

ABSTRACTS OF ACC CONFERENCE PROCEEDINGS

PLATFORM PRESENTATIONS

Analysis of immediate student outcomes following a change in gross anatomy laboratory teaching methodology

Salman Afshapour, Abigail Gonsalves, Eric Partin

Objective: To compare student performance following a change in laboratory teaching methodology from cadavers to models to virtual dissection table in a Musculoskeletal gross anatomy course in a doctor of chiropractic program. **Methods:** Three marking periods of laboratory and lecture examination scores from three consecutive academic calendar years were evaluated. The first cohort of students (n= 352) utilized cadavers. The second cohort of students (n = 350) had anatomical models as their primary gross laboratory modality. The third cohort of students (n = 393) utilized virtual dissection tables. (Anatome, inc. 2015, San Jose) **Results:** The midterm and final laboratory examination scores were evaluated and showed successive increase in aggregate averages between Cohort One (76.1), Cohort Two (81.4), and Cohort Three (85.1). Lecture examination scores remained fairly consistent between the cohorts at 61.2, 62.4, and 61.1 respectively. **Conclusion:** Students utilizing virtual dissection tables scored higher on laboratory examinations than students having models or cadavers. However, they displayed a similar testing competency in lecture examinations, suggesting a possible change in laboratory examination difficulty between the cohorts, but similar knowledge base. Further studies are warranted to evaluate the long term retention of student knowledge. (This is a conference presentation abstract and not a full work that has been published.)

The quality of life of children under chiropractic care using the PROMIS-25

Joel Alcantara, Jeanne Ohm, Junjoe Alcantara

Objective: To assess the quality of life of children under chiropractic care in a practice-based research network. **Methods:** Children (8-17 years old) under chiropractic completed a baseline and comparative survey of the PROMIS-25 to assess a number of quality of life domains based on T score metric (mean=50; SD=10). Parents provided socio-demographic and covariates (i.e., motivation for care, visit number) information. Analysis utilized descriptive statistics and generalized linear mixed model using Mplus V7 (Los Angeles, CA, 2008-2012). **Results:** A convenience sample of parents (N=881; average age= 42.03 years; 747 females) and children (N=881; average age=12.49 years; 467 females;) comprised our study population. The T scores (baseline/comparative) were: mobility (51.29/52.57), anxiety (46.91/44.82), depressive symptoms (45.32/44.21), fatigue (45.51/43.83), peer relationships (51.75/52.66) and pain interference (47.39/44.84). Mean # of visits from baseline to comparative was 3. After controlling for the effects of various covariates (i.e., gender, motivation for care, visit number), our analysis revealed significant differences across all outcome measures (Wald=82.897, df=4, p<0.05). Post-hoc comparisons reflected an improvement in all the QoL domains measured. **Conclusion:** The PROMIS-25 questionnaire for children was successfully implemented within a chiropractic PBRN. Following a trial of care, their quality of life improved. (This is a conference presentation abstract and not a full work that has been published.)

Boot camp programs for lumbar spinal stenosis: A randomized controlled clinical trial comparing outcomes following a comprehensive verses a self-directed non-surgical approach

Carlo Ammendolia, Pierre Cote, Y. Raja Rampersaud, Danielle Southerst, Brian Budgell, Claire Bombadier, Gilliam Hawker

Objective: to compare outcomes following a comprehensive treatment approach that included manual therapy to self-directed care. **Methods:** Eligible consenting participants with neurogenic claudication due to lumbar spinal stenosis and limited walking ability were randomized to

a 6-week comprehensive program that included twice weekly manual therapy or self-directed care following a single educational session. Both groups received a pedometer and an exercise manual and video with instructions on home exercises and self-management strategies. The primary outcome was the between group mean difference in walking distance from baseline to 8-week. **Results:** Fifty-one participants were randomized to the comprehensive and 53 to the self-directed group. At 8-weeks the mean difference in walking distance between the groups was 291.0 metres, 95% CI (76.6 to 505.3), favouring the comprehensive group. A total of 85% and 83% of participants in the comprehensive group achieved at least 30% and 50% improvement in walking distance respectively compared to 61% and 57% of participants respectively in the self-directed group. **Conclusions:** Both boot camp programs showed significant improvement in walking distance at 8 weeks with the comprehensive program demonstrating superior improvement. (This is a conference presentation abstract and not a full work that has been published.)

Comparison of outcomes in non-specific low back pain (LBP) patients with and without modic changes that receive chiropractic treatment

Michele Annen, Cynthia Peterson, B. Kim Humphreys

Objective: To compare outcomes of low back pain (LBP) patients with Modic changes to patients without Modic changes undergoing chiropractic treatment. **Methods:** This is a prospective outcomes study on 94 consecutive LBP patients with MRI scans within 3 months of presentation. MRI scans were evaluated in consensus by 2 readers for the presence/absence of Modic changes and Modic type (I or II). Baseline pain levels (NRS) were collected. Outcomes (Patients' Global Impression of Change (PGIC), NRS and Bournemouth questionnaire (BQ)) were obtained at 1 week, 1 and 3 months via telephone interview or online questionnaire. The proportion of patients 'improved' or 'worse' (PGIC) at all time points were compared between Modic present/absent patients and Modic I vs. II patients using the Chi-square statistic. NRS and BQ change scores were compared using the unpaired t-test. **Results:** 53% of patients were Modic positive with 23.2% Modic I and 27.3% Modic II. There were no significant differences between Modic positive/negative or Modic I vs. II patients for the proportion 'improved' or 'worse' or for NRS and BQ change scores at any time point. **Conclusion:** Modic changes were not related to treatment outcomes at any time point. (This is a conference presentation abstract and not a full work that has been published.)

Primum non nocere: Upholding patient preference and provider duty to non-maleficence through patient education, trial of care, and co-management in a case of cauda equine

Virginia Barber, Tracey Littrell, Michelle Barber

Objective: Evidence-informed practice (EIP) requires discovering the balance among best evidence, clinician experience, and individual patient preferences. Ethical practice guidelines require the chiropractic physician to respect patient autonomy while upholding physician duty to beneficence and non-maleficence. This report details this process with a new patient presenting with cauda equina syndrome due to disk herniation and pedicular hypoplasia, complicated by previously undiagnosed type III Klippel-Feil syndrome, who initially refused surgery or co-management. **Clinical features:** A 31-year-old male chiropractic student presenting with severe low back, leg, and foot pain and signs of cauda equina syndrome sought treatment and management solely through chiropractic manipulative therapy (CMT).

Intervention and outcome: After a two-week trial of unsuccessful CMT, intensive patient counseling and education by the chiropractic physician, and engaged discussion of the doctor's and patient's rights and responsibilities toward the patient's health, the patient underwent lumbar and cervical MRI, and sought neurosurgical consult. He

underwent successful L4-L5 discectomy and laminectomy and has been cleared to resume CMT.

Conclusion: The successful chiropractic physician must advise and counsel as effectively as he or she treats, especially with a potentially emergent diagnosis such as cauda equina, while respecting and upholding the patient's autonomy. (This is a conference presentation abstract and not a full work that has been published.)

Multimodal imaging of longitudinal medial arch structures in non- and weight bearing posture

Patrick Battaglia, Ross Mattox, Brett Winchester, Norman Kettner

Objectives: We compared changes in clinically significant medial arch structures in non- and weight bearing postures utilizing radiography and ultrasonography. Our secondary aim compared participants with flatfoot deformity to matched controls. **Methods:** IRB approval and informed consent were obtained. Foot alignment was quantified with weight bearing radiography. Non-weight bearing and weight bearing ultrasound images of the spring ligament, posterior tibialis tendon, subtalar joint space, and abductor hallucis muscle were acquired. **Results:** Primary analysis (n = 52) yielded no significant change (p > 0.05) in structure size during weight-bearing with the exception of the spring ligament (p < 0.01), which reduced in size. At secondary analysis, flatfoot deformity (n = 12) and normal foot alignment (n = 12) demonstrated no difference in size within and between groups. The majority (10/12) of flatfoot deformity participants had radiographic hindfoot neutral or varus alignment. **Conclusions:** We provide novel data regarding the size of key medial arch structures while weight-bearing. The unexpected varus hindfoot alignment observed in flatfoot participants may represent compensatory change to an altered midfoot posture. (This is a conference presentation abstract and not a full work that has been published.)

Do chiropractors undertake weight management interventions?

Peter Beliveau, Michael McIsaac, Silvano Mior, Simon French

Objective: To identify associations between chiropractor directed weight management and patient and chiropractor-level variables. **Methods:** We used data from the Ontario Chiropractic Observational and Analysis Study (N=42 chiropractors, N=3523 patient encounters). Multilevel logistic regression was performed to determine the probability of chiropractors initiating or continuing weight management interventions, stratifying patients by weight category, and also determining adherence to overweight and obesity clinical practice guideline recommendations. Seven patient and two chiropractor-level variables were investigated. **Results:** Ontario chiropractors provided weight management to 5.4% of patients. No significant preference was found between patients who were of normal weight, overweight, and obese (p-value = 0.2291). Chiropractors who graduated after 2005 provided weight management interventions significantly more often (12.8%, p-value = <0.0001) than chiropractors who graduated between 1995 and 2005 (1.0%) or prior to 1995 (5.7%). Significantly more weight management intervention was provided to patients who suffered from both overweight or obesity and at least one comorbid condition (10.1% compared to 4.7%, p-value = 0.0002). **Conclusions:** Weight management provided to patients by Ontario chiropractors is associated with patient health and chiropractor training. Our study suggests more could be done by the profession to address overweight and obesity. (This is a conference presentation abstract and not a full work that has been published.)

Comparison of outcomes in patients with lumbar radiculopathy treated with nerve root blocks containing particulate vs. non-particulate corticosteroids

Susanne Bensler, Cynthia Peterson, Reto Sutter, Christina Pffirmann

Objective: Based on U.S. FDA warnings, this hospital switched from particulate to non-particulate corticosteroids for nerve root injections. The purpose of this study is to compare outcomes in lumbar nerve root block patients receiving either particulate or non-particulate corticosteroids. **Methods:** This is a comparative effectiveness, prospective study on 2 cohorts of lumbar radiculopathy patients. 173 received particulate and 191 non-particulate corticosteroids in their CT-guided lumbar nerve root injections. Pain levels were collected at Baseline (NRS) and at 1 day, 1 week and 1 month. Overall

'improvement' was assessed using the Patients' Global Impression of Change' (PGIC) at these same time points (primary outcome). The proportions of patients 'improved' were compared between the two groups using the Chi2 test. The NRS change scores were compared using the unpaired t-test. **Results:** A significantly higher proportion of patients treated with particulate steroids were improved at 1 month (p = 0.03, 46% vs. 34%). Patients receiving particulate steroids also had significantly higher NRS change scores at 1 week (p = 0.02) and 1 month (p = 0.007). **Conclusions:** The particulate corticosteroids have significantly better outcomes compared to non-particulate corticosteroids. This hospital has switched back to using particulate corticosteroids. (This is a conference presentation abstract and not a full work that has been published.)

Risk factors for persistent pelvic girdle pain 12 years postpartum

Cecelia Bergstrom, Margareta Persson, Ingrid Mogren

Objective: To identify risk factors of poor outcome associated with persistent pelvic girdle pain (PPGP) 12 years postpartum. **Methods:** This is a long-term follow-up study based on a previous cohort study. The questionnaire was distributed to a total of N=624 women. A modified Poisson regression as well as a modified Poisson autoregressive repeated measure analysis was performed to evaluate the relative risk (RR) of reporting PPGP 12 years postpartum. **Results:** In total, 295 women (47.3%) responded to the questionnaire where n=36 (12.3%) reported 'continuous' pain, n=83 (28.3%) reported 'recurrent' pain, and n=174 (59.0%) reported 'pain on a few occasions'/'no' pain. Statistically significant decrease in the RR of PPGP was demonstrated at with 95% confidence interval (CI) (in parenthesis); 6 months (RR 0.46 (0.41-0.51)), 14 months RR 0.76 (0.70-0.82), and 12 years RR 0.41 (0.35-0.47) postpartum. However, if reporting PPGP at 6 months after delivery analysis shows an 86% increased relative risk of reporting PPGP 12 years postpartum (RR 1.86; CI 1.35-2.56). **Conclusion:** As time progresses there is a decrease of the long-term RR of PPGP. Conversely, women reporting PPGP 6 months postpartum almost had a twofold increased RR of reporting PPGP at the 12-year follow-up. (This is a conference presentation abstract and not a full work that has been published.)

Test anxiety in chiropractic college, a descriptive analysis of second and third year chiropractic student's test anxiety

Judy Bhatti, Katherine Manley-Busser, Elissa Twist

Objective: Assess self-reported Westside Test Anxiety Scale (WTAS) to describe levels of test anxiety (TA) in students in first-through-third years of a chiropractic program, and report the level of test desensitization in second and third year students. **Methods:** A questionnaire containing the WTAS and demographics was administered to students from first to third year; desensitization information was also gathered from second and third year students. Students were given class time to complete the questionnaire. Data analysis used only surveys with complete WTAS. **Results:** 326 students (182 male, 139 female) completed the WTAS survey: 102 year 1-beginning, 110 year 1-end, 53 year 2-end, and 61 year 3. Students had a mean age of 24.8 years. 24% of year 1-beginning students reported high TA, 26% for year 1-end, 11% for year 2-end and 11% for year 3. 60% of students without a previous college degree reported high TA levels compared to 49% with a previous degree. Desensitization (n=219) was reported affirmatively by 69% of year 2-beginning, 75% of year 2-end, and 92% of year 3 students. **Conclusion:** This population of students had reduced levels of TA and increased desensitization as they had repeated testing throughout the program. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic care of a 52-year-old female patient presenting with cervical spine disc replacement surgery with complications: a case report

Thomas Bloink, Charles Blum

Objective/Clinical Features: A 52-year-old female who was suffering from significant neck pain which radiated down her right arm to her second-third fingers with paresthesia and muscle weakness. Disc replacement surgery was performed April-2015 to the C5-C7 discs and initially her symptoms resolved and then returned with symptoms on

the contralateral side. An MRI was ultimately negative, however her neurologist was attempting to rule out multiple sclerosis or dural fistula. The patient had significant TMJ dysfunction with pain to palpation in the craniofacial sutural regions, hypertonic muscles of mastication, TM disc disorder, clenching/bruxism, and malocclusion. Cervical antalgia, limited range-of-motions with pain on motion and palpation along with related musculature weakness. **Intervention/Outcomes:** The patient was treated (10-visits) March-2016/May-2016 with prone SOT category one blocking, intra-oral cranial adjusting, and TMJ balancing. Following the 1st-three visits she was seen by her dentist to balance a lower occlusal splint. By May-2016 her VAS constant pain levels decreased from a 8-9/10 to 3/10, paresthesia significantly decreased with normal ranges-of-motion, and muscles strength had returned. Follow-up MRI was unremarkable for any prior suspicious lesion. **Conclusion:** This case suggests a relationship between the patient's TMJ disorder and cervical spine limited function and pain. (This is a conference presentation abstract and not a full work that has been published.)

Lumbar spine manipulation improves locomotor activity and reduces hypersensitivity in a knee-joint immobilization model

Felipe C.K. Duarte, Carolina Kolberg, Anna Paula Riffel, Taina Scheid, Jessican Araujo Souza, Andrea Horst, Wania Aparecido Partata

Objective: Evaluate the effect of lumbar spine manipulation (LSM) using a manually operated chiropractic adjusting instrument with adapter (AAI-4) on sciatic, tibial and peroneal functional indices (FIs) and mechanical threshold in a model of knee-joint immobilization (KI). **Methods:** After ethical approval (#21462), adult male Wistar rats were divided into Naive (N - without immobilization) and Immobilized (I - right KI per 4 weeks), and into subgroups which received treatment for 3 weeks, 3 times-week, during remobilization: AAI-4 in setting force 1 (NAAI-4 and IAAI-4), free remobilization (I-FR) and a group without AAI-4 pre-load (without retractable portion compressed on the spine) (Sham). FIs and mechanical threshold were assessed at pre-immobilization, 24h after joint-cast removal and at treatment ends. Statistical analyzes by repeated measures ANOVA followed by Tukey. Differences were considered significant when $P < 0.05$. **Results:** The FIs show recovery of normal locomotor activity for AAI-4 treatment. In addition, only AAI-4 treatment was able to reverse the mechanical hypersensitivity caused by immobilization of the knee. **Conclusion:** The LSM AAI-4 treatment improves locomotor activity and reduces mechanical hypersensitivity attributed to the knee-joint immobilization. This might be related with chiropractic treatment leading to neuroplastic changes on proprioceptive and nociceptive mechanisms. (This is a conference presentation abstract and not a full work that has been published.)

