's spinal regions were flexed during the entirety of set-up and thrust; the cervical region also remained in right lateral bending and rotation; the lumbar spine was mostly in left rotation. Rapid flexion-extension was seen around peak thrust, the largest range in the cervical region (9-10 degrees), the smallest in the lumbar region (5 degrees). Motion patterns were consistent, trial-to-trial, though peak magnitudes varied in timing relative to the thrusts. There was a wide range of angular velocities, fastest in the cervical and thoracic regions. **Conclusion:** The methods appear to be feasible for identifying similarities and differences in motion patterns. Future studies will include additional chiropractors, and may contribute to student education and understanding occupational injuries of chiropractors. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic care for pregnancy and post-partum: a systematic review

Carol Ann Weiss, Katherine Pohlman, Sophia da Silva-Oolup, Crystal Draper, Kent Stuber, Kent Murnaghan, Cheryl Hawk

Objective: To conduct a systematic review of chiropractic care during pregnancy and post-partum for lower back and/or pelvic girdle pain. **Data Sources and Selection:** Five databases were searched to November 2016. Inclusion criteria were: pregnancy and/or post-partum population; chiropractic care for back or pelvic girdle pain; treatments taught at chiropractic colleges; systematic reviews (SR), guidelines; randomized controlled trials (RCTs), or observational studies with a control group; and English language. Two-phase screening was performed by pairs of independent reviewers. A modified SIGN criteria was used for critical appraisal. **Results:** Of 297 articles, 138 full articles were screened; 32 RCTs and 19 SR were included for pregnancy and 9 RCTs and 1 SR for post-partum, plus another SR for both populations. Eleven RCTs and 8 SRs were high quality, 19 RCTs and 11 SRs were acceptable, 9 RCTs and 2 SRs were low quality, and 2 RCTs were of unacceptable quality. Exercise and physical therapy were the sole treatment in 29 RCTs and 12 SRs. **Conclusions:** Chiropractic care for pregnant and postpartum populations typically incorporates numerous treatment approaches. This review found the majority of evidence for pregnancy focused on exercise and physical therapy modalities. (This is a conference presentation abstract and not a full work that has been published.)

Older adults' perceptions of doctor-patient relationships in a trial of collaborative care for low back pain: A qualitative study

Breanne Wells, Stacie Salsbury, Dana Lawrence, Dustin Derby, Lia Nightingale, Christine Goertz

Objective: This qualitative study explored older adults' perceptions of their doctor-patient relationships with the medical and chiropractic physicians who provided treatment for their low back pain (LBP). We also examined participants' perspectives on the collaboration among these healthcare providers. **Methods:** This secondary analysis used interview data obtained from a prospective randomized controlled trial of collaborative care for older adults with LBP (n=115). Two investigators analyzed the data using thematic content analysis and an existing model of the clinically excellent primary care physician. **Results:** Main themes included communication and interpersonal relationships, clinical and diagnostic acumen, passion for patient care, professionalism and humanism. Less frequent themes were "hands-on" treatments, scholarly approach, and skillful negotiation of the healthcare system. Participants generally reported

good relationships with both types of doctors. They wanted a doctor who listened, spent time with them, and who educated and helped them with their condition. Collaboration between providers was considered beneficial in helping LBP because the doctors were working together for their common good. **Conclusion:** Overall, older adults with LBP wanted to have a good relationship with their healthcare providers. They liked it when their provider was knowledgeable, open-minded and helpful in treating their condition. (This is a conference presentation abstract and not a full work that has been published.)

Forces used to assess perceived prone thoracic end feel

Jon Wilson, Steven Agocs, Mark Pfefer, Jackson Berg, Rebecca Wates

Introduction: Previous studies have evaluated reliability of end feel palpation, but few studies have evaluated joint end feel of the thoracic spine in the prone position. Prone palpation of the thoracic spine is commonly performed by chiropractors to assess for the need to apply spinal manipulation. The aim of this pilot study was to assess feasibility of measurement of perceived thoracic end feel using a chiropractic table equipped with a biomechanical force plate. **Methods:** Skin marker was applied to the peak kyphosis of the thoracic spine on two volunteers. Experienced doctors (n=5) and student volunteers (n=5) palpated each volunteer using a crossed, bilateral contact. The doctors and students were instructed to palpate until perceived end feel. Peak forces were measured during palpation using the force sensing table. The university institutional review board approved this project. **Results:** Average mean peak scores were calculated from three replicates for each student and doctor. Students' average forces were lower than doctors' average forces, ranging from 26N to 89N. **Conclusion:** Students perceived end feel of the thoracic spine at lower peak forces compared to experienced doctors. Further study is warranted. (This is a conference presentation abstract and not a full work that has been published.)

Effects of random questioning expectations on chiropractic students' preparedness for lecture and academic performance

Niu Zhang, Charles Henderson

Objective: Evaluate student pre-lecture preparation and academic performance with active- vs. passive-lectures. **Hypotheses:** H1) Active-lectures will increase student pre-lecture preparation. H2) This preparation will correlate with academic performance. H3) Academic performance will be greater with active-lectures. **Method:** We examined active- vs. passive-lectures in a four-arm comparison trial within our chiropractic training program. Two active lectures featured oral pre-lecture questions on assigned reading materials – random student questioning vs students volunteering answers. Two passive lectures without pre-lecture questions – reading materials provided with and without assignments. **Assessments:** Student pre-lecture preparation time and academic performance (final exam). **Results:** Third-quarter students during 2015 and 2016 (n = 385). H1: Statistically significant pre-class preparation times between random and voluntary active-lecture groups (4.5 hrs. and 3.6 hrs., p = .039) and between random active-lecture and passive-lecture with assignments (4.5 hrs. and 3.5 hrs., p = .010). H2: Pre-class preparation time wasn't a statistically significant predictor of final exam scores (F1,294 = .492, R2 = 0.002, p = .484). H3: Active- vs. passive-lecture final exam scores were statistically significant (78.47% and 75.11%, t383 = 2.817, p = .005). **Conclusion:** Active-lecture improved final exam performance didn't correlate with student pre-lecture preparation time. (This is a conference presentation abstract and not a full work that has been published.)

POSTER PRESENTATIONS

The chiropractic care of a patient presenting with rib pain syndrome

Joel Alcantara, Junjoe Alcantara

Objective: To describe the chiropractic care of a patient presenting with rib pain syndrome

Clinical Features: A 45-year-old female suffered from anterolateral thorax pain of 2 months duration. Medical consultation resulted in prescription of muscle relaxants, Celebrex and Arcoxia for reflux esophagitis and muscles spasms. Medications were discontinued due to side effects and ineffectiveness. Whole abdomen CT examination with no relevant abnormalities. The patient thus consulted for chiropractic care. Standing and supine lateral rib compression was unremarkable but from lying or sitting to standing positions were provocative. Palpation of the right abdominal upper quadrant and the costosternal joints were also unremarkable with tenderness to palpation and motion restriction at the cervical, thoracic and lumbosacral spine.

Intervention and Outcome: Full spine spinal adjustments with Diversified Technique and Arthro-Stim over the course of 2 weeks consisting of 3 visits. On the 3rd visit, the patient reported a 75% improvement in her pain complaint. Three weeks follow-up revealed her pain complaint had resolved. **Conclusion:** This case report provides supporting evidence that patients suffering from rib pain may benefit from chiropractic care. (This is a conference presentation abstract and not a full work that has been published.)

Spinal manipulation and other complementary and alternative therapies for neck pain in the US

Peter Amua-Quarshie, Patricia Cates, Afsar Sokhansanj, Farshid Marzban, Richard Salazar, Harrison Ndetan

Objective: Neck pain (NP) is among the most frequent and costly conditions. Its treatment remains a clinical challenge. This study explored the potentials of combining Spinal Manipulative Therapy (SMT) and other Complementary and Alternative Medicine (CAM) modalities as integrative approaches for managing NP in adults in the US. **Methods:** A subset of adults who reported having neck pain in 3 months in the 2012 National Health Interview Survey (NHIS) defined the analytical sample. Applying the complex survey design structure, national population estimates (NPE) were generated for those using SMT in combination to other CAM therapies as treatment options for NP. **Results:** NP was reported by 14.26% of the respondents (NPE=33515403) among which 17.53% (NPE=5873736) reported the use of SMT. Those who combined SMT with Herbal supplement, Yoga, Mind Body Therapy, Craniosacral Therapy, Movement or Exercise Technique, and Homeopathy were respectively, 3.49%(NPE=1170497), 2.72%(NPE=913185), 2.83%(NPE=947774), 1.32%(NPE=441947), 0.97%(NPE=327570) and 0.73%(245439). **Conclusion:** A small proportion of US adults reported a combined use of SMT and another CAM modality as treatment for NP and small percentages of them reported that it helped with their condition, suggesting potentials for integrative care through these combinations which warrant further investigation. (This is a conference presentation abstract and not a full work that has been published.)

Preparation for US chiropractic medicine licensure by doctor of chiropractic educational programs

Christopher Arick, Sheyda Isazadeh

Objective: Doctor of Chiropractic (DC) programs have the responsibility to prepare students for licensure. Chiropractic medicine programs should accomplish this preparation through admissions requirements, curricular content, and academic rigor. The purpose of this study is to review licensure requirements from the United States licensing boards and compare these requirements to the admissions requirements and curricular content of the sixteen accredited chiropractic medicine programs to determine if programmatic preparation of licensure exists. **Methods:** Data regarding licensure educational requirements were obtained through the Federal of Chiropractic Licensing Boards website content and confirmed through state resources. Information regarding programmatic admissions requirements and curricular content was obtained through the institution's academic bulletin and website content. The licensure requirements and programmatic data were cross-referenced. The institutional names were made anonymous and randomly assigned numbers 1 through 16. **Results:** None of the sixteen accredited chiropractic medicine programs in the United States, through admissions requirements and curricular content, fulfilled the education requirements for licensure for all fifty-three licensing boards reviewed. **Conclusion:** United States based chiropractic medicine

programs have an ethical responsibility to make essential changes to the admissions and curricular standards or collaborate with legislative bodies to provide student preparation for licensure. (This is a conference presentation abstract and not a full work that has been published.)

Post-traumatic scapholunate advanced collapse of the wrist: a case review

Daniel Ault, David Mann, Alyssa Troutner, Norman Kettner

Objective: To describe a patient with scapholunate advanced collapse (SLAC) of the wrist, the features of SLAC on multiple imaging modalities, and provide a discussion about the proximal row carpectomy (PRC) method of surgical intervention. **Clinical Features:** A 38-year-old male presented to a chiropractic teaching clinic with a 7-year history of wrist pain. The chief concern consisted of sustaining a fall onto an outstretched hand (FOOSH) injury to his right wrist after falling off the tailgate of a truck, which was traveling approximately 20mph. Ultrasonography and radiography were performed upon presentation. Imaging demonstrated abnormal lunate kinematics and scapholunate joint diastasis associated with a clenched-fist maneuver. These findings were consistent with SLAC. **Interventions and Outcome:** Following the FOOSH injury, the wrist was splinted. Conservative care involved paraffin dips, therapeutic ultrasound, and stretching. The patient received only minimal alleviation of pain. Consequently, the patient underwent surgical intervention involving a PRC procedure. **Conclusion:** This case demonstrated chronic wrist pain, and progression of instability, ultimately manifesting as SLAC. We demonstrate on multiple imaging modalities both pre- and post-operative management findings. To our knowledge, this is the first case demonstrating a postsurgical PRC using diagnostic ultrasonography. (This is a conference presentation abstract and not a full work that has been published.)

Sonography of Achilles tendon pathology: a case series

Patrick Battaglia, Ross Mattox, Daniel Ault, Norman Kettner

Objective: Highlight the sonographic features of the following Achilles tendon pathologies: acute tear (pre- and post-operative); chronic tear; chronic tendinopathy; tear of the fascia cruris. **Clinical features:** Patients include a 47 year old male with an acute full thickness tear with subsequent operative repair, a 41 year old female with a chronic previously undiagnosed full thickness Achilles tendon tear, a 64 year old female with chronic tendinopathy, and a 21 year old female with tear of the crural fascia. **Intervention and outcome:** This is a diagnostic case series describing static and dynamic B-mode, power Doppler, and elastographic imaging features. **Conclusion:** Sonography is an ideal modality to image a broad spectrum of Achilles tendon pathology. It permits high resolution of the tendon and allows for dynamic examination where ankle plantar and dorsiflexion can delineate regions of tendon tearing from surrounding anatomy. Furthermore, sonography is more economical than magnetic resonance imaging and contralateral comparison can be performed in minimal time without any increase in costs. Lastly, ancillary sonographic tools such as power Doppler imaging and elastography allow for further quantification of tissue pathology. (This is a conference presentation abstract and not a full work that has been published.)