The effect of online formative self-assessment on academic performance of chiropractic students: a pilot study

Munyeong Choi, Douglas Black

Objective: To evaluate the effect of online formative self-assessment (OFSA) on academic performance of Chiropractic students. It is hypothesized that students will embrace OFSA and students' summative exam (SE) scores will have a positive change based on the degree of utilization of OFSA. **Methods:** A link to a weekly OFSA was electronically sent to students five times during the quarter. The students could take the quiz voluntarily outside of class time. The students were divided into three groups depending on the degree of utilization of OFSA. SE scores were used to assess the relationship between the number of OFSAs utilized and academic performance via ANOVA and Pearson's correlation. **Results:** The group of students who utilized OFSA the most demonstrated the highest score on SE with a moderate statistically significant positive correlation between the number of OFSAs utilized and the SE score ($p = .004$, $r = .378$). Approximately 93% of students participated in one or more OFSAs. **Conclusion:** Our results demonstrated that OFSA had a positive impact on students' academic performance and participation rate was high. Therefore, OFSA can be an effective tool to enhance student learning and is readily accepted by students. (This is a conference presentation abstract and not a full work that has been published.)

Clinical outcomes in neurogenic claudication using a multimodal program for lumbar spinal stenosis: A long-term follow-up study

Ngai Chow, Danielle Southerst, Deborah Kopansky-Giles, Carlo Ammendolia

Objective: To assess long-term outcomes of a 6-week multimodal program (manual therapy, exercises, and self-management strategies) in patients with neurogenic claudication due to degenerative lumbar spinal stenosis. **Methods:** This was a case series of patients with neurogenic claudication who completed the multimodal program from 2010-2013. Outcomes included Oswestry Disability Index (ODI), Zurich Claudication Questionnaire (ZCQ), and Numeric Rating Scale. Mean differences and paired t-tests were used to compare outcomes at baseline and long-term follow-up. **Results:** 23 patients completed the survey (47% response rate). Median follow-up was 3.6 years (IQR: 3.3-4.6). Mean differences from baseline to follow-up was 23.7 (95% CI: 15.7-31.6) for ODI, 0.7 (95% CI: 0.3-1.1) for ZCQ pain scale, 0.4 (95% CI: 0.1-0.7) for ZCQ function scale, 1.0 (95% CI: -1.0-3.1) for low back pain, and 3.5 (95% CI: 1.8-5.2) for leg pain. At baseline, 41% of patients reported difficulty walking without an aid, compared to 17% at follow-up. All outcomes were clinically important except for low back pain. **Conclusions:** In patients with neurogenic claudication participating in the program, clinically important improvements in most outcomes appear to be maintained over the long-term. Future studies should evaluate the program using more confirmatory study designs. (This is a conference presentation abstract and not a full work that has been published.)

The effects of a single session of spinal manipulation on strength and cortical drive in athletes

Thomas Lykke Christiansen, Imran Khan Niazi, Kelly Holt, Rasmus Wiberg Nedergaard, Jens Duehr, Vivian Schlupp, Paul Marshall, Kemal Tucker, Jan Hartvigsen, Heidi Haavik

Objective: The primary objective of this study was to investigate whether a single session of spinal manipulation (SM) increases plantarflexion strength and cortical drive in elite Taekwondo athletes. **Method:** Soleus evoked V-wave (cortical drive) and maximum voluntary contraction (strength) of the plantar flexors were recorded from 12 elite Taekwondo athletes using a randomized controlled crossover design. Interventions were either SM or a passive movement control. Outcomes were assessed pre-intervention and at three post-intervention time periods (immediate post, post 30min, post 60min). A multifactorial repeated measures ANOVA was conducted to assess within and between group differences. Significance was set at $P \leq 0.05$. **Results:** In the same individual, SM resulted in increased strength ($p < 0.01$) and V-waves ($p < 0.01$) over time compared to the control intervention. Between-group differences were significant for all time periods ($p < 0.05$) except for the post60 force measurements ($p = 0.065$). **Conclusion:** In a group of elite Taekwondo athletes SM increased plantarflexion strength and cortical drive, and prevented fatigue, compared to a passive movement control. The strength findings lasted for 30 minutes and the cortical drive increase persisted for at least 60 minutes. Further research is required to investigate whether SM improves athletic performance. (This is a conference presentation abstract and not a full work that has been published.)

Neuromechanical responses to spinal mobilization and manipulation in an ovine model of cervical intervertebral disc degeneration

Christopher Colloca, Roberg Gunzburg, Deed Harrison, Marek Szpalski, Brian Freeman, Mostafa Hegazy, Richard Hinrichs

Objective: To investigate the effect of cervical annular degeneration upon stiffness, electromyographic and vertebral motion responses during spinal mobilization and manipulation. **Methods:** Fifteen sheep with confirmed annular degeneration were compared to 15 controls. Oscillatory 25N, 2-Hz loads (mobilization) and 10 and 100 ms 25N spinal manipulative thrusts (SMTs, manipulation) were randomly applied to the mid-cervical spine. Load, displacement, needle electromyography (nEMG) and adjacent segment motion responses were recorded. The effect of degeneration on spinal stiffness, vertebral motions, and nEMG responses, were assessed using ANOVAs. **Results:** Degeneration resulted in 60% reductions in vertebral

displacements ($p=0.001$), 45% increases in spinal stiffness ($p=0.006$) and decreased adjacent segment accelerations ($p<.05$) during mobilization. Consistent decreases in normalized nEMG accompanied degeneration but were significant only at one electrode site ($p=0.025$). Slower (100 ms) SMTs caused 3-fold larger vertebral displacements, $p=0.001$, yet 3-fold less adjacent accelerations than faster (10 ms) SMTs, $p=0.001$ that were significantly reduced in the degeneration group, $p=0.01$. SMTs caused appreciable nEMG responses during SMT ($p=0.001$) not significantly different between SMT types or degeneration. **Conclusion:** Cervical degeneration increased spinal stiffness and decreased vertebral motion during the application of spinal mobilization and manipulation that were unrelated to neuromuscular activity. (This is a conference presentation abstract and not a full work that has been published.)

Quantifying in vivo vertebral motions during impulsive spinal manipulation

Christopher Colloca, Roberg Gunzburg, Marek Szpalski, Mostafa Hegazy

Objective: To quantify in vivo lumbar spine motions in human subjects during impulsive spinal manipulative therapy (SMT) delivery. **Methods:** Tri-axial accelerometers were rigidly attached L4- L5 spinous process of three patients undergoing lumbar surgery to record vertebral motions during impulsive SMTs delivered by an Impulse iQ medical device equipped with an accelerometer. Three force settings were delivered the L4 facet joint and spinous process at two vectors (cranial and caudal) using repeated measures. The effects of contact point, force magnitude, and vector on peak-to-peak displacements was performed by ANOVA and correlation of medical device recorded accelerations was compared to interosseous pin accelerations using least-squares linear regressions. **Results:** Peak-to-peak ML, PA, AX vertebral motions increased significantly ($p<.05$) with increasing applied force. Cranially directed SMTs created significantly greater L4-L5 motions compared to caudally directed thrusts ($p<.01$). Contacts to the facet joints induced greater ML motions than those applied to the spinous processes ($p<.01$). Non-invasive stylus accelerations were positively correlated to the main invasively measured accelerometer motion (linear regression $R^2 = 0.988$, $p<0.01$). **Conclusion:** Applied forces, vectors and segmental contact points influence spinal motion during SMT enabling validated non-invasive biomechanical measurements for use in clinical practice. (This is a conference presentation abstract and not a full work that has been published.)

Inter-method comparison of supine and prone measures of leg length inequality

Robert Cooperstein, Marc Lucente, John Lockenour, Terry Payton

Background: Manual therapists determine leg length inequality (LLI), in both supine and prone positions. Anatomic LLI may increase the risk of somatic complaints in the lower extremities, pelvis, and spine. Functional LLI may reflect mechanical dysfunction of spino-pelvic structures and serve as outcome measures for clinical changes. It is not known if prone and supine measures of LLI agree. **Methods:** In this $n=43$ inter-method reliability study, 2 experienced examiners assessed each subject for LLI, one using a prone and the other a supine method. They stated whether they were “confident” or “not confident” in their findings. **Results:** Kappa values for inter-method agreement were: 0.16 for the full dataset; 0.00 for the $n=20$ subgroup with both examiners confident; 0.24 for the $n=18$ subgroup with 1 examiner confident; and 0.55 for the $n=5$ subgroup with neither examiner confident. **Conclusion:** Supine and prone measures showed “slight” agreement for the full data set, but no agreement when both examiners were confident. The “moderate” agreement with both examiners not confident may be an artifact of small sample size. Future studies should address the impact of patient position on measures of LLI, to improve diagnostic and treatment methods. (This is a conference presentation abstract and not a full work that has been published.)

A secondary analysis of the interexaminer reliability of motion palpation for the most fixated spinal segment

Robert Cooperstein, Morgan Young

Background: Three prior motion palpation studies of the cervical, thoracic, and lumbar spines using continuous rather than more typical segmental data demonstrated high interexaminer agreement on the most fixated level. The primary goal of this study was secondary analysis of the combined data from previous studies, stratified by examiner confidence. The secondary goal was analysis of actual vs. simulated motion palpation data. **Methods:** This $n=113$ secondary analysis emphasized Median Absolute Examiner Differences and Bland-Altman Limits of Agreement, which are immune to subject homogeneity, unlike intraclass correlation; and Median Absolute Deviation to measure data dispersion. The results of using simulations to identify the most fixated segment, were compared with results using actual data. **Results:** Median Absolute Examiner Differences for the combined data set were 0.7 of one vertebral level, equivalent to agreement on the most fixated level or motion segment including it. Examiner confidence increased reliability. Actual compared to simulated data improved interexaminer reliability by 1.8 to 4.7 times, depending on spinal region. **Conclusions:** Examiner decisions for the most fixated spinal segment were deemed adequately reliable, especially when the examiners were confident, favoring a most fixated segment protocol compared with more typical segmental analysis. (This is a conference presentation abstract and not a full work that has been published.)

Zygapophyseal (Z) joint crepitus before and after spinal manipulation: a pilot study

Gregory Cramer, Matthew Budavitch, Preetam Bora, Kim Ross

Objective: To assess Z joint vibrations/sounds (crepitus) during lumbar motion before and after side-posture spinal manipulation (SMT). **Methods:** This IRB-approved pilot study used 5 healthy and 5 low back pain (LBP) subjects. Nine accelerometers were applied to the lumbar region, allowing assessment of crepitus. Subjects underwent full lumbar ranges of motion (ROM), SMT, and repeated ROM, while accelerometer recordings were made. Primary outcome was descriptive report of crepitus prevalence (average number of crepitus events/subject). Subjects were also divided into 3 age groups for comparisons (18-25, 26-45, and 46-65 years). **Results:** Overall, crepitus prevalence decreased following SMT; average pre-SMT= 1.4 crepitus/subject, vs. post-SMT= 0.9. Prevalence progressively increased from the youngest to oldest age groups (pre-SMT= 0.0, 1.67, and 2.0, respectively; and post-SMT= 0.5, 0.83, and 1.5). Prevalence was higher in LBP subjects compared to healthy (LBP pre-SMT= 2.0 vs. Healthy pre-SMT= 0.8; LBP post-SMT= 1.0, vs. Healthy post-SMT= 0.8), even though healthy subjects were older than LBP (40.8 years vs. 27.8 years). **Conclusion:** In this pilot study prevalence of crepitus increased with age, was higher in LBP than healthy subjects, and overall decreased following SMT. (This is a conference presentation abstract and not a full work that has been published.)

The prevalence and impact of spine pain in Ontario long term care seniors

Connie D'Astolfo, Peter Tsasis

Objective: This is the first study of its kind to address the burden of mechanical spine pain in Ontario Long-Term Care (LTC) seniors. Prevalence, incidence, cost and predictors of spine pain related Emergency Department (ED) visits and hospitalizations were analyzed to test the value/feasibility of an Interdisciplinary Spine Program for this population. **Methods:** A CIHI administrative dataset of 150,000 LTC seniors in Ontario from 2009 to 2014 was analyzed. Regression models were developed to predict risk factors for primary spine pain ED/hospitalizations. Surveys and focus groups of LTC homes were used to identify attitudes and knowledge gaps. **Results:** The prevalence of mechanical spine pain is 24.2% with incidence of 370 new cases/year. Mechanical spine pain accounts for 9% of all ED visits with an average hospital stay of 24.2 days; costing \$149 million per year; One third of seniors with falls-related hospitalizations has comorbid spine pain. Spine pain, individually, increases the risk of hospitalization by 6% (highest predictor after hip fracture.) LTC home staff and administrators minimize the impact of spine pain. **Conclusion:** Mechanical spine pain is a significant contributor to avoidable ED/hospitalization in this population. Policy/program development is recommended to effectively address this problem.

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

The efficacy of manual therapy for pain and disability in older persons with chronic low back pain: A systematic review

Katie de Luca, Sheng-Hung Fang, Justin Ong, Ki Soo Shin, Samuel Woods, Peter Tuchin

Objective: Chronic low back pain is the most common musculoskeletal condition and is a great cause of disability in the elderly. The evidence for the effectiveness of manual therapy on chronic low back pain in older persons unknown. The aim of this study is to investigate the efficacy of manual therapy on pain and disability in older persons with chronic low back pain. **Data Source/Selection:** Four databases were searched with the keywords: elderly, geriatric, seniors, older, low back pain, chiropractic, osteopathic, physiotherapy, spinal, manipulation, adjustment, manual therapy, massage, mobilisation. **Inclusion criteria** were: 1) Manual therapy; 2) Participants \geq 55 years of age; 3) Chronic low back pain. **Results:** Five studies met the inclusion criteria. They were of good methodological quality, (scores from 6-8 on the PEDro scale.) There was moderate evidence, albeit from a small number of studies, for manual therapy to improve pain and quality of life in terms of improving disability and physical function. **Conclusion:** Very few studies have investigated the effectiveness of manual therapy in the management of older persons with chronic low back pain. Further studies are required to evaluate the effectiveness of manual therapy in this population. (This is a conference presentation abstract and not a full work that has been published.)

The effect of chiropractic treatment on the reaction and response times of special operation forces military personnel: a randomized controlled trial

James DeVocht, Dean Smith, Cynthia Long, Robert Vining, Thomas Jones, Qian Li, Christine Goertz

Objective: Previous pilot work has indicated the possibility of improvements in response time following chiropractic treatment. The objective of this study was to test the hypothesis that chiropractic treatment improves the reaction and response times of extremely physically fit individuals in the military's special operation forces (SOF) whose duties require optimal reaction and response times. **Methods:** This study was a randomized controlled trial of asymptomatic volunteer SOF personnel. Five different outcome measures of reaction and response times were used. The participants were randomly allocated to either a treatment group receiving 3 chiropractic treatments before the final assessment or to a wait-list control group who received no treatment but were assessed at the same time intervals. The primary outcomes were change in reaction and response times. **Results:** There were 60 male participants per group. Small changes were not significantly different between the 2 groups for any of the 5 different measures of reaction and response times. **Conclusion:** Reaction and response times of SOF personnel were not affected by 3 chiropractic treatments spread over 2 weeks. It is possible that more extensive treatment could induce an improvement of larger magnitude in reaction or response times. (This is a conference presentation abstract and not a full work that has been published.)

Motor neuron excitability attenuation as a sequel to lumbar manipulation in low back pain patients

J. Donald Dishman, Jeanmarie Burke, Paul Dougherty

Objective: To evaluate motor neuron excitability (MNE) pre-post high velocity low amplitude (HVLA) lumbar manipulation in subacute low back pain (LBP) patients and asymptomatic controls. **Methods:** Asymptomatic (n=66) and LBP patients (n=45) participated. The protocol was approved by the local IRB and informed consent was obtained. Both groups were randomized into three groups: side posture positioning, joint load with no thrust, and HVLA manipulation. Baseline H reflex data was obtained and H/M ratios were utilized as an index of MNE. A post procedure series of data was obtained at 10 second intervals for up to one minute and again at 5 and 10 minutes post procedure. A mixed ANOVA model (group x procedure x time) was used to determine the effects of the procedure on H/M max ratios. **Results:** Only the HVLA group in both groups Side posture positioning and non-thrust spinal loading exhibited

reduced H/M max ratios (MNE), with significance reached at 10 secs. There was no significant difference between the LBP and asymptomatic groups. **Conclusion:** HVLA manipulation produces significant reduction in MNE in both asymptomatic and LBP groups that is unique and specific as compared to non-thrust perturbation. (This is a conference presentation abstract and not a full work that has been published.)

Spinal pain in Danish school children – how often and how long? The CHAMPS Study-DK

Kristina Dissing, Jan Hartvigsen, Niels Wedderkopp, Christopher Williams, Steven Kamper, Eleanor Boyle, Lise Hestbaek

Objectives: The overall aim of this study was to describe the prevalence of spinal pain in 9-15 year-old Danish schoolchildren, over a three-year period. Specifically determining the characteristics of spinal pain in terms of frequency and duration. **Methods:** A three-year prospective longitudinal cohort study following a cohort of 1400 school children. Parents received weekly text messages (SMS) inquiring about the child's musculoskeletal pain. **Results:** The results were presented separately for each study year (year 1, 2 and 3). The prevalence was 29%, 33% and 31% for year 1, 2 and 3 respectively, and increased with age, especially for lumbopelvic pain. Most children had few and short episodes with spinal pain, but 21%, 20% and 25% had three or more episodes during a study year and 16%, 17% and 17% of all episodes lasted for more than four weeks for year 1, 2 and 3 respectively. **Conclusion:** This study confirms the relatively high prevalence of spinal pain in young people. Most episodes are brief, but there is a substantial group of children with frequent and long-lasting episodes of spinal pain indicating a need for action. (This is a conference presentation abstract and not a full work that has been published.)

Mind body intervention (MBI) for chronic lower back pain: a pilot study

Paul Dougherty, Jurgis Karuza, Jennifer Murphy, Amanda Dlugniewski, Dorian Savino

Objective: To assess the feasibility of combining Cognitive Behavioral Therapy for pain (CBT-p) and manual therapy (MT) into chiropractic treatment of chronic lower back pain (CLBP) in patients at high risk for chronicity. **Methods:** Two chiropractors were trained in CBT-p. CLBP patients rated as "high risk" (Keele STarT Back) without contraindications to MT or CBT-p were randomized to either MT alone or MT combined with CBT-p (MBI) 2X/wk for 6 weeks. Sessions were recorded and evaluated by two psychologists for fidelity. **Results:** Two patients received MBI, and 2 MT. Average times for sessions were 22 minutes and 32 minutes per session for MT and MBI respectively. There was no significant difference in the mean of the ratings between the two evaluators. Results indicate that the implementation was "good" with only 6% below satisfactory. In MT only treatment there was no evidence of incorporation of CBT principles. Patient satisfaction ratings were 5/5 for all patients. **Conclusion:** The results provide evidence of a "proof of concept" that CBT principles and techniques can be effectively integrated into chiropractic treatment. Further studies will be required to evaluate the clinical effectiveness of MBI as compared to MT alone. (This is a conference presentation abstract and not a full work that has been published.)

Prevention of low back pain: effect and cost-effectiveness of preventive treatment (chiropractic maintenance care) as compared to symptomatic treatment – a pragmatic randomized clinical trial

Andreas Eklund, Irene Jensen, Malin Lohela-Karlsson, Jan Hagberg, Lennart Bodin, Charlotte Lebouf-Yde, Alice Kongstad, Iben Axen

Objective: To investigate the effect and cost-effectiveness of Chiropractic Maintenance Care (MC) as compared to symptomatic treatment on reducing recurrent and persistent low back pain (LBP). **Methods:** In a pragmatic investigator-blinded two arms randomized clinical trial, individuals with recurrent or persistent LBP were randomly assigned to either MC (treatment at pre-determined regular intervals aimed at preventing future LBP episodes) or to symptomatic treatment (when there was a subjective need due to pain). The follow-up period was 52 weeks and the primary outcome

was “number of days with bothersome LBP”, measured weekly using text messages. In the cost-effectiveness analysis only costs associated with the visits were included. **Results:** The MC group (n=163) had a total of 19.3 (CI 95%: 4.9, 33.6) less days with bothersome LBP, however the cost was 164.06 € (CI 95%: 70.48, 255.44) higher compared to the control group (n=154). **Conclusion:** MC is more effective but more costly. Depending on how much the patient is willing to pay, MC may be cost-effective compared to symptomatic treatment. The results need to be interpreted with caution as the clinically significant difference for days with bothersome LBP is unknown. (This is a conference presentation abstract and not a full work that has been published.)

Neck loading during thoracic high-velocity low amplitude (HVLA) manipulation: an investigation of regional interdependence

Shawn Engell, Samuel Haworth, John Jay Triano

Objective: This study exploited observations of table headpiece and neck movements during upper thoracic spine HVLA procedures to investigate the mechanics of regional interdependence. **Methods:** Nine healthy volunteers received a unilateral hypothermic transverse push maneuver using a custom table headpiece that could be locked or unlocked, allowing a “frictionless” gliding in the caudocephalic direction. Headpiece motion was monitored along with neck angular displacements and velocities. Clinician applied forces and interaction forces between the participant’s torso and the table were also recorded. **Results:** The headpiece translated in a cephalad direction by an average of 11.5 mm (SD = 10.0 mm) in the unlocked condition, which was greater than translation (0.9 mm, SD = 0.9 mm) during the locked condition ($p = 0.011$). Neck extension was induced by both maneuvers with a trend toward a greater amount of extension induced with the headpiece unlocked ($p = 0.077$). **Conclusion:** This work is the first effort to quantify regional interdependence within spinal kinetic chain during HVLA. Cephalad translation of the unlocked headpiece indicates a transfer of forces from the thorax to the neck and head. (This is a conference presentation abstract and not a full work that has been published.)

Subclinical neck pain leads to altered multi-sensory integration at baseline and four week follow-up relative to healthy controls

Bassmem Farid, Paul Yelder, Michael Holmes, Heidi Haavik, Bernadette Murphy

Subclinical neck pain (SCNP) is marked by painful “flare-ups” and minimal to no pain between flare-ups. It is associated with altered proprioception, slower mental rotation, and altered sensorimotor integration, suggesting that multisensory integration may also be affected. Effective multisensory integration is essential for many occupational and recreational tasks and it is important to know if SCNP affects it. **Objective:** to test whether SCNP results in altered response times to visual, auditory and multisensory stimuli vs healthy controls, and the consistency of results over time. **Methods:** A two-alternative forced-choice discrimination task recorded response times to presentation of visual stimuli (red, blue or green circles) and auditory (verbalization of the words red, blue and green) at baseline and week 4. **Results:** A two-way mixed ANOVA indicated that auditory response times improved over 4 weeks ($p < .05$) with no group difference. The SCNP group was slower at both visual and multisensory tasks ($p < .05$ for both), with no change for either group over 4 weeks. **Discussion:** This is the first to show that SCNP alters visual and multisensory response times. Visual and multisensory stimuli were found to be stable measures for use in future SCNP studies. (This is a conference presentation abstract and not a full work that has been published.)

Mindfulness within chiropractic

Fuchsia Farrow, Adrian Hunnisett, Sokratis Dinas, Christina Cunliffe

Objective: Mindfulness use is increasing in clinical practice, improving the therapeutic relationship between practitioner and patient. However, it is not widely used within chiropractic at present. With interpersonal skills being identified as important factors in chiropractic practice success and educational stress widely perceived by chiropractic interns, this study aims to investigate the potential of mindfulness within chiropractic practice. **Method:** Following ethical

approval, a qualitative study was undertaken. A sample group of chiropractic interns participated in a 2-day introductory workshop covering psycho-educational elements of mindfulness and basic mindfulness exercises. Semi structured focus groups were held six weeks post intervention, exploring attitudes, outcomes and usefulness of the concept. **Results:** Results suggest mindfulness supports the chiropractic intern to develop skills and attributes known to be important for chiropractic success and patient satisfaction. In addition, mindfulness has implications in developing therapeutic relationships and improving mental health and wellbeing of the interns. **Conclusion:** The results of this grass root study suggest that the practice of mindfulness is both relevant and useful within the field of chiropractic. Further research is indicated to help understand how mindfulness could be used to develop reflective practices, patient centred care and the intern’s confidence. (This is a conference presentation abstract and not a full work that has been published.)

Research priorities of the Canadian chiropractic profession

Simon French, Paul Bruno, Jill Hayden, Greg Kawchuk, Steven Passmore, John Srebely, Peter Beliveau

Objective: Identify research priority areas for the Canadian chiropractic profession. **Methods:** We conducted a modified Delphi consensus study to determine the views of Canadian chiropractic organisations (e.g. Canadian Chiropractic Association) and stakeholder groups (e.g. educational institutions, researchers). Participants completed two online survey rounds. In Round 1, participants suggested research areas in four broad research themes: 1) Biomedical; 2) Clinical; 3) Health services; 4) Population health. In Round 2, participants judged research areas’ importance; we defined consensus as $\geq 70\%$ of participants agreeing that a research area was “essential” or “very important”. **Results:** Participants (n=57) completed Round 1 (response rate 67%) and 54 completed Round 2. The following areas were considered important: 1) Biomedical: general mechanisms and effects of manipulation; neurophysiological mechanisms and effects of SMT; 2) Clinical: effects of chiropractic care; chiropractic care and older adults; safety/side effects of chiropractic care; 3) Health services: integration of chiropractic care into multidisciplinary settings; costs and cost-effectiveness of chiropractic care; effect of chiropractic care on reducing medical services; 4) Population health: none. **Conclusions:** This project identified research priority areas for the Canadian chiropractic profession. The next stage is to determine the priority rank of the identified research areas. (This is a conference presentation abstract and not a full work that has been published.)

The efficacy of workplace interventions on physical factors for office workers with neck pain: a meta-analysis

Martin Frutiger, Robert Borotkanics, Peter Tuchin

Objective. The objective is to determine the efficacy of workplace health promotion interventions (WHPI) compared to no intervention (or usual care) for physical factors in office workers with mechanical neck pain (MNP). **Search methods.** We searched: CENTRAL, PubMed, EMBASE, CINAHL, Web of Science, OTseeker and PEDro to March 2016, to conduct a meta-analysis. **Results.** We identified 4,532 references and included 17 RCTs (3,404 office workers). Four studies were rated as having low risk of bias. Since WHPI varied significantly, heterogeneity restricted pooling of data, and thus meta-analysis was not possible. Overall, low quality evidence that showed WHPI (such as muscle strength or resistance training, ergonomic changes, education/neck schools, or myofeedback), produced no significant reduction of neck pain prevalence and severity. Whilst some studies showed improvement in neck pain, significant results in favour of WHPI were not sustained across follow-up times. WHPI were seldom designed to improve return-to-work rates. **Conclusion.** Our study found low quality evidence that neither supported nor refuted the benefits of any specific WHPI for neck pain relief. This re-affirmed results from a previous systematic literature review. (This is a conference presentation abstract and not a full work that has been published.)

Correcting thoracic adolescent idiopathic scoliosis using a new 3D bracing approach: a case study

Bradley Gage, Jeb McAviney, Firoz Miyanji, Arvinder Ghag

Objective: To demonstrate the treatment results of a new type of 3-dimensional scoliosis brace, ScoliBrace, in a 14-year-old girl with a 52° thoracic adolescent idiopathic scoliosis co-managed by a chiropractor and orthopedic surgeons. **Clinical features:** The patient presented with a 52° right thoracic scoliosis, Risser 3, 22° of thoracolumbar trunk rotation, a TRACE score of 11/12. **Intervention:** The 3D ScoliBrace custom spinal orthosis was prescribed and supported by a rehabilitation program of ScoliRoll, mirror-image spinal traction, and exercises. The ScoliBrace uses a 3D “Mirror Image” approach rather than traditional 3-point pressure used in most scoliosis braces. This allows for a physiological correction based on spinal coupling. **Outcome:** At the end of treatment (18 months), the patient was Risser 5, the scoliosis had reduced to 36° - a correction of 16° (out of brace) and her TRACE was 6/12. **Conclusion:** The result of this case suggests that this new approach is an effective non-surgical approach in the treatment of large thoracic AIS curvatures. Traditional scoliosis braces aim to stabilize rather than improve the scoliosis. In this case significant correction was achieved. ScoliBrace can be successfully implemented by specially trained practitioners. (This is a conference presentation abstract and not a full work that has been published.)

Effects of palpation and two-point rolling thermography on skin temperature as assessed with a digital infrared thermography camera

Les Gilbert, Stephanie Sullivan, Julie Jordan, Ronald Hosek

Objectives: Using a digital infrared thermography camera this study sought to determine if two-point rolling thermography (RT) and palpation altered skin temperature and if those changes were sustained over time. **Methods:** Thirty participants were randomly assigned to three groups: palpation, RT and control (10 per group). Paraspinal thermography imaging was recorded using an IR-Pad 640 (ICI). Images were taken at baseline, 5, 10, 11, 15 and 20 minutes. Palpation or RT were applied between 10 and 11 minutes. During the study the participants were gownned and sitting with their backs exposed. **Results:** Following palpation and RT temperatures continued to increase in cervical regions at times 15 and 20 minutes, statistically significant for RT: L $p=0.019$, R $p=0.021$ and L $p=0.043$, R $p=0.019$, respectively. Although not significant, thoracolumbar regions demonstrated continued increases in temperature following RT. Control participants continued to experience decreases in temperature throughout study. Pre-contact temperatures were stable across groups. **Conclusion:** Palpation and rolling thermography appear to influence skin temperature up to 10 minutes following contact, especially the cervical region. This may have implications for techniques which commonly utilize pre and post RT to assess changes following chiropractic care. More research is needed. (This is a conference presentation abstract and not a full work that has been published.)

Subclinical neck pain affects motor skill acquisition and transfer as compared to a healthy control group

Ryan Gilley, Paul Yelder, Julianne Baarbe, Michael Holmes, Heidi Haavik, Bernadette Murphy

Subclinical neck pain (SCNP) pain impacts brain plasticity changes during motor skill acquisition but the relationship between skill acquisition and transfer is unknown. **Objective:** to determine if SCNP leads to worse performance during initial learning and transfer of a new skill (dart throwing). **Methods:** 39 volunteers who were novice dart throwers (mean age 21.4 years \pm 1.99) were divided into healthy (5 male and 6 females) and SCNP (10 males, 18 females), measured using the Chronic Pain Grading Scale. The x and y positions of the throw were logged and used to determine an absolute vector representing the distance from the origin of the dart board. **Results:** The SCNP group was significantly worse for both skill acquisition and transfer ($p<.05$). For healthy controls mean accuracy was 6.18 cm (± 0.90 cm), 4.57 cm (± 0.88 cm) and 3.4 cm (± 0.454 cm) for the skill acquisition trials 1-3 and 4.7 cm (± 0.68 cm) for the transfer task. For SCNP, mean accuracy was 8.17 cm (± 0.87 cm), 5.10 cm (± 0.57 cm) and 5.18 cm (± 0.77 cm) for trials 1-3, and 6.15 cm (± 0.63 cm) for the transfer task. **Conclusion:** SCNP impacts both acquisition and transfer of new motor skills. (This is a conference presentation abstract and not a full work that has been published.)