The ambiguity of sciatica as a clinical diagnosis and the value of integrating chiropractic care into a federally qualified health center

Patrick Battaglia, Barry Wiese

Objective: Describe three patients referred internally from primary care with a clinical diagnosis of sciatica. **Clinical features:** Examination yielded disparate working diagnoses: S1 radiculopathy in a 47-year-old female, greater trochanteric pain syndrome in a 62 year-old female, and unilateral sacroiliitis (radiography confirmed) in a 35 year-old male. **Intervention and outcome:** The patient with S1 radiculopathy was treated using a directional preference approach. After 5 treatments, she was asymptomatic and resumed full work activities. The patient with greater trochanteric pain syndrome was treated with myofascial release of the iliotibial band and gluteal musculature, and hip abductor strengthening. After 5 treatments, her thigh and leg pain had resolved, and she resumed full activities of

daily living. The patient with unilateral sacroiliitis is awaiting rheumatologic consultation. Conclusion: In a primary care setting, back and leg pain often yields a working diagnosis of sciatica. As illustrated by this report, a broader differential exists, and primary care physicians may lack the time to effectively diagnose and manage these conditions, being burdened with managing complex internal disorders. Therefore, the integration of chiropractic care into traditional medical settings may be of immense value in managing pain from spinal or extremity origin. (This is a conference presentation abstract and not a full work that has been published.)

Vertebral displacement and muscle activity during manual therapy: distinct behaviors between spinal manipulation and mobilization

Eric Biner, Martin Descarreaux, Isabelle Page

Objective: To compare the absolute and relative vertebral displacement and the muscle response induce by spinal manipulative therapies (SMTs) using short and long impulse durations. Methods: 25 healthy adults (free of thoracic pain) were recruited. Six SMTs (255N peak force) of different impulse durations (100, 125, 200, 500, 1000 and 1500 ms) were delivered to each participant using a mechanical device and contacting T7 transverse processes. The effect of impulse duration on the vertebral displacement (absolute displacement of T6, T7 and T8 and relative displacement between T7 and T6 and between T7 and T8) and the thoracic muscle response (sEMG) was assessed using mixed model ANOVAs and predefined linear trends analyses. Results: A linear increase in vertebral displacement following the increase in impulse duration was observed for T8 ($p=0.002$) but not for T6 ($p=0.59$). A linear decrease in T7/T6 and T7/T8 relative displacement when impulse duration was increased ($p<0.0001$) could also be observed. Analyses also revealed a linear decrease in sEMG response ($p<0.0001$) with increasing impulse duration. Conclusion: Distinct neurophysiological responses are generated by SMTs of short and long impulse duration. The implication of such responses in SMT clinical effects remains to be determined. (This is a conference presentation abstract and not a full work that has been published.)

A survey of sacro-occipital technique (SOT) practitioners: Pediatric patients and their presenting symptoms

Charles Blum, Christine Benner

Objective: Does a chiropractic technique determine what types of patients and conditions a chiropractor might see? Methods: The survey was disseminated via SOT doctor e-mails lists, internet chiropractic groups, and chiropractic Facebook groups as a "Survey Monkey" survey. Respondents included doctors from United States, South America, Australia, and Europe. The goal was to determine what proportion of patients seen by SOT practitioners were pediatric patients, and of those patients what proportion were infants, children, or young adults. Additionally, what proportion of those patients were treated for musculoskeletal, non-musculoskeletal, or for preventative care. Results: There were 326 responders stating they were SOT practitioners who treated pediatrics, with the majority noting that pediatrics averaged between 5-30% of their patient population. The responses for those who treated pediatric patients appeared to be evenly distributed amongst infants (0-3 years-old), adolescents (4-11 years-old), and young adults (12-17 years-old). Treatment of pediatric patients for musculoskeletal, non-musculoskeletal, and preventative care was also evenly distributed amongst the responders. Conclusion: It may be of value to assess the chiropractic profession at large or subsets based on technique preference to help determine what place chiropractic care might play in pediatric musculoskeletal, non-musculoskeletal, and preventative care. (This is a conference presentation abstract and not a full work that has been published.)

The polyvagal theory: A rational for psychological and chiropractic interdisciplinary care

Charles Blum

Objective: An integrative review was performed of Porges' polyvagal theory relating to the autonomic nervous system, which considers there are two-parts to the vagal or parasympathetic nervous system. Data Sources/Selection: Searches were made for polyvagal theory, parasympathetic, vagal, autonomic, chiropractic, cranial manipula-

tion, and temporomandibular joint disorders through PubMed, ChiroIndex, and ChiroAccess search engines. Results and Conclusions: Porges' polyvagal theory suggests the mammalian vagus is neuroanatomically linked to the cranial nerves that regulate social engagement via facial expression and vocalization. This "face-heart" relationship has been studied by investigating the polyvagal theory as it relates to cardiac vagal tone (CVT) and heart rate variability (HRV). Some studies have found chiropractic interventions may have a therapeutic effect on autonomic nervous system function, which may theoretically aid patients with compromised social interaction secondary to vagal compromise. Sacro occipital technique (SOT) attempts to incorporate both spinal and cranial adjusting components to address autonomic imbalances. Aspects of SOT cranial care focus on balancing cranial and sacral parasympathetics and specifically supporting balanced vagal function. Porges' polyvagal theory suggests a rational for a body-mind support team that would include chiropractors (physical interventions) and psychologists/psychiatrists (psychological interventions) related healthcare practitioners may warrant further study. (This is a conference presentation abstract and not a full work that has been published.)

A preliminary survey of chiropractic college use of table sanitizers in their clinic: Are there green alternatives?

Charles Blum

Objective: The chiropractic profession in recent years has been studying the need for chiropractic table sanitization, with studies noting gram-positive and negative bacteria (cocci and bacilli) such as: Methicillin-resistant *S. aureus*, *S. epidermidis*, *S. saprophyticus* and *S. aureus*. Methodology: A 2014-informal telephone survey to all 16-chiropractic college clinics within the United States asked what do they use to sanitize their treatment tables. Some responses were obtained over the telephone and other through email. Results: From the response it was noted that the various sanitizers (ammonium chloride derivatives) used at the college clinics offer some risk to the practitioner during application via skin contact/inhalation, the patient via direct prolonged skin contact, and environmentally through patient's clothing or when disposing of cloth/paper towel applicator. Conclusion: Healthcare encounters should at all times minimize risk. Discussed is the research relating to aqueous ozone, which has been found to function as sanitizer comparable to those currently used in the college clinics. It may be possible through the use of aqueous ozone the chiropractic profession could study the use of a green technology, to prevent the spread of infection while reducing any toxic load on the doctor, patient, and environment. (This is a conference presentation abstract and not a full work that has been published.)

Study on inducing fifth lumbar vertebra malposition by M. B. DeJarnette: Historical development of sacro-occipital technique

Charles Blum

Objective: It is helpful to understand the historical development of chiropractic manipulative techniques since they helped form the foundation of chiropractic in its early years. One technique developer (DeJarnette) of Sacro Occipital Technique (SOT) attempted a research project, however flawed, that gives us a glimpse into his development of an aspect of his technique.

Data Sources and Selection: In DeJarnette's 1952 text, he described a 1941 research study involving subject recruitment from his patient base (target ages 18-50 years old/no low-back pain). Over 200-subjects were examined with 16 fitting his inclusion criteria. Each of the 16-subjects received an adjustment to place a strain on the fifth-lumbar directing the spinous process towards the right and repeated daily for four-days. During the next two years DeJarnette followed their health status. Results: One consistent finding was that each of the 16 subjects developed palpatory pain over the left transverse of their atlases. None of the 16 had such pain prior to the first experimental adjustment. Conclusions: DeJarnette attempted to employ research methodologies to study and investigate his interventions. While this study was fraught with design flaws and would never receive IRB approval, it nonetheless shares his thought process. (This is a conference presentation abstract and not a full work that has been published.)

Sacroiliac joint hypermobility syndrome and a chiropractic: A preliminary survey

Charles Blum

Objective: Sacro occipital technique (SOT) has long discussed how the anterior and posterior aspects of the sacroiliac joint (SIJ) are completely different in their anatomy and function, leading to differences in assessment and treatment. Research has also found that 20% of the population has joint hypermobility syndrome and may be an important factor for chiropractic assessment and treatment modalities. **Method:** A small sampling preliminary survey was taken of SOT practitioners (N=53) and practitioners not familiar with SOT (n=11) via online-internet groups to determine the value of larger study. Questions related to whether the doctor practices SOT or not and what percentage of patients they see have hypermobile-versus-fixed SIJs. **Results:** From this pilot survey, SOT chiropractors more commonly found patients with hypermobile SIJs, whereas chiropractors without an SOT bias, more commonly found patients with fixed SIJs. **Conclusion:** Another survey with a larger sampling would yield greater information and if the results are similar to this one, then determining whether SOT practitioners find SIJ hypermobility suspiciously often or whether practitioners not trained in SOT under-report it, would be an important consideration. Whether-or-not hypermobile/fixated SIJ assessments and treatments lead to different outcomes will also be important to determine. (This is a conference presentation abstract and not a full work that has been published.)

Intervention in gall bladder dysfunction through chiropractic adjustment and nutritional therapy: a case report

William Boro, Mary Psaromattis

Objective: This report describes the clinical course, treatment and response of a 58-year-old female suffering 2-years from unremitting gall bladder dysfunction, seeking conservative chiropractic care. **Clinical Features:** Patient had been receiving allopathic care for epigastric pain and esophageal reflux. She presented June-2016 with hopes of avoiding surgery. Initially her medications included (taken daily) Protonix and Zantac as well as various other medications for allergy, stress and pain reduction. **Intervention and Outcome:** Treatments consisted of spinal manual manipulation Van-Rumpt organ adjustments, sacro-occipital technique's chiropractic manipulative reflex technique, and liver/gallbladder visceral manipulations. Following the first-treatment the patient noticed improvement for the first time in two-years. Initially nutritional supplementation focused on the liver, adrenals, and sooth stomach lining, ceasing supplementation by 2-3 months. After 45-days (8-treatments) a radionuclide hepatobiliary scan noted a gallbladder ejection fraction (11%) at 60 minutes (abnormally low). Due to her symptomatic relief and ability to significantly reduce medication intake she continued with chiropractic care. Approximately six-months later (22-treatments) a follow-up scan noted a normal ejection fraction (75%). **Conclusion:** This case report demonstrates a chiropractic approach utilizing manual manipulation and somatovisceral reflex techniques that appeared to aid a patient suffering from gall bladder dysfunction. (This is a conference presentation abstract and not a full work that has been published.)

Intervention in tachycardia through chiropractic adjustment, sacro-occipital technique's chiropractic manipulative reflex technique: a case report

William Boro

Objective: This report describes the clinical course, treatment and immediate response of 64-year-old male patient suffering from tachycardia and arrhythmia of 15-years' duration to the application of chiropractic adjustments and Sacro Occipital Technique's (SOT) Chiropractic Manipulative Reflex Technique (CMRT). **Clinical Features:** A patient presented with history of atrial fibrillation and arrhythmia dating back to 2002. Cardiac ablation and catheterization of the left atrium performed in September 2014 helped to control his condition. However the effectiveness of the prior interventions waned and patient reported ongoing increased pulse rates constant for months. Typical findings (21-random-pulse-readings) during the first week of May 2016 noted an average heart-rate of 134.6/minute.

Intervention and Outcome: Two office visits consisted of cervical adjustment, cranial manipulation, and CMRT related to cardiac viscerosomatic/somatovisceral reflex balancing with local vagal nerve stimulation. Heart-rate reduced within 5-minutes of the treatment. Patient-supplied data during the two-weeks post-treatment (41-random-pulse-readings) averaged heart-rates of 88.7/minute for the two-weeks following adjustment. **Conclusion:** This case report demonstrates a chiropractic approach utilizing manual manipulation and somatovisceral reflex techniques that appeared to aid a patient suffering from tachycardia. Greater study is needed to determine what subset of patients might benefit from this procedure. (This is a conference presentation abstract and not a full work that has been published.)

Evidence-based clinical practice curriculum development: An innovative and integrated approach

Theresa Brennan, Ali Rabatsky, William Sherrier

Objective: The challenges of our integrated curriculum resulted in an innovative model for the incorporation of Evidence-based clinical practice (EBCP) into a curriculum. Methods EBCP topics to be taught were identified and sequenced throughout the curriculum. A competency was created for each EBCP topic.

An introductory course on EBCP was included in our first quarter. EBCP competencies were placed sequentially in existing courses such that the competency was introduced in first quarter, covered in greater depth in another quarter and reinforced in a later quarter. Teaching tools for each competency were shared. Assessment methods for each competency were implemented within the courses. Assessment tracking of learning was developed to determine the success of our embedded curriculum. **Discussion:** Anecdotally it has been noted that this model of an embedded curriculum has fostered collaboration among faculty and a culture shift to inclusion of EBCP throughout our program. The Assessment tracking noted above will inform the success of our model. **Conclusion:** The nature of an integrated curriculum challenged us to develop an incorporation of EBCP competencies into existing courses that resulted in an embedding of EBCP into our curriculum. (This is a conference presentation abstract and not a full work that has been published.)

Patient-centered outcomes utilized in clinical pediatric manual therapy research studies

Beth Carleo, Carol Prevost, Brian Gleberzon, Kris Anderson, Katherine Pohlman

Objective: Patient centered outcomes (PCO) provide insight into patients' experience, which document care and safety. Standardizing and increasing PCO utilization may help fill the current void of pediatric and manual therapy (MT) research. The objective of this study was to evaluate condition-specific, PCO currently utilized in MT research studies for musculoskeletal and structural pediatric conditions. **Methods:** Extract PCO utilization and psychometric property data from studies included in a recent systematic review (2016) of pediatric MT. **Results:** Sixteen studies were reviewed of which six utilized a PCO (37.5%). Three studies included a Visual-Analog or Numeric-Rating Pain Scale with different parameters. Change in daily activities and pain were measured with a diary for three conditions. Additionally, one study utilized Patient Specific Functional Scale and Global Rating of Change and another used the Scoliosis Quality of Life Index. Psychometric properties were discussed in four studies. **Conclusions:** This study found that 33% of studies in the systematic review utilized PCOs. Of note, was that none of the studies utilized the same measure or parameter. Providing PCO current use will allow for future guidelines to more efficiently assess the care and safety of MT for the pediatric population. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic management of Fluoroquinolone allergic reaction

Tara Chevront, Adam Sergent

Objective: To describe the care of a patient presenting with diffuse pain and Achilles tendinopathy with a suspected cause of Fluoroquinolone reaction. **Clinical Features:** A 48-year-old male had a 4-year history of diffuse pain and Achilles tendinopathy. He had sought care immediately following his first dose of Fluoroquinolone. Since then he has seen his primary care physician and an orthopedic physician both confirming the

soft tissue pathology due to allergic Fluoroquinolone reaction. Intervention and Outcome: The initial medical management consisted of bed rest and immobilization along with Non-steroidal anti-inflammatories. Following a referral to a physical therapist by his orthopedist, he began to see some slow improvement. Following a course of home exercise and cold laser therapy prescribed by the chiropractor, he saw gradual improvement. With the addition of nutrition supplementation, anti-inflammatory diet and soft tissue techniques as well as lower extremity adjustments, he has seen significant improvement. Conclusion: The use of alternative treatment procedures were shown to help a patient with an allergic reaction to Fluoroquinolone anti-biotics. Further research is recommended to understand the benefits of alternative care treatments and the management of allergic reaction to Fluoroquinolone. (This is a conference presentation abstract and not a full work that has been published.)

Incidentally-found benign bone tumor leading to diagnosis of avascular necrosis in a patient with Crohn's disease: A case report

Munyeong Choi

Objective: To describe, in a patient with a history of Crohn's disease, the clinical connection between long-term corticosteroid usage and avascular necrosis of the hip that was incidentally found because of a benign bone tumor on a radiograph. Clinical Features: A 37-year-old male chiropractic student complained of abdominal pain and was hospitalized for four weeks. The patient was diagnosed with Crohn's disease and was prescribed long-term corticosteroid therapy to suppress inflammation, followed by a new onset of right hip pain. Intervention/outcome: Radiographs of the right hip were taken and demonstrated a well-circumscribed medullary-based large osteolytic lesion with a thin rim sclerosis in the proximal metaphysis of the femur. This radiographic finding warranted MRI examination of the right hip. MRI revealed abnormal signal alteration of the right femoral head that is characteristic of avascular necrosis. Conclusion: Avascular necrosis of the hip is a known complication as a result of long-term usage of corticosteroids. Therefore, a new onset of hip pain in patients with a history of medical conditions that may require long-term corticosteroid therapy should prompt clinicians to include potential avascular necrosis of the hip in their differential diagnosis. (This is a conference presentation abstract and not a full work that has been published.)

Effects of high and low-power poses on maximal force production during a prone Carver thoracic adjustment performed on a mannequin atop force sensing table technology

Lydia Colacino, Richelle Martins, Jesse McAleese, Joseph Greenwood, David Starmer, Simon Wang

Objective: To determine the effect of power posing on maximal force production during a prone thoracic adjustment. Methods: 20 third year students from a chiropractic college were recruited for a randomized control trial, and were randomly assigned to two groups; Group 1 performed low power poses on day 1 and high power poses on day 2; Group 2 performed high power poses on day 1 and low power poses on day 2. Subjects performed a 1-minute hold of two poses of the same power and then conducted a manipulation with maximal force on Human Analogue Mannequins™. Transmitted Impulse Peak forces in Newtons were recorded using Force Sensing Table Technology™. Results: There was no statistically significant difference in force output for a maximal chiropractic thrust between the high and low power pose displays. Conclusion: High power pose displays have been shown to increase testosterone and decrease cortisol. There was no relationship found between high and low power pose displays and physical performance. Future research is needed to determine the relationship between power posing and physical performance for other manipulation parameters such as load rate, time to peak force, or target force accuracy. (This is a conference presentation abstract and not a full work that has been published.)

The Effect of Chiropractic Care and Retained Primary Reflex Therapy on a Patient with Erb's Palsy

Karima Cooper

Objective: This case highlights the outcomes of chiropractic adjustments, with retained primitive reflex therapy, on a patient with Erb's

Palsy. Clinical Feature: Patient presented to a chiropractor for treatment of symptoms from a birth injury. Patient has left Erb's Palsy; restricting arm extension, fingers extension, and wrist extension. History revealed that nerve transplant surgery was performed on the patient. The transferred nerve was taken from the patient's leg. Patient had decreased cervical Range of Motion (ROM). The following were retained primitive reflexes: Babinski's, palmer grasp and rooting. Intervention and Outcome: The patient was treated 3 times per week. Treatment consisted of 15 repetitions of cervical traction, lumbar ROM exercises on an unstable surface, and Chiropractic adjustment. The parents were instructed to stroke proximal to distal over the palmer surface of the patient's left hand and left foot; and from medial to lateral across left cheek 5 times per day. On the 3rd visit she had the ability to extend her fingers and after the 12th visit there was a decrease in the presentation of the retained primitive reflexes. Conclusion: This case demonstrates the increase of nerve function associated with chiropractic adjustments and primitive reflex therapy. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic management for female veterans with low back pain: A retrospective study of clinical outcomes

Kelsey Corcoran, Andrew Dunn, Lance Formolo, Gregory Beehler

Objective: To determine if female Veterans had clinically significant improvement in low back pain (LBP) after chiropractic management. Methods: This is a retrospective chart review of 70 courses of care for female Veterans with a chief complaint of LBP who received chiropractic management through a Veterans Health Administration medical center. A paired t-test was used to compare baseline and discharge outcomes for the Back Bournemouth Questionnaire (BBQ). The minimum clinically important difference (MCID) was set as a 30% improvement in the outcome measure from baseline. Results: The average female Veteran meeting inclusion criteria at consultation was a 44.8 year old, overweight (BMI=29.1 kg/m²) Caucasian (86%). The mean number of chiropractic treatments was 7.9. For the BBQ, the mean raw score improvement was 12.4 points (p<0.001), representing a 27.3% change from baseline with 47% of courses of care meeting or exceeding the MCID. Conclusion: Mean chiropractic clinical outcomes from baseline to discharge were reflective of improvement which was statistically significant and approached but fell short of an MCID established at 30%. While further research is warranted, chiropractic care may be of value in contributing to the pain management needs of this unique patient population. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic management in a 54-year-old female with post-operative spinal adhesive arachnoiditis

Stacey Cornelson, Edward Johnnie, Norman Kettner

Objective: This case report describes the significant clinical complications and imaging features of post-operative spinal adhesive arachnoiditis. Clinical Features: A 54-year old female presented with right posterior thigh and leg pain after her second lumbar spine fusion surgery to correct a degenerative spondylolisthesis of L3/4. Her pain was sharp and shooting and worsened with knee extension. A lumbar CT myelogram demonstrated clumping and adhesion of the nerve rootlets in the cauda equina at the surgical fusion levels. Intervention And Outcome: The patient was treated with 2 sets of neural mobilization of the sciatic nerve with 15 repetitions each. The patient utilized the neural mobilization exercises at home and performed to tolerance. The patient's Oswestry Questionnaire was significantly reduced by 19% with decreased pain intensity. Conclusion: Spinal adhesive arachnoiditis is characterized by inflammation and scarring of the arachnoid membrane causing nerve roots to adhere to the thecal sac or to other rootlets. Symptoms often include radiating low back pain that extends into the legs, persists at rest, muscle spasms, or neurologic deficits. Since, there are few surgical options for arachnoiditis, neural mobilization may be a non-surgical approach for pain management in these patients. (This is a conference presentation abstract and not a full work that has been published.)

Large intramuscular hemangioma of the forearm: a case report

Stacey Cornelson, Jude Miller, Gary Gueber

Objective: This case report describes the radiographic and magnetic resonance (MRI) findings in a patient with a longstanding soft tissue hemangioma of the right forearm. **Clinical Features:** A 42-year-old female presented with known soft tissue hemangioma and pain of the right forearm. The patient had reduced ROM of the right wrist. She wanted consultation before pursuing a rigorous exercise routine. Radiographic and magnetic resonance imaging (MRI) examinations demonstrated cortical irregularity and periosteal reaction with minimal osseous invasion of the distal ulna and radius consistent with a soft tissue hemangioma.

Intervention and Outcome: The large size, extent of muscular involvement, associated pain and adjacent ulnar and radial periosteal reaction from the hemangioma resulted in a recommendation for the patient not to pursue the high impact exercise regime. **Conclusion:** We present a case of soft tissue hemangioma with adjacent osseous changes in a patient who wanted to pursue a high impact, rigorous exercise program but was dissuaded. Soft tissue hemangiomas occasionally cause adjacent periosteal reaction or intraosseous change of bone which may result in local resorption or osteopenia. Clinicians should be cognizant of the increased risk of fracture of bone adjacent to soft tissue hemangiomas. (This is a conference presentation abstract and not a full work that has been published.)

A case report of osteomyelitis secondary to *Kingella kingae* in a 17-month old

Sophia Da Silva-Oolup, Julie O'Shaughnessy

Objective: This case report presents a patient with osteomyelitis of the foot and associated cellulitis secondary to *Kingella kingae*. **Clinical features:** A 17-month old presented to a chiropractor with a chief complaint of left hip pain and the inability to weight-bear. Superficial palpation revealed increased temperature and pain over the left hip joint. Active and passive ranges of motion of the left hip were painful and reduced. Pelvic radiographs revealed increased hip joint space. The following day the infant's left foot was erythematous, swollen and warm to the touch. Intervention and outcome: The patient was referred to his family physician and subsequently to a pediatrician for further examination, advanced imaging and management. The patient was diagnosed with osteomyelitis of the left first metatarsal bone and cellulitis of the left thigh. The patient was hospitalized for four days and underwent a course of antibiotic therapy.

Conclusion: Parents often consult a chiropractor for their children's musculoskeletal complaints. The clinical presentation of osteomyelitis due to *Kingella kingae* infection commonly produces only mild signs and symptoms. As such increased clinical acumen is required to reach an accurate working diagnosis, appropriate patient referral and management in suspected inflammatory musculoskeletal conditions. (This is a conference presentation abstract and not a full work that has been published.)