Integrative clinical pathway for veterans with spine pain and mental health co-morbidities: results of a Delphi process study

Christine Goertz, Stacie Salisbury, Cheryl Hawk, Robert Vining, Richard Branson, Linda Burgo, Virginia Smith, Robert Wallace, Cynthia Long, Anthony Lisi

Objective: The purpose of this study was to develop an integrative care pathway for doctors of chiropractic, primary care providers and mental health professionals who care for Veterans presenting with back pain with mental health comorbidities in preparation for a multidisciplinary intervention study. **Methods:** An interdisciplinary steering committee tailored existing back pain guidelines to link with current Veteran Health Administration pain and mental health initiatives to develop an integrative care pathway comprised of 43 seed statements and 2 care management algorithms. Fifty-six VHA clinicians participated in an on-line Delphi process to rate the appropriateness of the seed statements using the modified RAND/UCLA methodology. **Results:** Most (93%) seed statements achieved consensus among Delphi panelists during the first review round, with all statements reaching consensus following a revision process. Seed statements and algorithms addressed clinical evaluation, diagnostic imaging, informed consent, documentation of clinical outcomes, chiropractic treatment, case management, treatment frequency standards, interprofessional collaboration and referral, tailoring approaches to chiropractic care in Veteran populations, and clinical presentation and referral for common mental health conditions. **Conclusion:** This study achieved consensus on an integrative care pathway for chiropractic care in Veterans that will be tested in a clinical trial. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic integration into multidisciplinary healthcare centers: results of a multi-site qualitative case study

Christine Goertz, Elissa Twist, Stacie Salisbury, Virginia Smith, Anthony Lisi

We conducted a qualitative case study to describe organizational structures, referral and care processes, and perceived value of chiropractic integration within private sector medical facilities. Settings were selected from a pool of 31 organizations indicating interest in a 2-day site visit. We conducted 135 semi-structured interviews with clinicians, administrators, support staff and patients at 9 institutions with chiropractic incorporated into the delivery system. Analysis included thematic content analysis of audio recorded transcripts. Research sites included 5 hospitals and 4 clinics (1 private, 1 community, 1 university, 1 corporate health), all having unique organizational structures. Chiropractic co-management with other clinicians are perceived to have high value among patients, providers, and administration. At each site providers shared patient notes and referrals through electronic health record systems and reported ease of collaborative practice through direct communication. Most stakeholders expressed the need for the chiropractor to have experience and ability in communicating in a medical culture. Chiropractors reported their services were highly utilized, but many suggested that chiropractic services could be better marketed throughout the health system. At all sites the use of chiropractic services increased over time, with most facilities expanding their chiropractic workforce to meet increased demand. (This is a conference presentation abstract and not a full work that has been published.)

Assessment of chiropractic treatment for active duty, U.S. military personnel with low back pain: a randomized controlled trial

Christine Goertz, Cynthia Long, Robert Vining, Katherine Pohlman, Joan Walter, Ian Coulter

Objective: To determine if the addition of chiropractic manipulative therapy (CMT) to usual medical care (UMC) improved clinical outcomes for military personnel with low back pain (LBP). **Methods:** A comparative effectiveness trial designed to assess outcomes after 6 weeks of UMC + CMT vs UMC alone in 750 active duty service members with LBP. Equal numbers of participants were enrolled at 3 U.S. military treatment facilities (MTFs). Primary outcomes were the Roland Morris Disability Questionnaire (RMDQ) and numerical

rating scale for LBP intensity. Data were analyzed with mixed effects models over baseline, 2, 4 and 6 weeks, adjusted for sex, age, pain duration and worst pain during last 24 hours, at a 0.025 level of significance. **Results:** The models had significant group by site interactions. For each MTF, there was a statistically significant difference in mean change in LBP intensity between UMC + CMT versus UMC alone, ranging from 0.8 to 1.5. Mean RMDQ between groups difference (ranging from 1.3 to 3.0) was statistically significant at two MTFs. **Conclusion:** In active duty military personnel with LBP, those with UMC plus CMT showed greater improvement than UMC alone. These changes were of modest clinical importance. (This is a conference presentation abstract and not a full work that has been published.)

Cranio-cervical dysfunction as a cause of trigeminal impingement: a case report

Paul Gold

Objective: To familiarize the clinician with a method of managing head and atypical facial pain. Cranio-cervical joint dysfunction is known to be a condition causing otodynia, tinnitus, head and facial pain. Prompt recognition of the signs and symptomatology of this disorder including the implementation of an effective intervention are highlighted as paramount components of management for the chiropractic practitioner. **Clinical Features:** This case report describes a 47-year-old female patient, diagnosed with chronic cervico-occipital dysfunction that is associated with trigeminal impingement. Clinical features of this case include disabling occipital headache, retro-orbital and shock-like mandibular /TMJ pain as well as ipsilateral tongue paresthesia. Of note was the severe cervico-occipital dysfunction discovered during physical examination. **Intervention / Outcome:** Symptoms were successfully managed using spinal manipulative therapy, intraoral soft tissue techniques, TMJ manipulation and an electrotherapeutic modality. **Conclusion:** It is hypothesized that irritation of the trigemino-cervical nucleus is reduced through improving the function of the cervico-occipital articulation through reflex mechanism. (This is a conference presentation abstract and not a full work that has been published.)

Predictive factors for reporting adverse events following spinal manipulation in randomized clinical trials - secondary analysis of a systematic review

Lindsay Gorrell, Benjamin Brown, Reidar Lystad, Roger Engel

Objective: To investigate predictive factors for adverse events reporting in randomized clinical trials (RCTs) involving spinal manipulation (SM). **Data sources and selection:** The Physiotherapy Evidence Database (PEDro) and Cochrane Central Register of Controlled Trials (CENTRAL) were searched for RCTs involving SM. **Domains of interest included:** sample size; publication of the article relative to the 2010 CONSORT statement; methodological quality of the trial; the region treated, classified as either 'back' or 'neck'; and number of intervention sessions. **Results:** 7,398 records were identified in the electronic searches, of which 368 articles were eligible for inclusion. A total of 140 (38.0%) articles reported on adverse events. Articles were more likely to report on adverse events if they possessed larger sample sizes, were published following the 2010 CONSORT statement, had a low risk of bias and involved multiple intervention sessions. The spinal region treated was not a significant predictor. **Conclusions:** Trials with smaller sample sizes, a publication date prior to the 2010 CONSORT statement, a high risk of bias and involving only a single intervention session were significantly less likely to report on adverse events. (This is a conference presentation abstract and not a full work that has been published.)

Prefrontal blood volume changes with neck positioning

Hercules Grant, Greg Kawchuk

Objective: Cervical spine screening tests, used to rule out contraindications to manual therapy, attempt to identify compromised cerebral circulation through neck positioning. Unfortunately, most tests are subjective, expensive or do not measure the site of interest (i.e. brain). We quantified total brain hemoglobin (tHb) as a function of neck position using a novel non-invasive measure; hypothesizing that prefrontal tHb will not be altered significantly by neck positions. **Method:** Total hemoglobin was measured over the prefrontal cortex

(PFC) in 14 healthy supine participants, via functional Near Infrared Spectroscopy (fNIRS). From a neutral neck position, participants actively moved into 8 unique neck positions at regular timed intervals. Two-way repeated measures ANOVA was performed (change in tHb as the dependent variable; neck position and side of the PFC as within subject factors). **Results:** A significant difference in PFC tHb was noted for neck position ($p=.048$). Greatest reduction was noted for flexed positioning (right, left side flexion and axial flexion) when compared to all other neck positions. There was no significant difference when comparing the left and right PFC. **Conclusion:** Neck positioning can alter PFC blood volume making a potential tool for screening vascular insufficiency within the brain. (This is a conference presentation abstract and not a full work that has been published.)

A qualitative study describing the experience of students successively enrolled in chiropractic and medical school

Julie-Marthe Grenier, Danica Brousseau

Objectives: The goal of this project was to explore the academic and personal experience of chiropractic students or recently graduated chiropractors who decided to pursue a medical degree. **Methods:** An IRB approved qualitative research methodology was utilized along with a thematic analysis of the experiences of four students with review and validation by a 5th participant. Data was acquired through in-depth interviews and discussion. **Results:** A comparison between the two educational experiences was slowly established through the discussion: similarities and differences between both curricula from an academic and personal perspective, perceived strengths and weaknesses, best memories and recommendations for changes. This study revealed that although all participants considered that the DC program was more difficult than medical school, they all agreed that the overall personal or social experience was better while studying chiropractic. The small class sizes, the ease of making and keeping friends as well as the availability of professors and relaxed atmosphere were mentioned to explain this perception. Conversely, the academic experience was described as much more satisfying, better organized and focused in medical school, but impersonal and strict. **Conclusion:** This study gives insight into the perceived differences between chiropractic and medical curricula. (This is a conference presentation abstract and not a full work that has been published.)

Dose-response and efficacy of spinal manipulation for cervicogenic headache: short-term outcomes from a randomized controlled trial

Mitch Haas, Gert Bronfort, Roni Evans, Craig Schulz, Darcy Vavrek, Leslie Takaki, Linda Hanson, Brent Leininger, Moni Neradliek

Objective: Conduct the first full-scale study to evaluate dose-response of spinal manipulation for cervicogenic headache (CGH). **Methods:** Participants in this two-site, observer-blind, randomized controlled trial ($N = 256$) received 18 treatments in 6 weeks from a chiropractor. Participants were randomized to a dose of 0, 6, 12, or 18 sessions of cervical/upper-thoracic manipulation with a light-massage control administered at each remaining visit. Outcomes at 6, 12, and 24 weeks were days with CGH (primary outcome) and average pain (0 to 10 scale) in the prior 4 weeks. Outcomes were regressed on the number of manipulation sessions and adjusted for baseline covariates. Adjusted mean differences between manipulation and control groups were also computed. **Results:** Mean CGH days improved up to 50% (18 visits) with concomitant 28% mean pain improvement. A linear relationship favoring higher dosage of manipulation was found at the three follow-ups for CGH days (-0.9 to -1.4 days per 6 visits, $P < .05$) and pain (-0.19 points per 6 visits, $P < .05$). Eighteen manipulation sessions generally showed the greatest advantage over the control group. **Conclusion:** Modest dose-response for CGH days and pain was observed; 18 sessions of manipulation yielded best outcomes. (This is a conference presentation abstract and not a full work that has been published.)

Spinal pains and comorbid conditions in the adult us population: data from the 2011-2013 National Health Interview Survey

Scott Haldeman, Haiou Yang, Bart Green

Objectives: Recent research indicates that spine pain may be related to a number of chronic physical and mental conditions. The objective of

the study was to explore the bi-directional associations between a range of co-morbid conditions and spinal pains in the US adult population. **Methods:** Data for this study were from the 2011-2013 National Health Interview Surveys. Multivariable logistic regression with the variance estimation method was used to explore the bi-directional associations in the adult population (18+). Spinal pain was defined as neck or low back pain in the past 3 months. Co-morbid conditions included: circulatory diseases, hypertension, respiratory conditions, liver conditions, kidney conditions, cancer, ulcer, diabetes, obesity, depression/anxiety, arthritis, headache, joint pain and facial pain. Related demographics variables were controlled as confounders. The sample size was 102,020. **Results:** Significant bi-directional associations were found between spinal pains and many of the studied comorbidities with (odd ratio that ranged from 1.38 to 6.47). **Conclusions:** This study shows a set of co-morbid conditions for spinal pains with a representative national sample. Findings of this study support research in this area. However, the pathways of how spinal pain and these co-morbid conditions are related are unclear. (This is a conference presentation abstract and not a full work that has been published.)

Open mouth lateral bending views for craniocervical junction hypermobility: a reliability study

Karthik Hariharan, Michael Schneider, Matthew Maxwell

Objective: The involvement of the craniocervical junction (CCJ) leading to latent symptoms following closed head and neck trauma is poorly understood. The clinical detection of hypermobility in this region is dependent on expertise and static imaging modalities. This study aims to establish the inter-rater reliability of examining lateral-bending open-mouth cervical radiographs. **Methods:** This inter-examiner reliability study used a convenience sample of retrospective patient records of 56 patients between 18-60 years of age following concussion or cervical spine injury. Evidence of fracture, dislocation or neck surgery were excluded. Two musculoskeletal radiologists and two clinicians performed qualitative and quantitative assessments of the amount of asymmetry noted between various osseous landmarks on Cervical open-mouth lateral-bending X-ray images. Reliability statistics, Kappa coefficients and ICC were calculated for levels of agreement. **Results:** Kappa values for the qualitative assessments were good (K range=.42-.70) for asymmetry of neutral C2 spinous position; dens-lateral mass spacing; "step-off" between the lateral borders of the C2 vertebral body and C1 lateral mass (K range=.47-.78). ICC values for quantitative measurements were excellent (ICC range=.56-.97). **Conclusions:** Qualitative and quantitative measurements used demonstrated good-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.)

Best practices for chiropractic care for older adults: a consensus update

Cheryl Hawk, Michael Schneider, Mitchell Haas, Paul Dougherty, Brina Gleberzon, Lisa Killinger, Paul Katz, John Weeks

Objective: The purpose of this project was to advance and update the recommendations found in a 2010 "best practice" publication. This was achieved by combining the most recent and relevant literature with the expert opinion and clinical experience of a Delphi panel and steering committee. **Methods:** A systematic review identified articles which were used by the steering committee to develop seed statements. Using the RAND-UCLA methodology, a multidisciplinary Delphi panel, consisting of content experts in practice, research and teaching reviewed and edited these seed statements until consensus approval was reached. **Results:** Consensus was reached on 45 recommendations. Topics were: general clinical principles in the care of older adults; informed consent, including risks and benefits; management approaches; history and examination, including red flags; diagnostic imaging; manual procedures; care planning; and disease prevention and health promotion. The literature and recommendations will be summarized in the presentation. **Conclusion:** This project reached consensus on a set of recommendations on "best practices" for the assessment and management of older adult chiropractic patients. A collateral benefit was to identify areas of healthcare currently under-investigated in hopes that targeted research initiatives will be

undertaken to fill in these evidentiary gaps. (This is a conference presentation abstract and not a full work that has been published.)

Student and new graduate perception of hospital versus traditional institution clinic in clinical educational experience

Navine Haworth, Linda Jones

Objective: To explore final year students and new graduates from two North American Chiropractic Colleges regarding perceptions of the clinical educational experience in a hospital versus the institution clinical setting. **Methods:** A qualitative exploratory descriptive design was used for this research. Students and new graduates were invited to participate. Semi structured interviews were conducted with 49 students and 13 new graduates lasting 60 minutes. **Results:** The patient case mix tended to be varied and more complex in the hospital versus the institutional setting, challenging the clinical skills of the students. Achievement of confidence and competence was considered in some aspects more within the hospital setting with the degree of patient complexity, varied case mix and intense pace, and the sense of feeling more prepared clinically. **Conclusion:** The hospital clinical rotation was profoundly seen as a benefit to the clinical experience by those who had the opportunity. As most graduate opportunities are private practice, the institutional clinical environment will provide a sufficient clinical teaching and learning environment to support the professional needs. A combination of these environments considered ideal for the graduate. (This is a conference presentation abstract and not a full work that has been published.)

Employer-funded onsite Chiropractic: effects on workers' compensation and associated costs

Chad Henriksen

Objective: This study analyzes the effectiveness of a one-year program integrating chiropractic services in an employer-funded, onsite care environment to reduce the rate and cost of cumulative trauma and sprain/strain neuromusculoskeletal workplace injuries. **Methods:** A 12-month service contract was established with a manufacturing company to provide onsite chiropractic services including patient care, wellness consultation, and ergonomic recommendations. Services were provided 7 hours/week and employees engaged voluntarily. Year-over-year de-identified workers' compensation claims were reviewed assessing cumulative trauma and sprain/strain injury rate and associated costs. Indirect costs were calculated using OSHA's most conservative multiplier, 1.1x direct cost. **Results:** 93 of 180 employees participated in the program. The injury rate decreased 63%; case cost average decreased 67%; direct workers' compensation cost decreased 88%. Including direct and indirect costs, the program yielded a savings of \$470,877 and a return on investment of \$8.35 for every dollar invested. **Conclusion:** Results show a marked reduction in measured injury rate, cost per injury, and workers' compensation cost. This suggests that employer-funded onsite chiropractic services may positively impact the reduction of workplace injuries and associated costs. Further studies are needed to test these results in a controlled trial and across multiple environments. (This is a conference presentation abstract and not a full work that has been published.)

Does motor development in early childhood predict spinal pain in early adolescence?

Lise Hestbaek, Steven Kamper, Jan Hartvigsen, Anne-Marie Nybo Andersen

Objective: To investigate the relationship between motor skills and coordination at age seven and spinal pain at age eleven. **Methods:** The mothers of 43,000 seven year old children answered a questionnaire (DCDQ) with subscales of control during movement, fine motor skills and general coordination. At age eleven, 30,000 of these children answered a questionnaire (YSQ) about frequency and intensity of cervical, thoracic and lumbar pain. Pain was defined as 'sometimes' or 'often' and with an intensity of ≥ 3 on an 11-point scale. Associations were explored by logistic regression analyses and all estimates were adjusted for sex, mother's schooling, height and weight at age 7. **Results:** All three subscales were significantly associated with thoracic pain; fine motor skills and general coordination with neck pain; no associations were detected with lumbar pain. The general coordination subscale score was the strongest predictor of pain. Compared to the children in

the top 10%, those in the bottom 10% had higher odds of cervical (OR:1.43, 95%CI:1.22-1.68), and thoracic pain (OR:1.56, 95%CI:1.26-1.93). **Conclusion:** In the prevention of spinal pain, motor- and coordination skills should be considered - both as a risk indicator and as a target area for intervention. (This is a conference presentation abstract and not a full work that has been published.)