Identifying the frequency of perinatal sacroiliac hypermobility indicators in a chiropractic clinic

John Edwards, Jeanne Ohm, Charles Blum

Objective: Increased psoas-tension (PT) changes biomechanics during pregnancy, and several sources suggest a correlation between PT in non-pregnant adults and persistent, subacute sacroiliac joint hypermobility (SIJH). The relationship between stabilizing relaxin-induced perinatal SIJH (P-SIJH) and preventing PT remains under-investigated. Sacro Occipital Technique's (SOT) screening protocol for addressing SIJH/pain related to hypermobility may complement the Webster Technique (WT), a popular, specific chiropractic sacral analysis and diversified adjustment that doesn't assess P-SIJH. We examined the frequency of four-SOT indicators in a cohort of perinatal chiropractic patients under WT care. **Methods:** A retrospective review of 170 visits (January 2016) identified 17-perinatal patients presenting with LBP/SIJ pain who also met the criteria for potential P-SIJH identified by SOT but not WT. **Results:** At least one indicator of P-SIJH was observed in all 17-assessments. Failing an arm fossa challenge (9), standing lateral sway (8), and unilateral scalenus muscle tension (5) were present in concert with knee tenderness that resolved upon SIJ stabilization (17) 75% of the time.

Two indicators were detected more frequently than three or four. **Conclusion:** SOT identified potential P-SIJH in 10% of the cohort under WT care. The uncorrected P-SIJH/PT relationship in pregnancy may warrant further investigation. (This is a conference presentation abstract and not a full work that has been published.)

Utility of ImageJ for measuring umbilicus-trochanter angle in a sample of pregnant women

John Edwards, Allison Union, Joel Alcantara

Objective: Resources are lacking outside subjective assessment to quantify progression of the forward angle of protrusion for a pregnant woman's uterus in relationship to her pelvis. ImageJ, a freeware photo-analysis program provided by National Institutes of Health, measures angles and distances on photos. A trial of this program on sample images of mid-late stage pregnancies examined its sensitivity in measuring the change of an angle from the umbilicus to trochanter (UTA) with the horizon. **Methods:** Five chiropractic patients were selected from an IRB-authorized retrospective file review (May 2013-15). Each had lateral posture photos taken between 26-33 weeks and within 2 weeks of delivery. Markers placed on palpated landmarks identified the trochanter and umbilicus before photographing/importing files to ImageJ. A line parallel to a horizontal reference was drawn using the angle tool from anterior to the patient to the trochanter, then back anterior-superior to intercept the umbilicus marker. ImageJ calculated the UTA. **Results:** UTA decreased in all five participants with a pre/post range of 0.3-14.3 degrees and mean difference of 8.06 degrees. **Conclusion:** ImageJ appeared useful for measuring UTA in this sample. Future studies may consider investigating inter-rater reliability and clinical relevance of assessing UTA. (This is a conference presentation abstract and not a full work that has been published.)

Performance of eyes-closed unipedal stance static balance test by pregnant women under chiropractic care

John Edwards, Allison Union, Joel Alcantara, Cassandra Varner

Objective: Low technology measures for assessing static balance in pregnant women are clinically useful. Springer's timed eyes-closed unipedal stance test (EC-UPST) norms improved on Bohannon's, yet excluded pregnant women despite this group being the 2nd highest risk for falls. Five perinatal patients (28.71+3.63wks) attending a chiropractic clinic performed the EC-UPST before care and their results were compared to the age-appropriate/non-pregnant Springer best-time standard. **Methods:** Participants began UPST eyes-open on their bare foot of choice, and closed their eyes when they felt balanced. The unsupported foot was not allowed to touch the support leg, but subjects were allowed Bohannon's protocol of arm-movement for safety. Both feet were timed until the unsupported foot came down, the weight-bearing foot moved, or the recommended 20-second limit for high-risk populations elapsed. **Results:** EC-UPST was safely completed and 3 subjects were available for postpartum follow-up. Two patients reached the 20-second ceiling, while the remaining reached the 21st, 28th, and 53rd percentile of Springer's norm. One week postpartum these times were 31st, 26th, and 56th percentile, respectively. **Conclusion:** With slight modification, EC-UPST was useful for assessing static balance in this perinatal sample. Future investigations may revisit the suggested cut-off for the test. (This is a conference presentation abstract and not a full work that has been published.)

Survey attributes of chiropractic patients over 50 years of age

Kimary Farrar, John Ward

Objective: The purpose of this qualitative study was to develop a profile of attributes of older chiropractic patients. **Methods:** Researchers developed a 23-question 3-pg survey which was distributed to 350 chiropractic patients through 70 different chiropractors' offices. **Results:** The survey was filled out by 110 respondents. They reported the following attributes: 65.8 + 7.1 years of age, 1.63 + 0.29 m, 82.8 + 18.6 kg, 124 + 14.4 mmHg systolic blood pressure, 75.5 + 9.1 mmHg diastolic blood pressure, 194.8 + 33.3 mg/dl blood cholesterol, and 106.4 + 19.0 mg/dL blood sugar. Most respondents were female (69.1%), reported taking 3.9 medications per day, Caucasian (80.0%), non-smokers (94.5%), possessing a college degree (51.8%), not living alone (75.5%), and not possessing anxiety

(91.9%). Most respondents (58.2%) reported their chiropractor and medical doctor did not collaborate on their care. The most reported cause for care was low back pain (70%). Of participants taking pain medication, 58.2% reported taking it less often in response to chiropractic care. Conclusion: Most older chiropractic patients were female, Caucasian, non-smokers, college-educated, living with other family members, they did not possess anxiety, and they were taking approximately 4 medications. (This is a conference presentation abstract and not a full work that has been published.)

Management of an 11-year-old male with calcaneonavicular partial coalition in a chiropractic teaching clinic

Melissa Ferranti, Lindsay Fierman

Objective: To discuss the case of a young patient with right sided calcaneonavicular partial coalition that presented as sub-acute right foot pain. **Clinical Features:** 11- year-old male athlete presented with progressive insidious sub-acute right sided foot pain after walking at a theme park. Patient has altered ambulation and reports that his pain is a 10/10 with activity and 0/10 at rest. **Intervention and Outcome:** Upon examination, right foot range of motion was mildly to moderately decreased with associated pain. The patient ambulates on the lateral aspect of his right foot in inversion. X-ray was used to evaluate for stress fracture. Upon X-ray examination, the patient was diagnosed with calcaneonavicular partial coalition anomaly in his right foot. Cold laser and Kinesiology tape were utilized over the patient's right foot to help promote proper ambulation. Patient was referred for orthopedic evaluation and subsequently underwent corrective surgery. **Conclusion:** Chiropractic physicians are primary care providers and are in the position to identify pathology on routine radiographs. Referring patients for appropriate management when indicated is an important skill needed by chiropractors acting as primary care providers. (This is a conference presentation abstract and not a full work that has been published.)

Unilateral Internal Jugular Vein Discovered External to Carotid Sheath and Superficial to Omohyoid Muscle

Craig Fuller, Peter Amua-Quarshie, Bahram Sardarabadi, Susan Miller

Objective: To describe an anatomical variation of the internal jugular vein (IJV) and its direct implications on cannulation, use as a landmark and potentially chiropractic occipitocervical manipulations. **Clinical Features:** During routine dissection of an 88-year-old female cadaver with documented congestive heart failure in conjunction with cardiac arrhythmia, a unilateral anatomical variation of the left IJV was observed outside of the carotid fascia sheath and superficial to the omohyoid muscle, as well as the common facial vein joining the IJV abnormally and a shallow angle of the omohyoid muscle. **Intervention and Outcome:** This anomaly would not allow for cannulation as normally conducted, as well as palpation of the neck pulse. Additionally, occipitocervical manipulation may be contraindicated as the doctor's hand placement may occluded the IJV. **Conclusion:** This anatomical variation has a clinical impact on central venous access and could be a potential source of complications for occipitocervical manipulation. Training of landmarks and modifications of treatment procedures when landmarks appear abnormal is necessary to ensure patient safety. Further investigation into this concern is necessary. (This is a conference presentation abstract and not a full work that has been published.)

Basic Science Education in Chiropractic Colleges

Craig Fuller, Georgina Pearson, Afsar Sokhansanj, Michael Perryman, Paula Robinson

Objective: A core component of chiropractic education is a high quality basic science curriculum; however, with current research constraints and new advancements in classroom technology it is imperative that best practices are known for advisement on curricular modifications. This study conducts a scoping review to assess the current literature of best practices in basic science curriculum at chiropractic schools. **Data Sources and Selection:** PubMed and Education Resources Information Center (ERIC) were searched using relevant search terms for publications written in English, highlighting basic science practices in healthcare and chiropractic within the last 5 years. **Results:** This scoping search revealed no publications examining the basic science curriculum in chiropractic

education. Thus, we examined basic science curriculum in medical and dental schools and found an increased use of virtual tools and peer education. **Conclusion:** A paucity of information about basic science coursework for chiropractic education was identified. Since it is important to understand best practices to increase student engagement and to improve learning, a cross-sectional survey of current practices at chiropractic schools needs to be performed. This information will provide a clearer understanding of current types of instruction and practices to implement within a chiropractic school. (This is a conference presentation abstract and not a full work that has been published.)

Cervical postural syndrome: a case for classification

Courtney Goodchild, Nathan Hinkeldey

Objective: The role of postural loads in risk of developing cervical spine pain is weak. McKenzie classification of postural syndrome defines a subclass of pain patients who report pain in sustained posture; however, the pain is relieved by change in position. We report a case of postural classification in a veteran reporting with 2 years of neck pain. **Clinical Features:** The patient presented to a hospital based chiropractic clinic with 2 years of daily intermittent neck pain. Provocative factors included prolonged driving and flexion. Relieving factors included ibuprofen; however, he noted that it did not offer much benefit. **Intervention and Outcomes:** Treatment included initially asking the patient to hold his head to the headrest while driving and performing 15 repetitions of cervical spine retraction and extensions. Upon follow up visit, the patient reported abolishment of pain and no discomfort over the week between treatments. He was pain free at the onset of visit two and was released from care. **Conclusion:** Cervical postural syndrome according to McKenzie was present in this case. As a result of appropriate classification and treatment, the patient received complete pain relief, the ability to self manage, and little utilization of healthcare. (This is a conference presentation abstract and not a full work that has been published.)

SOT cranial therapy with an occlusal splint for the treatment of low back, leg and neuropathic pain: A chiropractic dental co-treatment case report

Rachel Hamel

Objective: A 25-year-old female patient presented with chronic back, leg, and neuropathic pain was co-treated with chiropractic and dental interventions. **Clinical Features:** The patient reported a five-year history of low-back pain, hip pain, pulsing pain into her left-leg, decreased coordination and loss of feeling to her left-foot despite L5-S1 micro-discectomy and use of medication. She also experienced dizziness, headaches once-a-week, and TMJ crepitus. **Intervention/Outcome:** Examination revealed left-foot paresthesia, left-SIJ instability with palpatory pain and swelling, decreased left L5/S1 deep tendon reflex, decreased L2/3 and L5/S1 myotome strength, palpatory pain along L1-5 spinous processes and left quadratus lumborum. Dentally she was she had underdeveloped dental arches with anterior premature contact, poor TMJ translation, and evidence of clenching/bruxism. Treatment consisted of ten sacro occipital technique (SOT) cranial dental appointments (over 6-weeks) incorporating SOT, neuro emotional technique (NET) and craniofacial adjustments and a lower occlusal dental splint. Following care the patient reported significant reduction in all symptoms, stopped medications, was able to return to hiking and horseback riding, sleeping better, improved posture and improved Oswestry score. **Conclusion:** Greater study is needed to identify the subset of low back patients with neuropathy that could benefit from this approach. (This is a conference presentation abstract and not a full work that has been published.)

C2 spondylolysis: a case for collaborative care

Nathan Hinkeldey, Russell Reichter, James Leonard, Michelle Snow

Objective: To present a novel case of congenital C2 spondylolysis and provide support for collaboration and obtaining previous imaging when available. **Clinical Features:** The patient presented to a Veteran Affairs Hospital based chiropractic clinic with neck pain, positive rust's sign, and previous history of cervical spine manipulation. **Intervention and outcome:** A cervical spine CT and MRI was completed along with cervical spine flexion/extension radiographs. Upon radiographic evidence of sinister pathology the patient was

referred for neurosurgical consultation. Conclusion: Coordination of care is an issue throughout the healthcare system. The latter illustrates a case where adverse event to care was not experienced; however, the potential was great. Had care been coordinated and records been made available, manipulation of this patient would have been completely avoided. (This is a conference presentation abstract and not a full work that has been published.)

Emergency department referral: a case for chiropractic integration

Nathan Hinkeldey, Britta Conlon

Objective: To report a case of acute low back pain triaged to chiropractic care from the emergency department immediate evaluation and treatment. Clinical Features: A female veteran reported to the chiropractic clinic as a walk-in referral with a warm hand off from the Emergency Department with acute low back and hip pain. PROMIS Pain Interference 6B score was 30. She arrived in a wheelchair and was unable to stand and walk. She presented with a right anterior lateral antalgia and 10/10 pain when attempting to walk forward. Walking backwards, allowed the patient to attain an upright position with only little pain. Intervention and Outcome: The patient left the initial visit ambulatory without wheelchair. Following 8 visits, she was pain free and fully functional. Her PROMIS Pain Interference 6B was noted to be an 8 which was a 22 point improvement. In addition, she will report to the chiropractic office in lieu of the emergency department in the future. Discussion: Examples of physical therapists triaging musculoskeletal complaints in emergency departments exist in the literature. Education, training, scope of practice, and patient preference would suggest that a chiropractor may fulfill a similar role. (This is a conference presentation abstract and not a full work that has been published.)

Perceived canine adjusting confidence of multidisciplinary professionals after experience in a simulation lab

Dana Hollandsworth, Gene Giggelman, Lori Baggett, Eric Russell

Objective: Integrating simulation labs into traditional chiropractic curricula resulted in increased student adjusting confidence. There is a paucity of research regarding forces used in canine adjusting. This study aimed to develop force targets representative of the canine population and measure change in perceived confidence adjusting a canine's sacrum after the introduction of a simulation lab experience. Methods: Target forces were obtained by measuring three experts conducting 10 impulses on a human mannequin modulated for a small and large canine sacrum. Veterinarians(n=17), chiropractors(n=14), and chiropractic students(n=5) enrolled in an animal chiropractic program were given didactic instructions for sacrum adjustment set-ups. Practice opportunities in the simulation lab were given 16 and 20 weeks after initial instruction. Week 20 this experience was evaluated with a survey asking participants to rate their confidence before and after the lab. Results: Target forces averaged 120-200N for small canine and 300-500N for large canine sacrum. Following the lab, there was an increase in student's adjusting confidence ($p<0.05$). Conclusion: Utilization of canine specific mannequins would improve the training for this special population. This study provides a developmental step towards improving the ability to assess competencies and develop confidence in the animal chiropractic program. (This is a conference presentation abstract and not a full work that has been published.)

Effects of aromatherapy on test anxiety in students: A literature review

Karmen Hopkins, Breanne Wells

Objective: High-stakes testing environments may lead to test anxiety in college students and may negatively impact performance. Learning strategies related to test taking, test administration and test preparation may reduce test anxiety. A decrease in test anxiety may also lead to other positive benefits such as improved test scores, increased confidence, critical thinking and student satisfaction. Aromatherapy is shown to decrease test anxiety. Data Sources and Selection: The literature was searched using PubMed, Google Scholar and Ebscohost. Indexing terms included aromatherapy for test anxiety in students in the English language only. Studies were selected if they examined aromatherapy for test anxiety at the college level.

Ten articles were initially selected. After reviewing, 4 articles were chosen. Results and Conclusion: Results were similar in the 4 studies. Aromatherapy is recommended to decrease test anxiety in students. Students' satisfaction was noted along with feelings of relaxation. The essential oils used in the studies included: lavender, rosemary and lemon. Faculty and administrators may want to incorporate this testing strategy to help reduce test anxiety which may lead to increased exam scores. Further evaluation of aromatherapy and its influence on test anxiety is needed. (This is a conference presentation abstract and not a full work that has been published.)

Research topics of interest to practicing chiropractors: a pilot study

Ronald Hosek, Stephanie Sullivan, Edward Owens, Angela Seckington

Objective: The purpose of this IRB-approved pilot project was to utilize an online survey instrument to sample the opinions of field doctors concerning their views on what are the key areas of chiropractic research to pursue. Methods: An online survey with built-in consent form was developed consisting of 3 open-ended questions about research topics, 4 demographic questions and 2 check-box questions about research behaviors. The survey was made available to continuing education conference attendees as well as members of a university practice-based network. Results: While only a limited number of surveys were completed and responses to open-ended questions varied widely, a clear trend emerged suggesting that pursuing the effects of chiropractic on conditions other than pain or musculo-skeletal problems was most important. In particular, chronic and lifestyle-related diseases, wellness and performance were often cited. Most respondents reported using online searches or colleagues as their primary sources to solve clinical problems. Conclusion: These results, although limited, suggest that field doctors would like research studies designed to support what they anecdotally observe in their practices, i.e., chiropractic's positive effects on a wide range of non-musculo-skeletal related conditions. (This is a conference presentation abstract and not a full work that has been published.)

Traumatic lower cervical spondylolisthesis presenting comorbid with chronic rheumatoid arthritis in VA chiropractic clinic: a case report

Steven Huybrecht, Kyle Reynolds, Pamela Wakefield

Objective: Expand clinical knowledge and treatment for the comorbid presentation of rheumatologic conditions with spinal trauma. Clinical Features: A case of traumatic lower cervical spondylolisthesis in a patient with a 28-year history of rheumatoid arthritis presenting as musculoskeletal neck pain is reported. Cervical radiographs pre-trauma revealed atlantoaxial instability while post-trauma revealed an increase in atlantoaxial instability and an unstable C4 vertebrae. Post-accident C4-T1 laminectomy was performed. Intervention and Outcome: Patient declined surgical intervention and no spinal manipulation was performed in the cervical spine. Patient continues to have cervical pain, though does not report radicular symptoms or present with neurologic deficits. Conclusion: Though atlantoaxial instability is common in patients with rheumatoid arthritis, surgical interventions such as spinal fusion, even in patients who experience severe trauma to the cervical spine, are not always necessary. A brief review of traumatic spondylolisthesis and rheumatoid arthritis, including clinical presentation, prevalence, diagnostic testing, treatment options and outcomes is discussed. (This is a conference presentation abstract and not a full work that has been published.)

Trends in the utilization of force sensing technology outside of the curriculum in open practice hours

Rebecca Kang, Tim Lau, Jae Hyun Cho, Omolola Ayoola-amale, Hera Khayyam, David Starmer

Objective: Provide a descriptive analysis and identify trends of utilization rates during the 2012-15 academic years of voluntarily attended lab hours where students can practice manipulations and receive force feedback while practicing on surrogate patients and manipulation training mannequins. Methods: Volunteer attendance from the graduating classes of 2013 -18 were digitized and recorded manually from the lab's log books during the 2012-15 academic years. Data was broken into percentages of utilization by class year, peak periods of utilization, and changes in rates of utilization. Results:

There were a total of 11,271 voluntary visits during the 2012-15 academic years. The individual breakdown for each graduating class was 119; 218; 1,197; 3,463; 2,987; and 3,287 for the classes of 2013 to 2018, respectively. Trends included each graduating class having the highest utilization in the first year of their curriculum. Utilization was also highest in the week prior to technique testing, and the lowest during written examinations periods. Conclusion: This data can serve to optimize resource allocation to meet the needs of students. Future research could be conducted to monitor longer term trends, and identify factors that affect utilization rates and how that relates to student performance. (This is a conference presentation abstract and not a full work that has been published.)

What the supercentenarians can teach us about aging well: a literature review with clinical pearls

Lisa Killinger

The oldest people in the world are some of the most fascinating to study. They seem to have found the long sought after “fountain of youth.” Several characteristics and behaviors are common to those individuals around the world who live to be a supercentenarian, or over 110 years old. Additionally, the centenarians, a much larger group, (currently over 100,000 in the US alone) carry with them an even broader palate of lessons for scientists and health professionals to explore. This literature review focuses on the clinical pearls from studies of the “oldest-old” that chiropractors can use to promote healthy aging in our own practices and in our education of future chiropractors. A summary of a few of these clinical pearls includes: Having an active lifestyle (walking and doing physical activities regularly); Eating mostly a plant-based diet and herbs high in antioxidants; Practicing moderation in red meat consumption and consuming fish regularly; Having meaningful and fulfilling family relationships; Having a spouse (for men) or living alone (for women); Moderation in alcohol; Eating regular meals with a lower overall calorie intake; Getting adequate sleep; Having a positive attitude. (This is a conference presentation abstract and not a full work that has been published.)

Developing and testing rubric inter-rater reliability for assessing meta-competency 1 & 2 performance

Kathy Kinney, Rhina Patania, Linda Savage, Krista Ward

Objective: Our objective was to develop and test an analytic rubric to assess student performance in a new case-based program “Clinical Case of the Week” (ClinCOW). Methods: 17 dimensions were chosen on the rubric to assess performance as students apply critical thinking skills to four stages of case presentation (Chief Complaint, History/ROS, Physical Exam Findings, and Radiology and Laboratory Findings). A four level scale was applied to each dimension (Inadequate, Novice, Competent and Proficient). 57 rubric pairs were assessed for exact and adjacent agreement as well as for consensus agreement after scales were collapsed to two levels (Pass/Fail). Results: After grading n=16 pilot assessments, our percent agreement was 46% for exact agreement, 80% for adjacent agreement and 63% for consensus pass/fail agreement. We added clarity to our rubric and keys and increased agreement for n=14 assessments to 60% exact, 93% adjacent, and 81% consensus pass/fail. Conclusion: Students are required to submit three Competent/Proficient summative assessments for graduation and a reliable rubric is needed to make high stake decisions. Our results are consistent with other rubric inter-rater reliability studies and given the multiple dimensions and stages of our rubric, 81% consensus pass/fail agreement is considered reliable. (This is a conference presentation abstract and not a full work that has been published.)

Health behaviors and beliefs of patients seeking acupuncture and chiropractic care

Anupama Kizhakkeveetil, Kevin Rose

Objective: The purpose of this study was to describe the health behaviors and beliefs of patients seeking acupuncture and chiropractic care, and to determine if their overall health and beliefs had changed since beginning treatment. Methods: A survey was administered to patients with at least four visits to a CAM University Health Center. The survey included demographics, presenting complaints, treatment modalities received, satisfaction with care, improvement in their

health, and healthcare related beliefs and behaviors. IRB approval was obtained. Results:

109 acupuncture and 134 chiropractic patients completed surveys. Patients sought care for a wide variety of conditions, including wellness care. Positive health behaviors were reported by both chiropractic and acupuncture patients. Most participants believed that balance in life is important for health (92%) and that behaviors played a major role in maintaining their health (95%). Most reported that their health (84%) and health behaviors (76%) had improved since beginning acupuncture or chiropractic treatment. Conclusion: Acupuncture and chiropractic patients were strong proponents of healthy behaviors and beliefs and perceived that treatments they received improved their health. These practitioners can play a major role in improving the health and health related beliefs of the public. (This is a conference presentation abstract and not a full work that has been published.)

Full thickness biceps tendon tear in a 46-year-old male emphasizing the value of musculoskeletal ultrasound

Ashley Lewandowski, Stacey Cornelson, Norman Kettner

Objective: This case demonstrates the utility of diagnostic ultrasound (US) in the evaluation of a 46-year-old male with chronic shoulder pain. Clinical Features: A 46-year old male presented with chronic left shoulder pain recalcitrant to 3 weeks of soft tissue mobilization, including active release technique (ART) and post-isometric relaxation (PIR). After an acute flare from lifting groceries, examination yielded visible bulging of the left biceps muscle contour with absence of C5 deep tendon reflex. The patient underwent US of the left shoulder which demonstrated a full thickness mid-substance tear of the biceps long head tendon with 3.5 mm of distal retraction. Intervention And Outcomes: The patient was referred for orthopedic surgical consultation. Surgery is pending. Conclusion: This patient presented with chronic shoulder pain accompanied by an acute exacerbation of pain. Physical examination and US identified a full thickness tear of the long head biceps tendon. Long head biceps tendon ruptures may occur in the setting of acute trauma or chronic rotator cuff disease. This case report emphasizes the role of musculoskeletal US in the evaluation of internal derangement in a chronic shoulder with acute exacerbation of pain. (This is a conference presentation abstract and not a full work that has been published.)