Comparison of patient, clinician, and researcher definitions of chronic pain: Data from a national sample of chiropractic providers and their patients with low back and cervical pain

Lara Hilton, Margaret Whitley, Lisa Miyashiro, Gery Ryan, Ian Coulter

Objectives: Patient perspectives on what constitutes chronic pain are less understood than clinician and research definitions. We explored the relationships between the three perspectives on chronicity. This study is nested within an NCCIH Center of Excellence for Research on CAM. **Methods:** In this comparative analysis, a cross sectional sample of chiropractic chronic low back and cervical pain patients (N=1600) was surveyed and asked about their perspectives on chronic pain. Their chiropractors were surveyed simultaneously (N=120). These data are compared with standard research definitions that are the recommended guidelines for inclusion in chronic pain studies developed by the NIH Low Back Pain Task Force. **Results:** Findings indicate that patient definitions are misaligned with research and clinician definitions; however, research and clinical definitions overlap somewhat. Clinical and research definitions emphasize time, while patient definitions emphasize permanency of the condition, quality of life, and function. **Conclusions:** Patient attitudes about pain are important as they impact care seeking behaviors and expectations for outcomes. Findings are key for future research on chronic pain within the context of patient-centered care that emphasizes the provision of care that is respectful of and responsive to individual patient preferences, needs, and values. (This is a conference presentation abstract and not a full work that has been published.)

The effects of a single session of spinal manipulation on strength and cortical drive in stroke patients

Kelly Holt, Imran Khan Niazi, Rasmus Wiberg, Jens Duehr, Imrad Amjad, Muhammad Shafiq, Harrison Ndetan, Heid Haavik

Objective: This study investigated whether a single session of spinal manipulation (SM) increased strength and cortical drive in stroke patients. Method: Soleus evoked V-wave (cortical drive), H-reflex, and maximum voluntary contractions (strength) of the plantar flexors were recorded from 12 stroke patients using a randomised controlled crossover design. Outcomes were assessed immediately pre and post SM or a passive movement control. A repeated measures ANOVA was used to assess within and between group differences. Significance was set at $p \leq 0.05$. **Results:** SM resulted in increased strength ($F(1,11)=14.49, p<0.01$) and V-wave amplitude ($F(1,11)=9.67, p=0.01$) compared to the control. There was a $64.61\% \pm 74.81\%$ increase in strength after SM ($p=0.03$) and a decrease of $26.48\% \pm 14.85\%$ after the control ($p<0.01$). There was a $53.95\% \pm 68.07\%$ increase in V-wave amplitude after SM ($p=0.04$) and a non-significant $12.06\% \pm 14.39\%$ decrease in V-wave amplitude after the control ($p=0.07$). There were no significant differences in H reflex parameters in either group. **Conclusion:** In this group of stroke patients SM resulted in increased lower limb strength and cortical drive to the affected limb. Further research is required to investigate the longer term and potential functional effects of SM in stroke recovery. (This is a conference presentation abstract and not a full work that has been published.)

Building chiropractic research capacity for the chiropractic profession to impact spinal health: an international survey

Claire Johnson, William Meeker, Gregory Cramer, Mitchell Haas, Robert Mootz, John Mrozek

Objective: The purpose of this study was to identify barriers and solutions for building chiropractic research capacity. **Methods:** A survey and focus groups were performed for this IRB exempted study. An electronic survey (SurveyMonkey) was distributed widely to the international research and academic community. Participants provid-

ed consent and demographic information. Open-ended questions related to research capacity. At ACCRAC 2016, workshop attendees participated in focus groups to recommend solutions for building research capacity. **Results:** The survey resulted in 144 international research participants from over 60 programs or institutions. Barriers mentioned included lack of: funding (103), infrastructure/training (76), research positions and programs (74), research culture/mentorship (66), value/support for research (62), collaboration (57), and direction (20). Survey comments and focus group leader summaries included these solutions: increase training; develop resource and funding infrastructure; develop inter and intraprofessional collaborations; improve research agenda; develop research infrastructure within educational institutions; and develop culture to use and understand research. This presentation describes details of these findings. **Conclusion:** International efforts have identified a critical interaction between 3 major elements in the chiropractic profession: individuals/scientists, institutions/organizations, and sources of funding and resources. Relationship building and maintenance are needed among these elements. (This is a conference presentation abstract and not a full work that has been published.)

Spinal stiffness assessment with simultaneous magnetic resonance imaging: A feasibility study to determine how various spinal tissues contribute to spinal stiffness measures

Peter Jun, Greg Kawchuk

Objective: Whether by hand or by instrument, skin-based evaluation of spinal stiffness results in a bulk response comprised of individual tissue contributions. This feasibility study was conducted to determine if spinal stiffness measures could be collected simultaneously with magnetic resonance imaging (MRI) to better understand how individual spinal tissues contribute to spinal stiffness measures. **Methods:** An MRI compatible indentation device was used to apply increasing loads ranging from 0N to 60N to a single lumbar spinous process in a prone asymptomatic subject within an open MRI unit. Resulting tissue displacements and deformations were quantified using image processing software. **Results:** Our results suggest it is feasible to perform indentation measurements in an open MRI unit. Our data indicate that soft tissues deform at different rates compared to the displacement of vertebrae. In addition, deformation/displacement characteristics appear to be unique to individuals. **Conclusion:** To our knowledge, this is the first study to image, then measure, the response of individual lumbar tissues to stiffness testing. This approach allows us to develop new knowledge regarding the contribution of different spinal tissues to stiffness measures and better understand how stiffness measures may change over time or with treatment. (This is a conference presentation abstract and not a full work that has been published.)

Neural correlates of spinal manipulative therapy

Norman Kettner, Ekaterina Protsenko, Ishtiaq Mawla, Matthew Kowalski, David Swenson, Deanna O'Dwyer-Swenson, Vitaly Napadow, Marco Loggia

Objective: A growing body of evidence suggests that spinal manipulative therapy (SMT) can be helpful for a subset of chronic low back pain patients. However, the mechanisms mediating its beneficial effects are not fully understood. **Methods:** We evaluated the effect of SMT on the brain using arterial spin labeling (ASL), i.e., a functional magnetic resonance imaging technique that allows for the noninvasive assessment of brain perfusion. Thirteen non-specific low back pain patients (7 female) and 13 age- and gender-matched healthy controls completed ASL scans immediately pre- and post- grade 5 lumbar spinal manipulation. Pseudocontinuous ASL data were collected on a 3T Siemens Skyra scanner, equipped with a 32 channel head coil, and processed to obtain regional cerebral blood flow (rCBF) maps. **Results:** SMT-induced changes in rCBF differed between healthy controls and patients, with the former experiencing increases in middle cingulate and prefrontal regions, and the latter demonstrating increases in the posterior cingulate cortex. In patients, SMT-induced rCBF increases in the cingulate and prefrontal cortices were associated with larger decreases in clinical pain. **Conclusion:** SMT induces immediate changes in the brain that may be linked to its beneficial effect. (This is a conference presentation abstract and not a full work that has been published.)

The STarT Back Tool in Chiropractic Practice: A Narrative Review

Yasmeen Khan

Objective: In primary care and physical therapy settings, STarT Back Tool (SBT)'s stratified care plans improved patients' low back pain outcomes. The aim of this review was to examine studies that used the SBT in chiropractic settings. **Data Sources and Selection:** PubMed, Cochrane, Index to Chiropractic Literature, and Science Direct databases were searched using search terms "start back screening tool AND chiropractic." **Results:** 5 articles were selected. The SBT was feasibly incorporated into chiropractic clinics, total SBT scores correlated to total Bournemouth Questionnaire scores (BQ) (correlation 0.55, $p < 0.001$), and SBT's "low mood" question correlated with Bournemouth's "depression" question (correlation 0.54, $p < 0.001$). The SBT was a poor predictor of future Patient Global Impression of Change and Numerical Pain Rating Scale scores and clinicians predicted future outcomes better than the SBT. However, the SBT was predictive in chiropractic, general practitioner and physical therapy settings when episode duration was ≥ 2 weeks. **Conclusion:** The SBT can be incorporated into chiropractic settings and correlates with elements of the BQ, but its prognostic ability is limited by shorter low back pain episodes. (This is a conference presentation abstract and not a full work that has been published.)

A clinician's approach to doctor – patient boundaries

Stuart Kinsinger

Objective: This paper summarizes a review of the literature in the domain of professional boundaries within the clinical milieu. Discussion focuses on the ethical foundations that form the social contract between society and the professions, and concludes with a systematic approach to the professional's role in setting and maintaining a functional patient boundary. **Data sources and Selection:** A literature search gathered published articles seeking "professionalism" and "boundaries" 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 conducting clinical practice. **Results and Discussion:** While the total number of citations and publications is limited, there is general agreement in defining a boundary's function in addition to related issues including power differential and primacy of the patient. Discussion of social contract and moral agency form the essential ethical foundation of boundaries. **Conclusion:** From the peer reviewed literature, profession guidelines and foundational ethical tenets, a four step approach is given to assist the health care practitioner in boundary setting and maintenance. (This is a conference presentation abstract and not a full work that has been published.)

An exploratory analysis of gender as a potential modifier of treatment effect among patients in a randomized controlled trial of integrative acupuncture and spinal manipulation for low back pain

Anupama Kizhakkeveetil, Kevin Rose, Gena Kadar, Eric Hurwitz

Objective: To identify the potential modifying effect of gender on pain and disability among patients in a randomized controlled trial of integrative acupuncture and spinal manipulation (SM) for low back pain (LBP). **Methods:** Adult patients ($n=80$) were randomized to acupuncture, SM, or both combined at a university health center. Outcome measures were the Roland-Morris Disability Questionnaire and numeric pain scales. Regression models were used to estimate and test for sex-specific differences in age-adjusted changes from baseline through end of treatment. **Results:** Females assigned to acupuncture averaged a 3.8-point reduction in highest LBP vs. 2.0 points for SM, while males assigned to SM averaged a 3.5-point reduction vs. 1.8 points for acupuncture (P for interaction = 0.0392). There was a trend towards the same for disability (P for interaction = 0.1188). For females, acupuncture alone led to better outcomes without SM, and for males, SM alone led to better outcomes without acupuncture. **Conclusions:** Gender was found to modify the effect of integrative treatment for LBP: females demonstrated a greater reduction in pain and disability with acupuncture and males with SM. Future clinical trials should consider gender as a potential determinant of treatment

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

The combined use of spinal manipulation and acupuncture as a potential integrative care for low back pain: analysis of health interview survey data

Anupama Kizhakkeveetil, Harrison Ndetan, Cheryl Hawk, Marion Evans, Vishaldeep Sekhon

Objective: To explore the potential of combining spinal manipulation and acupuncture as an integrative approach for managing low back pain (LBP) by adults in the United States (US). **Methods:** Data from the 2012 US national health interview survey (NHIS) was analyzed using SAS 9.3. A subset of adults who reported having LBP in the past 3months defined the analytical database. Applying the complex survey design structure, national population estimates (NPE) were generated for those using both spinal manipulation and acupuncture as treatment for LBP. Odds ratio (OR) and 95% confidence interval (CI) was generated from binary logistics regression to assess the likelihood that it was helpful. **Results:** LBP in past 3months was reported by 29.2% of the respondents ($NPE=65823057$) among which only 0.8% ($NPE=549036$) reported the combined use of spinal manipulation and acupuncture for treatment. These respondents were more likely to report this combined treatment option as being helpful than not [$NPE = 481164$ (87.6%); OR (95%CI) = 14.30 (4.07,50.18)]. **Conclusion:** A small proportion of US adults used both combine spinal manipulation and acupuncture for LBP. However, among these, there is a high likelihood that it helps, suggesting a huge potential for integrative care through this combination, subject to future investigation. (This is a conference presentation abstract and not a full work that has been published.)

Development, evaluation and implementation of an interprofessional collaboration competency framework - experiences from an inner city teaching hospital

Deborah Kopansky-Giles, Ashley Skiffington, Norman Dewhurst, Lori Whelan, Fok-Han Leung, Ellen Newbold, Lindsay Beavers

Objective: Collaboration in practice is important in today's health care system and has been identified as an essential element in addressing fragmented healthcare systems (WHO 2010). Attainment and assessment of collaborative competency have been prioritized to support interprofessional care. It remains challenging however, for health care institutions to implement these best practice approaches. At a Toronto Hospital, an Interprofessional Collaboration Competency (IPC-C) Working Group was created to develop, evaluate and implement an IPC-C Framework to be applied across all health teams and disciplines. **Methods:** The working group conducted a literature review, created a draft framework, conducted validation testing of the framework and toolkit, and undertook pilot testing of components of the frameworks' implementation strategy. **Results:** The IPC-C Framework and toolkit have been validated. Piloted teaching strategies (simulation, web based tutorial, small group teaching) and integration with human resource (HR) processes were successful, enabling the hospital to proceed to full implementation. **Conclusion:** The outcomes of the validation and pilot testing of our framework and dissemination approaches has resulted in the creation of a multiyear cross-hospital strategy to support three research streams (HR - team competency attainment, education strategy, and patient outcomes) which are currently in development. (This is a conference presentation abstract and not a full work that has been published.)

The effect of a training program on speed development for students delivering prone thoracic manipulations

Steven Lester, David Starmer, Leah Barbaro, Brittany Fraser, Justine Landry, Kailee Stock

Objective: Examine if a six week speed-focused training program (6WSFTP) reduces the time to peak force (TTPF) in chiropractic students while performing prone thoracic manipulations. **Methods:** Students were asked to perform a prone thoracic manipulation on a force-sensing table with a target peak force of 600N. Thirty-six participants were selected from those with a TTPF greater than 115 ms and were randomly assigned into intervention and control groups. The intervention group went through a 6WSFTP. Post-intervention

data was collected and put through an ANCOVA type regression with R software to examine the difference in TTPF between the two groups. **Results:** Post intervention data was collected on 15/18 participants in the intervention group, and 17/18 participants in the control group. After adjusting for the baseline scores, there was an 8.1 ms decrease in time to peak force for the intervention group and a 7.9 ms increase in time to peak force for the control group. The intervention group's time to peak force was on average 16 ms faster than the control group (p -value = 0.0256). **Conclusions:** The results suggest that a 6WSFTP can reduce the TTPF in chiropractic students while performing prone thoracic manipulations. (This is a conference presentation abstract and not a full work that has been published.)

Tumor imaging instruction and assessment at chiropractic colleges in the US and Canada, a pilot study with implications for NBCE content

Kathleen Linaker, Sarah Arpin, Charles Fisher, Michael Sackett, Leslie Georger

Objective: Determine consistency in what, why, and how tumor imaging is taught and assessed and if NBCE test plan impacts tumor imaging curricular decisions at chiropractic colleges in the US and Canada. **Methods:** Electronic survey sent to lead tumor imaging instructors at all chiropractic colleges in the USA and Canada and a focus group of instructors was conducted to clarify ambiguous data. **Results:** 26 tumors were considered clinically significant by more than 65% of instructors, 9 tumors were identified as not clinically significant by more than 65% with 4 tumors considered clinically significant by 35-65% of instructors. Pearson correlation coefficient for the percent who evaluate versus percent who think the tumor is important revealed a correlation of $r=0.957$ with a p -value of $p<.001$. The focus group addressed the 4 equivocal tumors and recommended they be added to the list of clinically insignificant tumors. **Conclusions:** Chordoma, parosteal sarcoma, intraosseous lipoma, fibrosarcoma, extraosseous osteosarcoma, multicentric osteosarcoma, Gardner's syndrome, Maffucci's syndrome, synovial sarcoma, chondromyxoid fibroma, neuroblastoma, adamantinoma, and periosteal chondroma are not considered clinically important by $> 65\%$ of primary tumor instructors and should be removed from NBCE examinations. (This is a conference presentation abstract and not a full work that has been published.)