Effect of chiropractic care on opioid dependence among patients with back and neck pain

Melissa Lo, Wade Bannister, Laura Ten Eyck

Objective: Examine the relationship between chiropractic intervention and opioid dependence among patients with non-surgical back and neck pain. Methods: Episodes of care for non-surgical back and neck pain among adult patients were extracted using claims data from a commercial insurer. We identified patients receiving care from a chiropractor and compared outcomes between patients who did and did not receive chiropractic care. Outcomes of interest included evidence of opioids during the episode and subsequent development of opioid dependence within six months following the episode. Opioid dependence was identified in three ways: a diagnosis for Opiate Use Disorder, a single filled dose greater than 100 morphine equivalent dosage (MED), or a series of filled doses totaling more than 9,000 MED over any 90 day period. We controlled for differences in patient characteristics and risk between the groups and used logistic models to measure the likelihood of receiving opioids or developing opioid dependence. Results: Our analysis indicated that patients who received chiropractic care had a significantly lower likelihood of receiving opioids as well as a significantly lower likelihood of developing opioid dependence. Conclusion: Chiropractic care may be associated with reduced likelihood of developing opioid dependence in this population. (This is a conference presentation abstract and not a full work that has been published.)

Making National Library of Medicine Classification local: An expansion for chiropractic specific library collections

Katie Lockwood

Objective: The purpose of this project was to provide better access to our focused chiropractic subject collection by creating an

expansion for National Library of Medicine (NLM) call number classification for specific chiropractic therapeutic techniques. Methods: Using the existing Chiropractic Subject Headings (ChiroSH) developed by the Chiropractic Library Collaboration (CLC), 147 different chiropractic therapeutic techniques were identified. Cutter-Sanborn numbers were assigned to each technique under the current NLM call number for chiropractic therapeutics, WB 905.9. Materials for each technique were identified with subject and keyword searches in the library catalog. Results: Library staff reclassified, relabeled, and reshelfed over 500 items in the library collection using the expanded classification system. Materials on specific chiropractic techniques are now shelved together in our collection, increasing discoverability for our patrons in the online catalog and the stacks for this core library collection. Conclusion: Chiropractic libraries face unique challenges to providing access to their materials. National Library of Medicine Classification offers more granularity for medical collections than Library of Congress Classification, but lacks specificity for materials on complementary and alternative care. Expanding NLM for focused library subject collections allows easier access and more visibility to these important materials. (This is a conference presentation abstract and not a full work that has been published.)

Developing a formal tutoring program at a chiropractic institution

Ashley Long

Objective: To revamp a peer tutoring program to improve student success. Methods: Seven steps were taken: (1) Observation of existing staffing, training, evaluation, present identity; (2) mission and vision statement revision; (3) learning center creation; (4) improvement of training procedures; (5) student leadership development; (6) staff professional development; (7) formal assessment created. Results: These steps resulted in strategic plan formation, streamlined mission and vision with authentic goals, training procedures for targeted improvements, and the new connections and resources has promoted continuous improvement. The creation of the learning center helped increased utilization by 7.41 percentage points. Tutors, identified and trained through strategic student leadership efforts, have increased overall tutoring utilization to 28% of chiropractic students - 83% of students in Anatomy I and 48% of students in Neuroscience. Baseline data has been gathered to quantify impact and continuously monitor improvement opportunities. Conclusion: The resulting formal tutoring program better met the University's needs and exceeds the expectations of chiropractic students. Continued efforts involve collecting and analyzing impact data for further improvements, particularly for Advanced Alternative Track Program (AATP) students. Exploration of implications for students on academic probation or readmission following academic dismissal will be explored. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic role in management of an infant with VACTERL Association: A case report

David Mann

Objective/Clinical Features: This is a single case study involving an infant male being co-managed with chiropractic care for genetic anomalies resulting from VACTERL association. (Vertebral Defects, Anal Atresia, Tracheoesophageal Fistula with Esophageal Atresia, Cardiac Defects, Renal and Limb Anomalies) Medically, he is being co-managed by an orthopedist, cardiologist, nephrologist, and pediatrician. Logan Basic Technique was utilized to treat the patient's scoliosis and monitor development. Interventions/Outcomes: The patient received 10 treatments of Logan Basic Technique for spinal motion restrictions in the first three months of care and as needed since. Throughout treatment the patient's other providers all concur that he is developing nicely. His parents report he is a functioning well and it appears his spine has straightened some with growth. Conclusion: Positive outcomes such as this render incentive for further studies to determine the consistency of chiropractic in to the regular co-management of infant patients with VACTERL Association. Although crucial to establish the role the chiropractor will have treating which anomalies, this may provide a viable option assuring

the highest potential for exquisite growth of the child. (This is a conference presentation abstract and not a full work that has been published.)

Resolution of EMG confirmed lumbosacral radiculopathy with chiropractic care

Barbara Mansholt

Introduction: The purpose of this abstract is to describe an efficient clinical response of a patient diagnosed with S1 radiculopathy to chiropractic treatment. Clinical Features: A 58-year-old female reported chronic (>1 year) leg paresthesia, which was confirmed by an electrodiagnostic motor and sensory nerve conduction study. She had comorbidities of hypertension, dysthymia, hyperlipidemia, mild obesity, single major depressive episode, and nondependent alcohol and cannabis abuse and no recent history of chiropractic care. Diagnosis, Interventions, and outcomes: Treatment consisted primarily of flexion/distraction in the lumbosacral region with table assisted drop manipulation in the sacroiliac region. The patient complied with progressive end range home exercises to improve range of motion and reduce peripheral paresthesia and objective findings. Conclusion: This patient had improved subjective response to paresthesia as well as improved range of motion and resolved clinical neurological findings within a short trial period of care. Further research is needed regarding patients with similar presentations. (This is a conference presentation abstract and not a full work that has been published.)

Re-evaluation of intra- and inter-examiner reliability of leg length analysis procedure in prone position among experienced practitioners

Farshid Marzban, Marty Hall, Steven Kleinfeld, Charlotte Watts, Ronald Wells, Afasr Sokhansank, Harrison Ndetan

Objective: This study examines the intra and inter-reliability of leg length analysis (LLA) while subjects remained prone on the table during the experiment. Methods: All volunteers signed a consent for to participate in this study. Two skilled ActivatorTM chiropractic clinicians performed LLA at 3 different times on 10 chiropractic student volunteers each in a random order. Subjects were remained prone on the table during an entire 20 minutes of the experiment. Leg Length Inequality (LLI) greater than a 0.25 inch were reported. Clinicians were blinded to each other's findings and volunteer's identity. κ statistics and percent agreement between and within examiners were used to assess inter- and intra-examiner reliabilities. Results: κ analysis revealed a fair-moderate (0.31-0.43) agreement of inter-examiner reliability between the examiners.

A moderate-perfect (0.58-1) agreement of intra-examiner reliability for Examiner #1 and substantial-perfect agreement for Examiner #2. It appears there is a greater agreement in intra-examiner reliability compared with inter-examiner reliability. Conclusions: Observational prone LLA may be a reliable technique for clinicians to implement; however, further studies are warranted to investigate outcome differences. (This is a conference presentation abstract and not a full work that has been published.)

A case report highlighting pitfalls of clinical examination and imaging in the diagnosis of intramuscular myxoma

Ross Mattox, Patirek Battaglia, Norman Kettner

Objective: Describe the pitfalls of clinical examination and advanced imaging in diagnosing soft tissue tumors. Clinical features: A 44-year-old female presented for evaluation of left posterior thigh pain, with intermittent numbness in the left sciatic nerve distribution; previously diagnosed as remote proximal hamstring strain. Intervention and outcomes: Clinical examination revealed a soft tissue mass distal to the left ischial tuberosity, thought to be a lipoma. Radiography was unremarkable. Sonographic examination revealed a posterior thigh mass with a broad differential diagnosis that included both benign and malignant entities. Magnetic resonance imaging (MRI) was obtained 9 days later, providing a likely differential diagnosis of malignant peripheral nerve sheath tumor versus soft tissue sarcoma. Surgical excision was performed 6 weeks later and pathology confirmed the diagnosis of intramuscular myxoma, a benign entity which wasn't entertained in the differential diagnosis at clinical examination, ultrasonography, or MRI. The

patient has since fully recovered. Conclusion: This case highlights potential pitfalls of clinical examination and advanced imaging in diagnosing soft tissue tumors. Unless highly specific features exist, oftentimes histopathologic confirmation of soft tissue tumors is needed. Ultrasonography and MRI are excellent at identifying soft tissue tumors, but usually lack diagnostic specificity. (This is a conference presentation abstract and not a full work that has been published.)

Resolution of medial femoral cutaneous nerve entrapment using manual therapy and end range loading: a case report

Trevor McArthur, Nathan Hinkeldey, H. Michael Olson, Laurie Hinrichs

Objective: Medial femoral cutaneous nerve entrapment and manual treatment has not been previously described within the literature. We present a novel case of potential medial femoral cutaneous nerve entrapment in combination with lumbar spine discogenic pain using end range loading in extension and instrument assisted soft tissue manipulation as treatment. **Clinical Presentation:** A 64-year-old male presented to a hospital-based chiropractic clinic for evaluation and management of LBP and pain extending into the right medial thigh that had been ongoing for one month. His initial PROMIS Pain Interference 6B score was a 21. **Intervention and Outcome:** Chiropractic management in the form of McKenzie methodology, and IASTM was utilized to effectively resolve medial femoral cutaneous nerve entrapment and lumbar discogenic pain. Following treatment, 6 visits over 44 days, his PROMIS Pain Interference 6B score was noted to be 11. **Conclusion:** Our case identifies a patient presentation indicative of discogenic pain combined with novel peripheral nerve entrapment. While little is present in the literature related to this topic, having an understanding of peripheral nerve distribution and potential treatment options can assist in future identification and treatment. (This is a conference presentation abstract and not a full work that has been published.)

Dizziness in a patient with airway compromise and TMD: A case report

Jeffrey Mersky, Charles Blum

Objective: A 38-year-old patient presented November-2016 for care with an array of symptoms (autoimmune disorders, dizziness, obstructive sleep apnea – OSA, etc.). **Clinical Features:** The onset of his condition began eight-years-prior following a surfing accident (fell on left-shoulder) and removal of wisdom teeth. After these events, he began experiencing syncope, brain fog, dizziness, and movement/vertigo, all worsened when sitting on soft seats or when hunching over or with his head tilted up or down. He described his condition as debilitating, relentless, and life-altering preventing him from being able to work. Prior to being seen at this office he was seen by 28-other-physicians and was primarily diagnosed with OSA, vestibular dysfunction, vascular headaches/migraines, and cervico/thoracic enthesopathy. **Interventions/Outcome:** Treatment focused on SOT/SOT-cranial chiropractic interventions, nasal-balloon methods for craniofacial sinus expansion, and supplementation with B12/methylated folic acid (to facilitate red blood cell oxygen uptake). The patient was treated November-2016 through March-2017. By early 2017 his eight-year bout with dizziness was reduced and he could function in most activities of daily living. **Conclusion:** It was difficult to directly assess what aspects of his presentation were genetic, macrotrauma-induced, or the result from microtraumas, though the care rendered appeared effective regardless. (This is a conference presentation abstract and not a full work that has been published.)

Exploring chiropractic services in the Canadian Forces Health Services—opportunities and challenges

Silvano Mior, Ellen Vogel, Simon French, Margareta Nordin, Patrick Loisel, Audrey Laporte, Debbie Sutton

Objective: Canadian Armed Forces (CAF) includes chiropractic services within their spectrum of health services. Despite this inclusion, there is minimal interprofessional collaboration, leading to fragmented and lower quality care. We explored how chiropractic services could be provided to improve interprofessional collabora-

tion within an interdisciplinary CAF setting. **Methods:** We conducted an exploratory qualitative study to identify existing barriers and enablers for the inclusion within the existing CAF health care delivery model. Military personnel and chiropractors across Canada were recruited using purposive and snowball sampling. We collected data using a theoretically developed semi-structured interview guide and analyzed using constant comparative analysis. **Results:** We interviewed 25 [MDs (n=7); PTs (14); DCs (5)] participants. Divergent perspectives and experiences captured the categories of base-to-base variations, variable gatekeeper roles, and referral processes. The role of chiropractors, scope of practice, and variable application of evidence emerged as conflicting views. Duplication of services, role of patient, communication, and unique CAF culture emerged as prominent categories that could potentially affect delivery of collaborative interprofessional care. **Conclusion:** Key informants highlighted the barriers and enablers in advancing collaborative chiropractic services in the CFHS. These findings are important in modeling interprofessional collaborative care. (This is a conference presentation abstract and not a full work that has been published.)