Endurance of neck extensor muscles: evaluation of patients with tension-type headache

Andree-Anne Marchand, Marie-Pier Girard, Marie-Eve Hebert, Martin Descarreaux

Objective: Knowing that cervical spine muscle impairments are involved in the pathogenesis of headaches, this cross sectional study aimed at determining if endurance of neck extensor muscles can be used to differentiate patients with tension-type headache (TTH) from healthy adults. **Methods:** Thirty-seven participants with ($n=17$) and without TTH ($n=20$) completed an isometric neck extensors endurance task at their 60% of maximum voluntary contraction (MVC). Fatigue of neck extensor muscles, assessed by surface electromyography (bilateral sternocleidomastoid, upper trapezius, and C4 paraspinals), endurance time, perceived exertion (Borg scale), and pre-post intervention MVC, was compared between groups. **Results:** Fatigue occurred in both groups as confirmed by a positive mean root mean square (RMS) slope and a negative median frequency (MDF) slope for all six muscles, and a decrease in MVC after the endurance task (4% versus 6% for healthy and TTH respectively). Participants with TTH (mean=64.1sec \pm 11.8) held position for significantly less longer than controls (mean=83.9sec \pm 36.8; $p=0.04$). **Conclusion:** Neck extensor endurance in a submaximal isometric task can help objectively discriminate patients with TTH from healthy adults. Future cohort studies should inform whether neck extensor muscle endurance can predict headache intensity, frequency and disability. (This is a conference presentation abstract and not a full work that has been published.)

Regeneration of the intervertebral disc: evidence using a defined molecular approach based upon the notochordal cell secretome

Ajay Matta, M. Zia Karim, David Isenman, W. Mark Erwin

The non-chondrodystrophic canine (NCD or 'mongrel') intervertebral disc is protected from developing degenerative disc disease (DDD) ostensibly due to its retention of notochordal cells (NC) in the nucleus pulposus (NP). On the other hand, chondrodystrophic canines (such as beagles) and humans, develop DDD significantly and lack these cells. We performed secretome analysis of the NC-rich NP and using mass-spectrometry, identified 303 proteins including components of TGF β - and Wnt-signaling, anti-angiogenic factors and proteins that inhibit axonal ingrowth in the bioactive fractions of serum free, notochordal cell conditioned medium (NCCM). Ingenuity Pathway Analysis revealed TGF β 1 and CTGF as major hubs in protein interaction networks. A single intra-discal injection of recombinant TGF β 1 and CTGF proteins in a pre-clinical rat tail-disc injury model restored the NC and stem cell rich NP. In vitro treatment with TGF β 1 and CTGF promoted the synthesis of healthy extra-cellular matrix proteins, increased cell proliferation and reduced cell death in human degenerative disc NP cells. In conclusion, we demonstrate that percutaneous delivery of TGF β 1 and CTGF can restore homeostasis and prevent degeneration in a disc injury model of DDD thereby demonstrating the utility of these molecules as therapeutic agents to treat degenerative disc disease. (This is a conference presentation abstract and not a full work that has been published.)

Sonographic diagnosis of upper extremity effort thrombosis (Paget-Schroetter syndrome): a case report

Ross Mattox, Norman Kettner

Objective: This case report describes the use of ultrasound (US) in the diagnosis of Paget-Schroetter (PS) syndrome during evaluation of acute shoulder pain following an athletic competition. Effort thrombosis of the axillary-subclavian vein (PS) typically occurs in young healthy athletes. **Clinical features:** A 15-year-old male was referred for sonographic evaluation of dull shoulder pain on his dominant side after pitching in a baseball game. The working diagnosis was subscapularis tendonopathy. **Intervention and outcomes:** Ultrasonography of the painful shoulder was unremarkable using the standard scan protocol. Further US investigation using a non-protocol position (abduction and external rotation of the arm) revealed thrombosis of the axillary-subclavian vein, which correlated with the area of chief complaint. Emergent referral followed and treatment was initiated with thrombolysis and surgical intervention by thrombectomy. **Conclusion:** Shoulder US provided the incidental diagnosis of a life threatening condition in the workup for a presumed musculoskeletal diagnosis. Thorough US exams require knowledge of anatomy, pathophysiology, and clinical differential diagnosis beyond the standard scanning protocol. If only the standard US shoulder protocol had been completed in this case, a potentially lethal diagnosis would have been missed. Optimal outcome was achieved with prompt US diagnosis. (This is a conference presentation abstract and not a full work that has been published.)

Can you feel it? Limitations in palpating spinal stiffness

Stephen Miazaga, Greg Kawchuk, Jonathan Kawchuk, Martha Funabashi, Arnold Wong

Objective: To quantify stiffness detection thresholds then determine if these explain palpation performance. **Methods:** The threshold of stiffness detection was quantified in twelve clinicians using a standard methodology. Each clinician blindly palpated two targets whose differential stiffness was altered by investigators. Clinicians then palpated vertebral pairs in an asymptomatic subject (T7/L3, T7/L4, L3/L4) and were asked which of each pair was stiffer. Actual stiffness was quantified by a validated instrument developed in the Kawchuk Lab. **Results:** The mean palpation detection threshold was 8% (SD:3%). When the difference in measured inter-vertebral stiffness exceeded the threshold, 83% of clinicians correctly identified the stiff vertebra (20% difference between T7/L3; 30% difference between T7/L4). Alternatively, only 25% of clinicians identified the stiff vertebra when the stiffness difference approached the palpation threshold (10% difference between L3/L4). **Conclusion:** While clinicians can detect large stiffness changes between spinal regions, they are less able to detect small changes between adjacent vertebrae. These results suggest that physiological limits in palpation sensitivity prevent clinicians from identifying small stiffness changes such as those following spinal manipulation. Given instrumentation can detect

small changes in stiffness, using instrumentation over palpation may reveal new ways to optimize patient care. (This is a conference presentation abstract and not a full work that has been published.)

A systematic review of thrust manipulation plus one conservative intervention for non-surgical rotator cuff conditions

Amy Minkalis, Robert Vining, Cynthia Long, Cheryl Hawk, Katie de Luca

Objective: To determine the effects of thrust manipulation (TM) plus 1 conservative therapy for non-surgical shoulder pain and disability due to rotator cuff dysfunction.

Data Sources and Selection: Databases searched: PubMed, PEDro, ICL, CINAHL, AMED. Included were randomized trials studying participants diagnosed with a specific rotator cuff condition. Eligible interventions were TM directed to the shoulder and/or cervical or thoracic spine plus 1 conservative therapy. The PEDro scale was used to assess methodological quality and GRADE for qualitative analysis. **Results:** Initial search rendered 1442 articles with 2 meeting eligibility criteria. One study examined thoracic TM with exercise compared to a sham TM with exercise. Statistically significant changes in pain and disability were reported within but not between groups. The second study investigated exercise compared to exercise with manual therapy (including TM). Statistically significant improvements in pain and function between groups were reported favoring the manual therapy group. Using PEDro, both studies scored 6/10 indicating good quality. GRADE analysis revealed moderate quality evidence. **Conclusion:** Few clinical trials have been conducted studying TM plus 1 conservative therapy for non-surgical rotator cuff conditions rendering available evidence of TM plus exercise insufficient to determine effects of this combined treatment. (This is a conference presentation abstract and not a full work that has been published.)

Profiling chiropractic practices and their patients: Ontario chiropractic observation and analysis study (O-COAST)

Silvano Mior, Jessica Wong, Peter Beliveau, Andres Bussieres, Simon French

Objective: To describe the profiles of chiropractic practices and their patients in Ontario, Canada. **Methods:** We used a cross-sectional observational design. We generated a list of 135 randomly selected chiropractors from all those licensed in Ontario (3978 chiropractors), and approached them for participation. Each chiropractor collected information for ≤ 100 consecutive patient encounters, documenting patient health profile, reasons for encounter, diagnoses, and care. Data were coded and descriptive statistics summarized chiropractor, patient, and encounter characteristics, accounting for clustering and design effects. **Results:** From those chiropractors approached, 15 were ineligible, 43 participated and 42 completed, providing data on 3523 encounters. Over 65% of chiropractor participants were male, with mean age 44 years and in practice 15 years (mean). Participants predominantly reported treating neuromusculoskeletal problems. The typical patient was female (56% of encounters), between 45-64 years (43%), retired (21%), or employed in business, finance, and administration (13%). About 68% of patients paid out of pocket. Most common diagnoses were back (55%) and neck (15%) problems, and back syndrome with radiating pain (6%). Treatments included manual therapy (72%), soft tissue therapy (70%), and mobilization (35%). **Conclusions:** This comprehensive practice profile can inform workforce development, education, and healthcare policy. (This is a conference presentation abstract and not a full work that has been published.)

Latent class analysis derived subgroups of low back pain patients – do they have prognostic capacity?

Anne Molgaard Nielsen, Lise Hestbaek, Werner Vach, Peter Kent, Alice Kongstad

Objectives: Two novel approaches for subgrouping patients with low-back pain were previously developed using Latent Class Analysis. This study determined (i) whether the identified subgroupings were associated with future outcomes (pain and disability), (ii) whether one subgrouping was superior to the other, and (iii) assessed the performance of the novel subgroupings as compared to:

the STarT Back Tool, the Quebec Classification, four baseline characteristics, and a group of previously identified domain-specific patient categorisations (collectively, the 'comparator variables'). **Methods:** This was a longitudinal cohort study of 928 patients consulting for low-back pain in chiropractic clinics. The associations between the two subgrouping approaches and outcomes over one year were tested in linear regression models, and their prognostic capacity was compared to that of the comparator variables. **Results:** The results of the two approaches were similarly associated with outcomes ($p < .05$). Their prognostic capacity was better than that of the comparator variables, except for participants' recovery beliefs and the domain-specific categorisations, but still limited (4.3%-20.3% explained variance). **Conclusion:** Latent Class-derived subgroups provided additional prognostic information when compared to a range of variables, but the improvements were not substantial enough to warrant further development into a new prognostic tool. (This is a conference presentation abstract and not a full work that has been published.)

Manipulation and McKenzie method eliminates pain and opioid prescriptions: a case study

Ryan Molloy, Nathan Kinkeldey, Zach Jipp

Objective: To provide case evidence illustrating successful use of manipulation, McKenzie Classification and neuroscience education in a young chronic low back pain patient. **Clinical Features:** The 27 year old Veteran reported a 2 year history of low back pain. He used vivid descriptions of his DDD and reported that his spine was deteriorating. He was considering leaving his job as a firefighter as a result. Muscle motor, sensation, and reflexes were intact without red flag pathology. **Intervention and Outcome:** Therapeutic neuroscience education, McKenzie extension exercises and thoracic manipulation took place over four visits. Education consisted of the difference between hurt and harm, appropriate imaging findings, and pain related to deconditioning and the sensitive nervous system. The PROMIS Pain Interference 6B was performed on each visit with the patient scoring 30, 22, 17, and 15 respectively. The patient returned to work and exercise at a normal rate. **Conclusion:** Chronic pain patients must be adequately screened and educated with accurate information about their condition. Directional preference examination allowed for the identification of non-threatening movements. This case exemplifies the importance of appropriate patient education and identifying non-threatening movements. (This is a conference presentation abstract and not a full work that has been published.)

Treatment of migraine by Australian chiropractors: A secondary analysis of the ACORN national cross-sectional survey

Craig Moore, Andrew Leaver, John Adams, David Sibbrett

Objective: To investigate the proportion and factors associated with chiropractors with a high migraine caseload. **Methods:** Secondary analysis of the practitioner, practice and management characteristics of 1869 chiropractors who answered how frequently they treat migraine in the national ACORN survey. Migraine caseload was reported descriptively. Survey items with significant differences ($p < 0.25$) were explored using logistic regression with the outcome variable (treatment frequency) dichotomized into 'often' and 'less often' groups. A backward stepwise procedure using a likelihood ratio test. Statistical significance $p < 0.05$. Odds ratios reported with 95% confidence intervals. **Results:** Chiropractors reported treating migraine 'often' ($n=990$; 53.0%), 'sometimes' ($n=765$; 40.9%), 'rarely' ($n=106$; 5.7%) and 'never' ($n=8$; 0.4%). Factors independently associated with higher migraine caseload included the treatment of axial neck pain (OR 2.9, 95%CI 1.2 to 7.1), thoracic pain (OR=2.52; 95%CI: 1.58, 3.21), low back pain (OR=1.78; 95%CI: 1.11, 2.85) and non-musculoskeletal disorders (OR=3.06; 95%CI: 2.13, 4.39); practice spinal health maintenance (OR=1.59; 95%CI: 1.12, 2.25); use functional neurology (OR=1.63; 95%CI: 1.02, 2.61) and discussing medications (OR=1.55; 95%CI: 1.09, 2.21). **Conclusions:** Migraine is a significant part of Australian chiropractic caseload. Independent factors inform future research on chiropractic migraine management important to healthcare policy, providers and educators. (This is a conference presentation abstract and not a full work that has been published.)

Non-pharmaceutical management of an 80-year-old Caucasian female: A case report

Kenice Morehouse-Grand, Stephen Grand

Objective: The purpose of this case report is to describe the non-pharmaceutical management of a patient with osteopenia that had progressed to osteoporosis.

Clinical Features: An 80-year-old Caucasian female presented with osteopenia that had progressed into osteoporosis as evidenced by Dual-energy X-ray absorptiometry (DXA). The patient had multiple risk factors for osteoporosis, including a history of smoking, small-frame, use of corticosteroids, and being Caucasian. Bone resorption testing was performed and revealed elevated urinary pyridinium crosslinks and deoxypyridinoline, indicating accelerated bone and collagen loss. **Intervention and Outcome:** A diagnosis of osteoporosis was established. The patient was given a treatment plan that included diet, exercise, and whole-food supplements. The exercise recommendations included body-weight exercises, walking, and balance exercises. Diet recommendations included increasing protein and calcium-containing foods and avoiding sugars and processed foods. Supplement recommendations included a bone-meal product, a cruciferous vegetable concentrate, vitamin D3, and bone protomorphogen. After three months the urinary bone resorption markers were rechecked and were normal. One year later, DXA was obtained with overall improvement in bone density. **Conclusion:** Improvement in bone density and bone resorption markers were noted in this patient following a non-pharmaceutical management plan. (This is a conference presentation abstract and not a full work that has been published.)

Do clinical questionnaires for lumbar stiffness and instability correlate with mechanised assessment of lumbar spinal stiffness? An agreement study

Madeline Morrison, Aron Downie, Benjamin Brown, Greg Kawchuk, Michael Swain

Objectives: To evaluate the concordance between clinical questionnaires used to identify lumbar spine stiffness (Lumbar Stiffness Disability Index – LSDI) and instability (Lumbar Spine Instability Questionnaire – LSIQ) and mechanised lumbar spine stiffness measurement. **Methods:** This was a cross-sectional agreement study. Participants were both asymptomatic and symptomatic with LBP, aged 18+ years. An online questionnaire included the LSIQ and LSDI. A continuous measure of stiffness along the lumbar spine was obtained by a mechanical device using 10N increments to a maximum of 60N. Lin's Concordance Correlation Coefficient estimated agreement between the LSIQ & LSDI and measured lumbar stiffness. **Results:** Data were collected from 84 participants. According to the LSIQ, 7.1% of participants had clinical lumbar instability. The LSDI scores ranged from 0 to 25, with a mean of 4.4. The mean terminal (60N) stiffness of participants was 1.04, 1.02 and 1.00 N/mm at L1, L3 and L5 respectively. There was very poor agreement between Lumbar Terminal (60N) Stiffness and the LSIQ ($R_c=0.002$ to 0.013) and LSDI ($R_c=0.000$) scores. **Conclusion:** Clinimetric instruments used to identify individuals with clinical lumbar stiffness and instability do not agree with lumbar spine stiffness measures derived from a mechanical device. (This is a conference presentation abstract and not a full work that has been published.)