Learning spinal manipulation: gender and experience differences in biomechanical parameters, precision and variability

Megane Pasquier, Florian Barbier Cazorla, Yannick Audo, Martin Descarreaux, Arnaud Lardon

Objectives: Considering the growing number of women attending chiropractic schools, the purpose of this study was to investigate gender differences in biomechanical parameters, precision and variability of students learning spinal manipulation. **Methods:** A total of 137 students (fourth and fifth year) were recruited for the study. Biomechanical parameters (preload, time to peak, peak force, rate of force) as well as precision and variability of thoracic spine manipulation performance were evaluated during five consecutive trials using a force-sensing table and a target force of 450N. Gender but also experience differences were assessed using two-way ANOVAs. **Results:** Analyses showed significant gender differences for several biomechanical parameters as well as significant gender differences in precision and variability. Although women showed lower time to peak, peak force and rate of force values, they were more precise and less variable than men when performing thoracic spine manipulations. Students with clinical experience (fifth-year students) used less force and were more precise. **Conclusion:** Our data indicate that when instructed a given force target women tend to reduce spinal manipulation time to peak (speed) to increase precision and reduce variability. Precision and variability seem to improve with clinical experience. (This is a conference presentation abstract and not a full work that has been published.)

How well does chiropractic education prepare for practice – a comparison of perceived preparedness of European chiropractic graduates: a cross-sectional study

Pablo Perez de la Ossa, Ellen Pulkkinen

Background: Current evidence shows that education and professional practice do not meet. This study is aimed to explore chiropractic graduates' perceived preparedness for practice using CanMEDS framework. **Methods:** An anonymous 5-point Likert scale electronic questionnaire was distributed to graduates from the 2014-2016 cohorts of nine European Council of Chiropractic Education (ECCE) accredited colleges. For every group of four items under one competency role, the overall score was calculated as the mean score. **Results:** In all colleges, the lowest scores were found in collaborator (3.76) and scholar (3.78) competencies. The highest scores were found in professional (4.39) and chiropractic expert (4.13) competencies. **Conclusion:** There is a gap between education and professional practice in perceived preparedness. Graduates from chiropractic colleges perceived themselves to be unprepared in some competencies and differences were found among colleges. The preliminary results of this study could be used in improving curricula of chiropractic education. (This is a conference presentation abstract and not a full work that has been published.)

Use of a class 4 laser in recalcitrant elbow tendinopathy: a case study and brief review of the literature

Mark Pfefer, Brian Asbury, Rachel Gilmore, Jackson Berg, Dani Steffen, Nathan Hoover

Introduction: Photobiomodulation therapy describes application of laser beams to stimulate, heal, regenerate or protect tissues. Its use as a clinical therapy may increase limb blood flow, modulate protein production, and stimulate tendon healing. The aim of this project is to briefly review the literature and present a case study on clinical use of a Class 4 laser in a patient with recalcitrant elbow tendinopathy. **Methods :** We briefly reviewed literature describing Class 4 lasers, especially differentiating between class 4 and lower level lasers. In this IRB approved case report, a class 4 therapeutic laser was applied with a dual wavelengths (808nm pulsed and 905nm continuous) simultaneously to the elbow.

Results: The author describes a case of lateral epicondylopathy of 6 months duration, which was resistant to multiple prior interventions. The patient reported 50% reduction in symptoms after three visits and resolution of pain and disability after five visits. The patient continued to report no return of symptoms after 90 days. **Conclusion:** These findings suggest that laser therapy using a 10 W class 4 instrument may be effective for relief of symptoms associated with chronic epicondylopathy. Further investigation is warranted. (This is a conference presentation abstract and not a full work that has been published.)

Implementation of a multisource feedback system in a college of chiropractic

Daniel Ranz, Rodney Pendarvis, Pablo Perez de la Ossa, Pablo, Elina Pulkkinen, Adrian Wenban

Objective: Multisource Feedback (MSF) is an extended tool for professional development enhancing. The Barcelona College of Chiropractic evaluates whether chiropractic clinic interns find MSF useful in developing their professionalism, as well as their reflective practice skills. **Methods:** A paper-based questionnaire with a list of health practitioner competencies was developed. Assessors were asked to rate the clinic interns in relation to each competency using a Likert scale. Ten assessments were collected for each clinic intern, who were then asked to complete an evaluation of the tool. **Results:** More than 50% of students reported they would recommend using this tool to a colleague, see value in repeating this feedback and think the feedback received was important. Similar percentages agreed and disagreed (35% and 35%) with the thought that their professionalism had improved as a result of receiving MSF. **Conclusion:** The results confirmed the MSF as a useful tool to develop clinic interns' reflective practice. It was not perceived as having an effect in their professionalism. Students appreciated receiving feedback via the MSF system, and produced positive results, not in their clinical skills, but in their reflective practice. (This is a conference presentation abstract and not a full work that has been published.)

The double notch sign: Osteochondral fracture strongly indicating severe internal joint derangement: A case report

Matthew Richardson, Lauren Sullivan

Objective: To demonstrate the "double notch sign" on diagnostic imaging examinations of the knee of a 33-year-old male, and discuss significance of the sign for osteochondral fracture, including its association with anterior cruciate ligament (ACL) and lateral meniscus injury. Attention is given to radiographs and advanced imaging correlation for diagnosis and referral.

Clinical Features: The patient presented to a chiropractic clinic with knee pain, and positive Ottawa knee rule findings for fracture, following basketball injury sustained the previous day. Radiographs demonstrated osteochondral fracture of the lateral femoral condyle, presenting as a double notch sign at the condylopatellar sulcus, raising strong concern for injury to the ACL and lateral meniscus. MRI confirmed osteochondral fracture, complete tear of the ACL, and contusion of the tibia. Disruption of the lateral meniscus was suspected; however, image resolution limited assessment. **Intervention and Outcome:** Orthopedic referral. **Conclusion:** Physicians and radiologists should know the significance of the double notch sign for osteochondral fracture and its reported 100% specificity for ACL rupture. Identifying this sign on radiographs should expedite referral

for advanced imaging and orthopedic consultation. (This is a conference presentation abstract and not a full work that has been published.)

Concussion risk reduction among high school football players wearing protective external helmet technology: an observational study

Robert Rowell, Steve Novicky

Objective: Concussion is a serious concern in contact sports. This observational study compared the number of concussions among high school football players wearing vs not wearing an external helmet device (Shockstrip®). **Methods:** The intervention group wore helmets with Shockstrips, while the comparison group did not. **Results and Conclusion:** Nineteen concussions were diagnosed during 34 games, in the comparison group. In the intervention group, a total of 4 concussions were diagnosed during 39 games. The RRR was 83%, the ARR was 14.1%, and NNT was 7.1 for students wearing Shockstrips. The incidence of concussions was lower in high school football players who wore the external helmet device compared to another group of football players who wore only a traditional football helmet. Concussion rates dropped from an average of 16.9% per year to an average of 2.9%. The external helmet device should reduce and deflect the forces upon impact, which would decrease the force on the skull and the brain. This was an observational study, and as such there no variables were controlled, however, this study provides preliminary evidence that an external helmet device can substantially reduce the risk of concussions. More studies are warranted. (This is a conference presentation abstract and not a full work that has been published.)

Analysis of kinematic variability in pianists: a pilot study

Anne-Marie Schmidt, Brent Russell, Ronald Hosek

Objective: Keyboard performance imposes significant physical demands on the artist which may result in playing-related musculoskeletal disorders (PRMDs). The aim of this IRB-approved pilot study was to develop methods for analyzing movement patterns of pianists sensitive enough to document possible changes following chiropractic adjustments. **Methods:** We used a MyoMotion system to record spinal and upper-extremity movements of an experienced pianist playing a 'Grand Scale' 12 times during four baseline sessions. Another session followed seven chiropractic visits. Means and standard deviations for each time point were used to calculate Mean Coefficients of Variation as measures of pattern variability (inconsistency). **Results:** We overcame early challenges with electromagnetic interference and music choices. The equipment caused only minimal interference with playing. Data collection was consistently successful and the analysis method appeared to work as intended. Some spinal regions with higher levels of variability showed decreases following chiropractic care; and some areas of chronic complaint showed increases, possibly suggesting increased freedom of movement. **Conclusion:** Our procedure appears to demonstrate intra- and intersession consistency; we feel we have an objective tool for assessment of kinematic variability. Future work will extend to additional pianists with PMRDs and further study of variability theory. (This is a conference presentation abstract and not a full work that has been published.)

Sensory integration therapy utilizing the SAVE Program: A case report of a post-concussive adult

Angela Seckington, Stephanie Sullivan, Emily Drake

Objective: Documentation of changes in balance, visual, auditory and computerized cognitive testing of a post concussive male receiving sensory integration care using the SAVE table. **Clinical Features:** A 69-year-old male presented subsequent to a fall in 2015, suffering fractured skull, memory loss, and concussion. Using a standardized symptom list, self-reported symptoms included dizziness, sleep disturbances, slow reaction time and impaired attention. Clinically evaluated deficits included diminished vision, unstable balance, and cognitive impairment.

Intervention and Outcome: The SAVE Program is an accelerated sensory integration protocol that stimulates touch, sound, sight and proprioception along with the vestibular system. Treatment consisted of two, one-hour sessions per day for five consecutive days. Improvement was noted in self-reported symptoms (32%), in peripheral vision (from 15° to 30°), and balance (from 42° to 6°

instability). Percent improvement was also noted in cognitive function (accuracy, latency) in attention (18.75%, 33.42%) and planning (16.66%, 40.71%), and in accuracy of episodic memory (71.43%) and working memory (7.94%). Participant exhibited shift to right ear dominance. Conclusion: The SAVE program may benefit patients who have suffered a concussion with continuing sensory, balance, and cognitive deficits. Additional research is needed. (This is a conference presentation abstract and not a full work that has been published.)

Exploring the relationship of GPA and performance on a digital test of radiology interpretation skills (DIM) in chiropractic colleges. Margaret Seron, Paul Townsend, John Hyland, Igor Himel-farb, Michele Fisher

Objective: To determine what proportion of the score on a DIM test is predicted by a chiropractic student's GPA. Methodology: Regressions were conducted to predict test scores from GPA. The following sample sizes: $n = 68$, $n = 90$, and $n = 56$ were collected. IRB approval was obtained. Results: College 1. The model revealed statistical significance, $F = 15.46$, $p < .01$ explaining 15% of the total variability in the exam scores being a function of GPA. The GPA was a significant predictor of exam scores, $t = 3.93$, $p < .01$. College 2. The model revealed statistical significance, $F = 16.55$, $p < .01$ accounting for 20% of the variance in the exam scores being a function of GPA. Similar to College 1, the GPA was a significant predictor of exam scores, $t = 4.07$, $p < .01$. College 3. The model explained 8% of the variability in the exam scores, $F = 4.43$, $p < .05$. The GPA unveiled significant prediction of exam scores, $t = 2.11$, $p < .05$. Conclusion: Chiropractic students with good grades during their training are likely to perform better on a digital test of radiology interpretation skills. (This is a conference presentation abstract and not a full work that has been published.)

The benefits of acupuncture to the management of capsulitis (TMD): a case study

Peter Shipka, Brian Gushaty, Kostadinos Kakarelis, Peter Semeniuk

Objective: The purpose of this study is to discuss the management and outcome of TMD capsulitis utilizing an integrated approach which includes acupuncture and chiropractic care. Introduction: Temporal mandibular capsulitis (TMD) is the acute dysfunction of the jaw joint resulting in limited opening and pain. Clinical Features: A 49 year old female was referred for severely limited jaw opening (33 mm) and headaches which had been present for four weeks and unresponsive to dental and allopathic interventions. Intervention and Outcome: An initial session of acupuncture (both local and distal hand microsystem points) provided significant improvement. Her mouth opening increased to 51 mm post visit, her headache resolved and the gait shift corrected. Second visit a week later revealed similar and consistent findings. Follow-up with her dentist was recommended for a dental appliance. A comparative analysis of the anatomical structures and the super imposed acupuncture points revealed that the points directly influenced branches of the trigeminal nerve and resulted in the improved outcome. Conclusion: Healthcare providers who see experiencing capsulitis (TMD) should consider an integrated and holistic approach to TMD management. (This is a conference presentation abstract and not a full work that has been published.)