Demonstration of central conduction time and neuroplastic changes after cervical lordosis rehabilitation in asymptomatic subjects: A randomized, placebo-controlled trial

Ibrahim Moustafa-Moustafa, Aliaa Atiaa Mohamend Diab, Shima Taha, Deed Harrison

Objective: To investigate effects of cervical lordosis (CL) and anterior head translation (AHT) correction on central conduction time. **Methods:** Eighty (32 female) asymptomatic subjects with hypolordosis and AHT were randomized. Experimental group received the cervical denneroll and control group received a placebo (supine on a pillow). Interventions were applied 3 times per week for 10 weeks. Measures included AHT distance, CL, central somatosensory conduction time (N13-N20), amplitudes of spinal N13, brainstem P14, parietal N20 and P27, and frontal N30 potentials. Measures were assessed at baseline, 10 weeks, and 3 month follow up. **Results:** Differences

between experimental and control groups were identified N13-N20 ($P=0.04$) and all other variables ($P<.001$). Negative correlation between CL change was found: amplitudes of spinal N13 ($r=-.6$ $p<.001$), brainstem P14 ($r=-.5$ $p<.001$), parietal N20 ($r=-.4$ $P=.03$), P27 ($r=-.5.1$ $P<.001$), frontal N30 potentials ($r=-.6.2$ $P<.001$), and N13-N20 ($r=-.2$ $P=.04$). Positive correlations were found between AHT and: N13 ($r=.3$ $P=.005$), brainstem P14 ($r=.4.3$ $P<.006$), parietal N20 ($r=0.52$ $P<.001$), P27 ($r=.64$ $P<.001$), and frontal N30 potentials ($r=.49$ $P<.001$), and N13-N20 ($r=.4.7$ $P=.003$). Changes and correlations were maintained at 3-month follow up. **Conclusion:** Improvement of cervical spine alignment has an effect on central conduction time. (This is a conference presentation abstract and not a full work that has been published.)

Career choice motivations, demographics and future career aspirations of UK chiropractic students

Sharee Muir, Adrian Hunnisett, Christina Cunliffe

Objective: There is a paucity of studies exploring UK chiropractic student career choice motivations. This study provides in an in-depth exploration of student motivation to study chiropractic. **Method:** Following ethical approval, a cross sectional survey was undertaken using current chiropractic students at 2 of the 3 UK colleges. Questions covered career choice motivations, demographics and future career aspirations. **Results:** The key motivator for chiropractic students was reported as the desire to help others. Also, chiropractic can offer job satisfaction, the opportunity to be self-employed and be well paid. Students rated the greatest influence on their choice of profession as self-motivation, followed by personal experience of chiropractic. The potential introduction of chiropractic into the UK NHS, is supported by a majority (63%). A majority (58%) also felt chiropractors should not have prescription rights, remaining a drug-free profession. **Conclusion:** Students are aligned when considering key motivational factors and future career aspirations. They are self-motivated, prefer to study a degree level qualification and work within a caring profession, motivated by the desire to help others. Students believe that the profession will offer them the opportunity of self-employment, a high level of job satisfaction and a good income. (This is a conference presentation abstract and not a full work that has been published.)

Adherence to acute low back pain guideline recommendations: a cluster randomized controlled trial with chiropractors and physiotherapists

Denise O'Connor, Joanne McKenzie, Simon French, Matthew Page, Duncan Mortimer, Bruce Walker, Simon Turner, Jennifer Keating, Jeremy Grimshaw, Susan Michie, Jill Francis, Sally Green

Objective: This cluster randomised trial evaluated a theory- and evidence-informed implementation intervention aiming to increase chiropractors' and physiotherapists' compliance with a guideline for acute back pain (LBP). **Methods:** Chiropractic/physiotherapy practices were assigned to either receive a guideline for acute LBP (control), or to facilitated interactive workshops and peer support. Those not involved in intervention delivery were blinded to allocation. Primary outcomes were x-ray referral, self-reported on a practitioner checklist, and LBP-specific disability (at 3 months). Secondary outcomes (e.g. practitioner intention) were measured via questionnaire. **Results:** 106 practices (43 chiropractors, 85 physiotherapists; 246 patients) were randomised to the intervention and 104 practices (45 chiropractors, 97 physiotherapists; 219 patients) to the control. There was no statistically significant difference in the odds of patients being referred for x-ray (Adjusted OR: 1.40; 95%CI 0.51, 3.87). Patients in the intervention group were more likely to be given advice to stay active (Adjusted OR: 1.96; 95% CI 1.20, 3.22). There were no important differences in LBP specific disability (Adjusted mean difference: 0.37; 95%CI -0.48, 1.21). **Conclusions:** The intervention did change x-ray referral and there was no difference in patient outcomes, but a significant treatment effect was found for some secondary outcomes. (This is a conference presentation abstract and not a full work that has been published.)

Baseline evaluation of the evidence-based practice competencies for faculty and students at chiropractic program: a cross-sectional survey

Anjum Odhwami, Gene Giggelman, Pradip Sarkar, Katherine Pohlman

Objective: To evaluate faculty and student's baseline understanding of evidence-based practice (EBP) concepts in a Doctor of Chiropractic program (DCP). **Method:** Survey questions were curated from several established questionnaires to evaluate importance and skills of 7 desired EBP competencies for all respondents, EBP barriers/facilitator of faculty (n=45), and student's research-related experiences satisfaction (n=694). All questions were based on 0-10 (optimal) rating scale. **Result:** Response rate for faculty and students was 64.4% and 60.1% respectively. Faculty had an even academic rank distribution with an average 11.3 years' teaching experience. For all EBP competencies, faculty and students had similar high importance scores, 8.4 and 8.3, respectively. Student's EBP importance decreased over the 3 years (year1-8.5; year2-8.2; year3-7.7); however, their skills increased progressively (year1-6.0; year2-6.1; year3-6.6). Student's skills were on average lower than faculty's skills (7.3). All EBP barriers/facilitators were of modest concern (5.9-8.4) with resources identified as the area of most need (6.2). Students' satisfaction average was 5.5 (range 4.0-7.6). **Conclusion:** All respondents noted the importance of EBP competencies however, additional training is warranted and faculty resources needed. Findings from this study will support strategic modifications to the DCP to ensure EBP competencies are met. (This is a conference presentation abstract and not a full work that has been published.)

Integrating chiropractic into concussion management: a case series

Harold Olson, Spencer Lindholm, Michael Tunning

Objective: To describe the use of chiropractic intervention in the management and return-to-play of 3 student athletes who suffered a concussion. **Clinical features:** Three young (pre-teen and teen-aged) football players sought care after sustaining a concussion. Each athlete had neck pain accompanied by a headache. **Intervention and Outcome:** Chiropractic manipulative therapy, myofascial release, instrument-assisted soft tissue technique, and therapeutic exercises were provided to help treat cervical spine dysfunction. Each patient was also taken through computerized neurocognitive testing during the evaluation of the RTP process. At the conclusion of the treatments, all symptoms had resolved, the neurocognitive testing scores had improved and each person was returned to play. **Conclusion:** Three American-football players, all having sustained a concussion, were managed and treated by a Doctor of Chiropractic. Treatment was directed toward reducing cervical spine dysfunction to help diminish the patients' symptoms and return the athletes back to play. (This is a conference presentation abstract and not a full work that has been published.)

Thoracic spinal stiffness measurement and reliability: influence of spinal level and chronic thoracic pain

Isabelle Page, Arnaud Lardon, Francois Nougrou, Martin Descaroux

Objective: To assess how spinal level and chronic thoracic pain affect the value and reliability of thoracic spinal stiffness. **Methods:** Twenty-four adults with chronic thoracic pain and 25 healthy adults participated in two identical sessions. Spinal stiffness was assessed four times at T5 to T8 spinous processes using an apparatus applying a 45N force. The resulting load-displacement curves were used to calculate the global (GS) and terminal (TS) stiffness coefficients. The influence of pain and spinal level on spinal stiffness was assessed using mixed ANOVAs, while within- and between-day reliability were assessed using intraclass correlation coefficients (ICC3,1). **Results:** Reliability values ranged between 0.60 and 0.94 depending on the spinal level and the participant's condition. A main effect of spinal levels was observed (TS: $F_{3,135}=4.63$, $p<.01$ and GS: $F_{3,135}=6.83$, $p<.001$) revealing an increase in spinal stiffness from T5 to T8. Participants with thoracic pain showed lower spinal stiffness (pTS=.04 and pGS=.04) but high stiffness was also observed. **Conclusion:** Spinal stiffness assessment results and assessment reliability vary according to the spinal level assessed. Compare to the reported association between lumbar pain and high spinal stiffness, thoracic pain seems to be associated to low spinal stiffness. (This is a conference presentation abstract and not a full work that has been published.)

The impact of spinal manipulation on lower extremity motor control in lumbar spinal stenosis patients: a single-blind, phase-I randomized clinical trial

Steven Passmore, Michael Johnson, Stephan Cooper, Mina Aziz, Cheryl Glazebrook

Objective: Our objective was to quantify the impact of a single lumbar spinal manipulation (SM) intervention on the leg movement ability of degenerative lumbar spinal stenosis (LSS) patients in a small-scale (Phase-I) registered randomized clinical trial. **Method:** Participants with LSS (n=14) were baseline tested for pain, lumbar range of motion (LROM) and behavioral/kinematic motor performance (using an established Fitts' Law foot pointing task), then underwent covariate-adaptive randomization to receive SM or no intervention (NI). Post-intervention all dependent measures were repeated. Experimenters were blinded to patient group allocation. University ethics board approval was attained. **Results:** As predicted by Fitts' Law, ANOVA results yielded significant main effects for movement time (MT), peak velocity, time to peak velocity, and peak acceleration across task difficulty. Planned comparisons of the MT main effect revealed significant differences between the two most difficult targets post-SM ($M=740ms$, $SD=230$ and $M=780ms$, $SD=240$; $t(6)=3.042$, $p=0.02$) revealing improved movement timing precision. No significant differences in pain or LROM were found. **Conclusion:** Participants undergoing SM demonstrated immediate improvement in MT precision, specifically in the most challenging movement contexts. Future SM research on LSS patients should quantify the impact of a course of care on motor performance. (This is a conference presentation abstract and not a full work that has been published.)

Spinal manipulation dosage is affected by tactile perception

Steven Passmore, Geoff Gelley, Brian MacNeill

Objective: Spinal manipulation (SM) is a mechanical thrust event influenced by tactile sensation. The objective of this study was to determine how tactile feedback impacts the delivery of a dose of SM. **Methods:** In a cross-sectional within-participants design, experienced chiropractors (N=13) delivered SM thrusts on 4 low-fidelity models of different tactile pressures. In a randomized order, 12 trials of high-velocity/low-amplitude thrusts were performed for a total of 48 trials. Custom software synchronized triggering of a force transducer, accelerometer, and motion analysis system. Dependent variables included preload force, thrust force and duration, and the peaks of both resultant acceleration and displacement. Statistical analysis utilized one-way repeated measures ANOVA models and planned comparisons. **Results:** Participants used greater thrust force at higher model pressures than at lower model pressures ($F_{3,48}=11.83$; $p=0.001$). Pre-load force, thrust duration and displacement did not change with model pressure. There was a trend toward decreased acceleration at the highest model pressure ($F_{3,48}=2.63$; $p=0.061$). **Conclusion:** Chiropractors modulate their thrust output based on the tactile characteristics of a SM model. This experiment provides a foundation for the study of how perceptual factors contribute to SM thrust dose modulation. (This is a conference presentation abstract and not a full work that has been published.)

Teaching teams to teach: program evaluation results from an interprofessional faculty development program in academic family medicine

Judith Peranson, Deborah Kopansky-Giles, Morgan Slater, Abbas Ghavam-Rassoul

Objective: New teachers in our faculty of medicine have access to a professional development program (BASICS) designed to prepare clinician teachers (primarily physicians) for academic medicine. We modified this program, specifically to target an interprofessional (IP) audience (physicians and health professional educators (HPEs)) with the goal of determining: 1) if the program could be successfully modified for an IP audience; 2) if learning about teaching together could facilitate the acquisition of participants' competencies for both collaborative teaching and clinical practice. **Methods:** Mixed methods were used including a pre-program participant needs assessment, pre- and post-program questionnaires (to assess knowledge (MCQs), self perceived collaborative competency (HPCPS), program reflections), session-specific evaluations of each module, and qualitative feedback

from module teachers (debrief). **Results:** 13 physicians and 27 HPEs participated. 100% indicated somewhat or very satisfied with the program. Pre-post HPCCPS indicated improvement in self perceived collaborative competency ($p < 0.0001$) and MCQs showed increased attainment of knowledge over the course. 89.7% reported that learning needs were met and 50% felt more prepared for their teaching roles. Facilitators also found that teaching together enhanced their own collaborative competency. **Conclusions:** The modified IP BASICS program was successful in achieving our study objectives. (This is a conference presentation abstract and not a full work that has been published.)

Distribution of self-theories of intelligence in matriculating chiropractic students

Christopher Petrie

Objective: Self-theories of intelligence have been linked to learning motivation and persistence. They fall broadly into two categories: growth and fixed. While the distribution for various student populations have been studied, chiropractic students have not been studied. This study was conducted to examine the distribution of self-theories of intelligence for matriculating chiropractic students. **Methods:** Matriculating students ($n=287$) were surveyed using a previously validated survey instrument. Participants rated their level of agreement with statements about the nature of intelligence using a 6-point Likert scale. Consistent agreement with the statements was associated with a growth mindset. Consistent disagreement was associated with a fixed mindset. Inconsistent agreement was categorized as indeterminate. **Results:** The results showed 187 (64.5%) students holding a growth mindset while 44 (15.3%) holding a fixed mindset. The remaining 58 (20.2%) were indeterminate. **Conclusion:** The results show a majority of students hold a growth mindset, which has been associated with increased motivation to learn and persistence in learning. Further study is needed to determine the consistency of these results across chiropractic institutions, whether students' self-theories change during their enrollment, and whether there is any correlation between self-theories and academic achievement. (This is a conference presentation abstract and not a full work that has been published.)

Complementary care in Medicaid patients with long-term physical disabilities: a pilot program in the state of Colorado

Mark Pfefer, Stephen Cooper, Jennifer Boggess

Objective: Collaborative, integrative care including acupuncture, massage, chiropractic, adaptive exercise, and adaptive yoga may provide benefits for people living with long-term physical disabilities. A dearth of research evaluating the effects of these therapies for this population exists. Our purpose is to investigate preliminary outcomes for patients with physical disabilities, covered by Medicaid, who received collaborative, integrative, and complementary care. **Methods:** Established in 2012, the Chanda Plan Foundation's purpose is to provide support and funds through the Colorado Medicaid Spinal Cord Injury Waiver and to evaluate the efficacy of integrated care in patients with spinal cord injuries, brain injuries, multiple sclerosis, cerebral palsy, spina bifida, and other physical disabilities. Data were collected throughout the initial 3-year period, including service utilization, costs, pain, and functional and quality of life outcomes. **Results:** Of the current 100 patients, over 75% reported reduction in self-assessed pain and 57% decrease in medication use with associated decreases in pharmacy and other medical costs. Quality of life scores (BREF instrument) demonstrated increase in physical, psychological, and social environmental health domains for participants. **Conclusions:** People with physical disabilities will likely benefit when receiving collaborative, integrative, and complementary care. Additional research is warranted. (This is a conference presentation abstract and not a full work that has been published.)

Patient safety culture evaluation of chiropractors in three canadian provinces: preliminary findings

Katherine Pohlman, Silvano Mior, Martha Funabashi, Diana DeCarvalho, Mohammed El-Bayoumi, Bob Hiag, Kimbalin Kelly, Darrell Wade, Maeve O'Beirne, Sunita Vohra

Objective: There is a push to develop a positive patient safety culture in health care; however, knowledge of such culture is limited within

the chiropractic profession. This cross-sectional survey evaluates patient safety culture among members of chiropractic associations in Ontario, New Brunswick, and Newfoundland/Labrador. **Methods:** SafetyNET's Survey to Support Quality Improvement was emailed to association members in 3 provinces ($n=3471$). **Results:** Overall response rate was 6.8%. Most respondents were male, in solo practices for a mean of 19.1 years, with 50-150 patient visits weekly. Provinces had similar moderate-high patient safety dimension scores, except one province, that reported statistically different ($p < 0.05$) moderate scores in staff training and communication about error. While still modest, patient care tracking had the lowest overall score. Information exchange with insurers was reported problematic among all 3 provinces, while access to care was a concern in only one (mostly rural) province. **Conclusion:** This first survey found a positive patient safety culture among Canadian chiropractors. Despite the low response rate, opportunities for collaboration across Canada to improve specific patient safety areas were identified. Further efforts are required to emphasize the necessity for the chiropractic profession to develop an evidence-supported patient safety culture. (This is a conference presentation abstract and not a full work that has been published.)