Utilization of acupuncture for the management of neuropathy related to Freiberg's Disease: a case study

Peter Shipka, Brian Gushaty, Aaron Teitelbaum, Peter Semeniuk

Objective: Freiberg's Disease is the avascular necrosis of the second metatarsal head. Clinical Features: Our case study involves a 62-year-old who presented with late onset neuropathy related Freiberg's disease of the left second metatarsal head. Her condition had made it impossible to continue to do most physical activities and had even tried surgery to help to no avail. Intervention and Outcome: A trial of acupuncture utilizing: Bafeng (M-LE-8), Taichong (Liv 3), Xuehai (Sp 10), Zusanli (St 36) and Waiqiu (GB 34) was attempted. Patient reported immediate relief at the insertion of Bafeng and had a resolution from the neuropathy after a series of six visits. It is our hypothesis that Bafeng resulted in a relaxation of the lumbrical musculature, enhanced the micro-circulation to the foot and helped restored the normal biomechanical function. Conclusion: a treatment of regime that includes acupuncture (Bafeng) may be beneficial

approach for neuropathy and palliative management of Freiberg's disease patients (post necrosis stage). (This is a conference presentation abstract and not a full work that has been published.)

Vaginal birth after Caesarean (VBAC) with twin pregnancies under chiropractic care with Network Spinal Analysis

Melody Spear, Joel Alcantara

Objective: To describes the chiropractic care of a pregnant woman with via vaginal birth after Caesarean (VBAC) following chiropractic care. Clinical Features: A 34-year-old woman at 16-weeks gestation with twin girls presented with a chief complaint of acute left sacroiliac, left posterior hip and left buttock pain of unknown origin and 3 weeks duration. Her pain complaints had worsened since onset with pain NRS rated at 6/10. Rest was palliative while random weight bearing activities and climbing stairs were provocative. In addition, the patient had a desire to have a natural childbirth since giving a Caesarean birth 2 years prior. Intervention and Outcome: The patient was cared for with Network Spinal Analysis set at 2 times a week for 8 weeks and then re-evaluated for new course of care. The patient attended 18 visits over 19 weeks. The patient's presenting complaints abated and at almost 36-weeks gestation, she successfully delivered VBAC. Conclusion: This case report provides supporting evidence on the benefits of chiropractic care for the pregnant woman with the desire for VBAC. We encourage further research in this field to facilitate a natural childbirth. (This is a conference presentation abstract and not a full work that has been published.)

Evidence-based practice attitudes and utilization survey (EBASE) of chiropractic students

Sarah Stephens, Joel Alcantara

Objective: To examine the attitudes and utilization of evidence-based practice (EBP) by students

Methods: The EBASE survey was modified to examine student perception, skills, and level of training, their engagement in, the barriers and facilitators to, and possible interventions to EBP.

Results: A convenience sample of 160 students completed the survey. Of responses provided, the majority were 26-35 years old, female, and in year one of three of study. A high proportion agreed/strongly agreed that EBP was necessary in the practice of chiropractic. Most respondents considered themselves to have above-average skills in identifying clinical questions, online searching and applying research evidence to practice but not in conducting clinical research. Greater proportions indicated inadequate training in EBP while similar proportions indicated being confident versus not confident in conducting clinical trials, systematic reviews and meta-analyses. Almost half indicated lack of time, resources and clinical evidence as barriers to EBP while most indicated skills in locating, interpreting/ appraising and applying research evidence.

Conclusions: The responders of our survey embraced and considered themselves skillful in EBP. Inadequate training led to inadequate confidence in conducting and interpreting research. We support continued research in this field. (This is a conference presentation abstract and not a full work that has been published.)

Survey of chiropractic clinicians on self-reported knowledge and recognition of mild traumatic brain injuries

David Taylor, Shari Wynd

Objective: To assess the self-reported mild traumatic brain injury (MTBI) knowledge, recognition and treatment by chiropractic practitioners. Methods: A previously published standardized set of questions was distributed to a captive audience of chiropractic practitioners at the 2016 Texas Chiropractic College annual symposium. The chiropractic clinicians were assessed for MTBI knowledge and common practices. Results: There was a response rate of 43% of the 125 attendees. The survey demonstrated confidence in MTBI diagnosis. Average MTBI knowledge and recognition score was only $27\% \pm 22\%$. Frequency of MTBI patients presenting to the chiropractic clinician office was an average of less than one per month. Sixty nine percent (69%) of the clinicians relied upon their history and clinical exam for diagnosis. There was no knowledge of the Balance Error Scoring system and only 20% utilized the Standardized Concussion Assessment Tool (SCAT). The primary action of the chiropractic clinician who suspected MTBI was to refer to a

neurological specialist (76%). A small minority of patients would provide treatment. Conclusion: There is an overconfidence of the chiropractic practitioner in recognition of MTBI which is incongruent with the low knowledge scores. Further education of the chiropractic clinician is warranted. (This is a conference presentation abstract and not a full work that has been published.)

Development of student scholarship skills

Gene Tobias, Paul Wanless, David Sikorski, Anupama Kizhakkeveettil

Objective: To evaluate scholarship skills among students enrolled in an integrative healthcare university. Method: An IRB-approved survey of first, second and third year students was conducted. The questions included students' opinion of their scholarship skills and whether those skills have changed during their educational experience. The skills assessed were retrieving, appraising, and applying scientific literature. Students were also asked the influence of course assignments and the faculty in modeling scholarship skills. The survey was pretested for face validity prior to its administration. All data were analyzed using SPSS for descriptive statistics.

Results: The survey was distributed to 220 students and 206 responded: a response rate of 94%.

A majority of the respondents indicated that they had prior experience retrieving scientific literature (64%) but fewer had experience appraising (47%) and/or applying scientific literature (38%). As the students progressed through their education, the respondents indicated that they gained more scholarly skill especially in accessing (1st year: 45%, 2nd: 58%, 3rd: 53%) and applying (1st year: 43%, 2nd: 61%, 3rd: 65%) scientific literature. Instructors and course work played a major role in the development of student scholarship skills. Conclusion: Scholarship skills increased with each succeeding year. (This is a conference presentation abstract and not a full work that has been published.)

An institutional case study of best practices for student evaluations

Michael Tunning, Dustin Derby

Objective: The objective of this poster presentation is to highlight best practices in student ratings of instruction. Student ratings represent one piece of information commonly used in yearly evaluations as well as for promotion and tenure. Data Sources: The authors examined best practices as cited through the IDEA Center papers and other resources, as well as institutional data to evidence the impact of using best practices. Results: The institutional impact of utilizing best practices for implementing student ratings of instructions yielded improvements in student response patterns, reliable and valid data, and consistent instructional rating trends. Conclusion: Student ratings of instruction are valuable tools for faculty members to utilize. Following recommendations of Best Practices can improve response rates. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic management of chronic neck pain in a cancer patient in remission: a case study

Robert Walsh, Jessica Young, Greg Snow

Objective: To present the case of a patient in remission from Tonsillar Cancer with significant cervical spine pathology and chronic pain from chemotherapy and radiation managed with spinal manipulative therapy (SMT). Clinical features: A 68 year-old veteran presented with severe constant neck pain and associated right arm pain from life saving cancer treatment for tonsillar cancer. SMT was discouraged by primary providers for fear of injury. Prior to receiving SMT the patient was treated with H-wave prescription, superficial heat and cervical spine stretches; the patient avoided all pain medications due to gastrointestinal pathology. At initiation of SMT, neck pain rated 7/10 using numeric rating scale (NRS) and Neck Pain Disability Index (NPDI) was 48%. Objective findings included reduced and painful cervical motion, pain reproduction with shoulder depression and cervical compression and significant right arm weakness. Intervention and outcome: Cervical SMT and upper thoracic SMT was delivered on 10 occasions over 3 months. NPDI decreased to 16% and cervical ROM increased significantly. Conclusion: Successful pain management with SMT in a cancer patient in remission is presented. Further research is warranted to determine absolute contraindications to

SMT. (This is a conference presentation abstract and not a full work that has been published.)

Symptomatology compression rates of chiropractic patients over 4 weeks with acute low back pain

John Ward, Ken Tyer

Background: The study purpose was to investigate symptom compression rates of chiropractic patients with acute low back pain over a 4-week period. Methods: Thirty-five patients (age 49.7 + 17.0 y, ht 1.66 + 0.10 m, wt 79.0 + 20.4 kg) with acute low back pain received four weeks of chiropractic care. Numeric Rating Scale (NRS) pain score, Roland-Morris Low Back Pain and Disability Questionnaire (RDQ), and Stanford Presenteeism Scale (SPS-6) were recorded at baseline, day 7, day 14, day 21, and day 28. Additionally, the Flexion Relaxation Phenomenon (FRP) surface EMG test was performed to measure erector spinae muscle activation patterns at the same time points. A repeated-measures analysis of variance (ANOVA) was used to analyze data over time. Results: NRS improved changed over data collection time points as follows: 6.1, 5.8, 5.5, 5.6, and 4.0. RDQ values changed as follows: 13.8, 13.8, 12.1, 12.8, and 9.4. SPS-6 changed as follows: 20.3, 18.9, 20.4, 20.5, and 19.1. Flexion-Relaxation Phenomenon test results demonstrated impaired muscle activation patterns at baseline with some muscle guarding that improved on a week-by-week basis. Conclusion: Patients improved gradually and this normative data demonstrates the rate of improvement following chiropractic care. (This is a conference presentation abstract and not a full work that has been published.)

Aromatherapy for test anxiety in chiropractic students: a controlled feasibility trial

Breanne Wells, Lia Nightingale, Dustin Derby, Stacie Salsbury, Dana Lawrence

Objective: Up to 85% of college students experience test anxiety. This may contribute to decreased academic performance. The purpose of this study was to assess the feasibility of recruiting chiropractic students for a study involving aromatherapy for anxiety reduction. Methods: This study enrolled first-trimester chiropractic students, who were assigned to separate rooms during a biochemistry test. Diffusers dispersed lemon and rosemary aromatherapy in the experimental room and water in the control room. Students completed pre and post-test surveys rating current anxiety. Analysis of covariance (ANCOVA) was preformed to determine between group differences for current anxiety. Feasibility was the primary aim, statistical significance of pre-post anxiety test scores between rooms was the secondary aim. Results: The study is feasible, forty-three students participated. ANCOVA for between group comparisons showed no statistically significant difference between groups for pre-and post-test anxiety scores ($p=0.22$). In both groups, 94% of students reported considering using aromatherapy in the future to reduce test anxiety. Conclusion: We demonstrated that it was feasible to recruit students to measure the influence of aromatherapy on test anxiety. A larger powered study is needed to determine if aromatherapy can be effective in reducing test anxiety. (This is a conference presentation abstract and not a full work that has been published.)

Interdisciplinary collaboration to establish a self-management course at a VA facility, for patients with chronic pain

Susan Wenberg, Sheila Sedig

Objective: To improve ease of ADLs in patients with chronic pain by establishing a 3-session active care course in collaboration with pain clinic and health promotion staff. Clinical Features: Patients with chronic pain exhibit learned immobility. Kinesiophobia and related stiffness perpetuate inactivity, fostering decline of other measures of health and increased use of pain medication. A self-management course was designed to address this unmet need. Intervention and Outcome: This course provides patients with self-management tools that foster ease of movement, thus encouraging increased activity levels. Emphasis is on function rather than pain relief. Patients are educated in the application of gentle self-mobilizations, subtle postural changes, and spine sparing movements that are easy to learn, rewarding, and effective. Collaboration of a chiropractor, a

dietitian, a nurse, and a medical support assistant was needed to make this course a reality. Outcome assessment is ongoing. Conclusion: Collaboration enabled staff and departments to establish a needed movement course for patients with chronic pain. In addition, with the

growing emphasis on integrative health care, the course will become part of this facility's emerging Whole Health Program. (This is a conference presentation abstract and not a full work that has been published.)