Do clinician and patient reports of adverse events align? Assessing adverse events after chiropractic care at a chiropractic teaching clinic: an active surveillance pilot study

Katherine Pohlman, Patrick Bodnar Harrison Ndetan, Greg Kawchuk

Objective: To assess congruence of clinician and patient reporting of adverse events through an active surveillance reporting system recently piloted at a chiropractic teaching clinic. **Methods:** All clinicians ($n=10$) and interns ($n=173$) were invited to collect data from 10 continuous patient visits. Patients completed pre and post-treatment histories which included reporting of symptoms. Interns completed a post-treatment form describing care and patient's symptoms occurring immediately after treatment. Adverse events (AE) were defined conservatively as any worsened or new symptom following care. **Results:** Ten clinicians and 80 interns enrolled in the study resulting in 126/364 patient visits with complete data. Patients reported 303 symptoms that were improved/better with 192 unchanged symptoms. Patients also reported 130 AEs between 0-15 days after treatment compared to interns who reported 20 AEs immediately after care. **Conclusion:** This study found it feasible to collect safety data in a chiropractic teaching clinic. Information gathered suggests that while a majority of symptoms improve with care, many adverse symptoms appear following care which are unknown to care providers. This study provides valuable insights on AEs in chiropractic, as well as informs our future work regarding patient safety education within the chiropractic profession. (This is a conference presentation abstract and not a full work that has been published.)

Engagement as predictors of performance in a single cohort of undergraduate chiropractic students

Jacqueline Rix, Phillip Dewhurst, David Newell, Caroline Cook

Objective: Higher education institutions provide students with opportunities to succeed. However, how students achieve success is still not fully understood. Academic and non-academic factors affecting performance have previously been identified¹. As such, academic and non-academic factors were investigated to explore their potential links to student performance. **Methods:** Students enrolled onto year one of the Chiropractic Masters (Choro) at the Anglo-European College of Chiropractic were eligible to volunteer. Data collected included demographics, attendance, virtual learning environment (VLE) usage, additional learning needs (ALN), previous degree qualifications and summative marks. **Results:** Male students significantly outperformed female students in 4 of the 6 units. Students who attended less than 75% of taught classes were 14 times [14 (95%CI: 35-55)] more likely to have a reset in one or more units. Students who performed poorly in the semester 1 unit of Human Structure 1 and Clinical Management 1 were significantly more likely to have one or more resist in semester 2 units. VLE usage, ALN and previous degree qualifications did not correlate with summative marks. **Conclusion:** Attendance and semester 1 summative marks are associated with end of year performance. As such, these markers of

performance should be monitored. (This is a conference presentation abstract and not a full work that has been published.)

Interprofessional practice and clinical residency training in spine pain for doctors of chiropractic: A descriptive comparison of two programs in southern California

Robb Russell, Valerie Johnson

Objective: To descriptively identify and compare the interprofessional practice and interprofessional educational elements at two new chiropractic residency programs, one program being hospital-based, while the other is based at the public clinic of small, not-for-profit educational institution. **Methods:** A qualitative and descriptive comparison of the two program's resident selection processes, interprofessional practice opportunities, interprofessional educational exposure, competencies, assessment methods and attitudes of participating healthcare practitioners is made. **Results:** The two programs share similarities with regard to assessment and competencies partially due to collaboration. They vary in resident selection processes, duration of their respective programs, scope of practice, patient demographics and patient access to care. They also have considerably different interprofessional practice and educational opportunities. **Conclusion:** Both residency programs described offer considerable opportunities for interprofessional practice and interprofessional education. Preliminary assessment of the attitudes of other healthcare practitioners with whom the chiropractic residents interact are positive. Similarly, the attitudes of chiropractic residents to other professionals with whom they interact are favorable. An underlying assumption, as yet unproven, is that the collaboration necessary for these interprofessional practice residencies will lead to improved patient care and efficiencies for patients suffering from low back pain and related spine disorders. (This is a conference presentation abstract and not a full work that has been published.)

Non-surgical treatments for lumbar spinal stenosis: results from a randomized controlled trial

Michael Schneider, Carlo Ammendolia, Donald Murphy, Ronald Glick, Dana Tudorasu, Sally Morton, Elizabeth Hile

Objective: Compare the clinical effectiveness of 3 different non-surgical approaches to the management of patients with lumbar spinal stenosis (LSS), including a chiropractic/physical therapy approach. **Methods:** Randomized controlled clinical trial of N=259 patients with LSS, who were randomized into 1 of 3 groups: 1) medical care; 2) non-specific group exercise classes; or 3) combination of manual therapy and specific exercises. Primary outcome measures were Swiss Spinal Stenosis (SSS) questionnaire and Self-Paced Walking Test (SPWT), which were taken at baseline, 2 months and 6 months. **Results:** No serious adverse events were reported in any of the groups. The manual therapy group showed a significantly greater reduction in SSS score at 2 months as compared to the other 2 groups. The manual therapy group had the most improvement in SPWT at 2 months, but this between-group difference was not statistically significant. All within-group SSS and SPWT improvements were sustained at 6 months. Satisfaction and global index of change scores were highest in the manual therapy group, followed by group exercise and medical care. **Conclusion:** Patients with LSS can be safely and effectively treated with various non-surgical methods, with a trend favoring the chiropractic/physical therapy approach. (This is a conference presentation abstract and not a full work that has been published.)

A systematic review of musculoskeletal taping methods

Michael Schneider, Chris Bise, Brent Leininger, Emily Polakowski

Objective: To conduct a systematic review of the musculoskeletal taping literature by searching for studies by body region and taping method. **Data Sources and Selection:** A literature search was completed through June 2016 of these databases: PEDro, CINAHL, Cochrane Database of Systematic Reviews, PubMed and PROSPERO. We only included randomized controlled trials (RCT) or systematic reviews (SR) that studied patients with a musculoskeletal complaint using a clinical outcome measure. All studies were rated for quality with either AMSTAR (SR) or PEDro (RCT) guidelines. **Results:** 21 SRs and 47 RCTs were included in our final analysis. The majority of studies were focused on 5 main conditions or body regions: foot, ankle, knee, spine and upper extremity; and one taping

method: Kinesio-Taping. 10 evidence tables were produced, organized by body region/condition (8 tables) and taping method (2 tables). Inclusion/exclusion criteria and methodology varied greatly between studies, precluding our ability to perform meta-analysis. **Conclusion:** There is mixed quality and evidence of effectiveness for different types of taping methods for different body regions and conditions. The evidence tables from this SR can be useful to clinicians and researchers. (This is a conference presentation abstract and not a full work that has been published.)

Integration of chiropractic services in a patient centered medical home

Joel Stevens, Brian Justice

Objective: The purpose of this study was to investigate the effects of chiropractic integration on the cost of spine care services within a Patient-Centered Medical Home (PCMH). **Methods:** A retrospective pre/post analysis was conducted using health care claims to evaluate the cost of spine care services before and after chiropractic integration. Adult patients (≥ 18 years) with a primary spine related diagnosis across all lines of business; commercial, Medicare Advantage and were included. The outcomes of interest were the aggregate cost of chiropractic treatment, physician office visits, diagnostic imaging, pain management injections, and spine surgery. Services were identified using Current Procedural Terminology (CPT) codes. **Results:** The sample consisted of 7,488 spine patients. Most were female (56%) and between 45-64 years of age (40%). There were no significant differences in demographic characteristics after chiropractic integration. During the 12-month follow-up period there were reductions in the total cost for all outcomes: chiropractic treatment (-4%), physician office visits (-1%), diagnostic imaging (-16%), pain management injections (-4%), and spine surgery (-13%). This resulted in an estimated first year savings of \$424,416. **Conclusion:** Embedding chiropractors within PCMHs may reduce the total treatment costs associated with spine care patients. (This is a conference presentation abstract and not a full work that has been published.)

Is there a role for chiropractors in managing sick leave as part of work disability prevention for musculoskeletal disorders? A qualitative study of Nordic chiropractors

Mette Jensen Stockendahl, Ole Kristoffer Larsen, Caspar Glissman Nim, Iben Axen, Ole Christian Kvammen, Corrie Myburgh

Objectives: We aimed to describe the context, views and experiences of Nordic chiropractors engaging in work disability prevention (WDP) and sickness absence management (SAM) of their patients, and compare how WDP is integrated in the care provided in a context where chiropractors have legislated sickness certification rights (Norway) and two contexts without sickness certification rights (Sweden and Denmark). **Methods:** This study was embedded in an exploratory mixed-methods design. We followed a phenomenological approach to explore the lived experience of chiropractors drawn from face-to-face, semi-structured interviews. **Results:** Twelve individual face-to-face interviews were conducted. Our thematic analysis indicated that the chiropractors' capacity to support patients in SAM related to 1) issues of legislation and politics; 2) the rationale for being a SAM partner; 3) whether an integrated SAM pathway exists/can be created; and 4) the barriers to service provision for SAM. **Conclusion:** Chiropractors with patient management expertise may play a key role in WDP and SAM if integrated in a primary sector healthcare context. In the case of chiropractors in Denmark and Sweden, they currently face challenges related to legislative and professional ethics. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractors' perceived barriers and facilitators to managing sickness absence: A survey of Nordic practice

Mette Jensen Stockendahl, Caspar Glissman Nim, Ole Kristoffer Larsen, Iben Axen, Ole Christian Kvammen, Corrie Myburgh

Objectives: Danish, Swedish and Norwegian chiropractors function as primary care sector providers. In addition, Norwegian chiropractors have legislative rights to issue sickness certifications. The aims of this study were to 1) describe Nordic chiropractors' perceived key barriers, facilitators, and strategies to manage sickness absence of their patients, 2) determine the prevalence of these key issues, and 3)

compare their relative importance across the three countries. **Methods:** The study formed the quantitative component of an exploratory mixed-methods design (two-phased sequential). Based on interviews with 12 Nordic chiropractors, we constructed an electronic survey with which to observe the involvement and attitudes of chiropractors in sickness absence management across the three countries. Potential items for the survey were categorized according to the Consolidated Framework for Implementation Research (CFIR). **Results:** A 35-item survey covering five out of six CFIR constructs was designed in Danish, translated into Swedish and Norwegian, and evaluated for face and content validity. **Conclusion:** The survey will be issued to members of the national chiropractic associations in each of the three countries in the Fall of 2016. Descriptive statistics with measures of variability will be calculated. Final results will be available at the time of presentation. (This is a conference presentation abstract and not a full work that has been published.)

A description of the blended experiential learning environment and comparison of weekly quizzes versus midterm examinations as assessments of student learning

Stephanie Sullivan, Kathryn Hoiriis

Objective: To explore a teaching strategy that replaced extended face-to-face instruction with the blended classroom environment through incorporation of experiential learning exercises and weekly assessments. **Methods:** In a research methods course, the 2 hour lecture was altered to include: 20 minutes lecture, 30 minutes topic-specific in-class group discussions and 1 hour alternative location group work. In addition to weekly discussion related homework, midterm exams were replaced with weekly quizzes. Scores for student cohorts in 2 successive academic terms using identical Midterm (MT) Multiple Choice Questions (MCQs) were compared to Quiz MCQs for 2 topics, Statistics (Stats) and Safety of Human Subjects (NIH) over 2 terms. Student verbal feedback was elicited at the end of each term. **Results:** Student verbal feedback indicated higher satisfaction with the blended classroom and experiential learning style. Student quiz scores improved significantly for the more challenging statistics MCQs (Percent change: 7.6%; $p=0.028$; 95% CI -9.721 to -.573) with only nominal improvement in NIH MCQs (Percent change: 0.7%; $p=0.688$; 95% CI -3.414 to 2.257). **Conclusion:** Students preferred the blended classroom environment with experiential learning exercises and weekly quizzes. Early and often assessment seemed to improve student scores. (This is a conference presentation abstract and not a full work that has been published.)

The relationship between growth, maturation, and spinal pain in adolescents: a systematic review

Michael Swain, Steven Kamper, Chris Maher, Carolyn Broderick, Damian McKay, Nicholas Henschke

Objectives: This study aims to determine whether there is a relationship between physical growth or maturation, and spinal pain in adolescents. **Methods:** In this systematic review electronic databases were searched to identify epidemiological studies that evaluated the association between growth or biological maturity, and spinal pain in adolescents. Risk of bias was appraised using the Quality in Prognosis Studies (QUIPS) tool, which was modified for aetiological factors. A narrative synthesis was conducted. **Results:** A total of 13,644 titles were identified in the searches; 13 studies evaluated the relationship between growth and/or maturation and spinal pain. Study outcomes were back pain unspecified ($n=5$), low back pain ($n=7$), thoracic pain ($n=1$) and neck pain ($n=3$). Growth and maturation were evaluated as independent factors for spinal pain in seven and nine studies, respectively. Of these, only one study reported a significant association between rapid growth rate and low back pain; eight studies reported later stages of puberty was associated with spinal pain. **Conclusions:** There is a paucity of robust data to support the widely held belief that periods of rapid growth and maturation of itself are associated with spinal pain in adolescence. (This is a conference presentation abstract and not a full work that has been published.)

If you build it, they will come. The preliminary impact of a faculty mentoring program

Michael Tunning, Dustin Derby, Kelly Krell-Mares, Michelle Barber

Has the Academy of Educators (AoE) mentoring program made a significant impact and contribution to faculty? This study utilized a qualitative survey, deployed electronically over a period of 6 weeks, to 12 faculty who participated in the AoE program for at least one year. Data from 10 respondents was thematically coded based on respondents' experiences within the program. Concerning goal attainment, 100% (10/10) reported achieving teaching goals and 90% (9/10) scholarship goals due to participation in the program. Over half of respondents indicated the program helped shape scholarship (60%; 6/10) and teaching (70%; 7/10) goals, moving from generic goals like "publishing one paper a year" and "being a good teacher" to specific goals like working collaboratively to examine particular areas of study for explicit scholarly venues and learning more about successful pedagogical strategies to better inform teaching. The AoE program has impacted participants' goals in scholarship and teaching. Participants recognize value in camaraderie, collaboration, and mentorship. Although small in sample size, the initial cohort represents 11% of faculty. The AoE continues to grow from the initial 12 instructors to 22 currently. Further research is in-development on the continued impact to AoE participants and faculty at-large. (This is a conference presentation abstract and not a full work that has been published.)

Interdisciplinary rehabilitation including chiropractic for a patient with spinal cord injury

Robert Vining, Donna Gosselin, Jeb Thurmond, Kimberlee Case

Objective: Describe chiropractic care provided within an interdisciplinary rehabilitation team for a patient with incomplete spinal cord injury (SCI) and multiple comorbid conditions.

Clinical Features: A 51 year old male with incomplete lower cervical SCI was admitted to a rehabilitation hospital 2 months post-injury and initial recovery from 2 surgical fusion surgeries (C3-C6). Upon admission the patient demonstrated moderate to severe upper and lower extremity strength loss, percutaneous endoscopic gastrostomy tube due to dysphasia, orthostatic hypotension, mechanical lift and tilt-in-space wheelchair dependence, bowel/bladder incontinence, and pre-injury disability from bilateral shoulder pain and arthritis.

Interventions and Outcome: Chiropractic care, introduced 2 months post-admission, occurred within a team including primary care providers, occupational therapists, physical therapists, and other specialists. Chiropractic addressed shoulder and thoracolumbar pain attributed to static positioning and facilitated performance of rehabilitation activities. Interventions included thoracic and lumbar spine thrust manipulation, mechanical percussion, manual muscle therapy to the cervico-occipital and shoulder regions, and mobilization of the right hand/wrist. After 3 months, shoulder and back pain were largely resolved and care modified to include upper extremity stretching and exercises. **Conclusion:** Chiropractic care delivered within an interdisciplinary team can contribute to rehabilitation outcomes of patients with SCI. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic services provided at a rehabilitation specialty hospital

Robert Vining, Stacie Salisbury, Carl Cooley, Jeb Thurmond, Lance Corber, Donna Gosselin, Christine Goertz

Objective: It is unknown how chiropractic services can be applied within interdisciplinary rehabilitation teams treating individuals with traumatic brain injury (TBI), stroke, and spinal cord injury (SCI). This study reports chiropractic services provided in a rehabilitation hospital caring for patients with complex neurological conditions. **Methods:** Data were collected on paper forms completed by the staff chiropractor at each visit. Chiropractic services were available twice weekly. **Results:** Most patients (86%) were wheelchair dependent. Individuals presented with compromised speech/communication (23%), muscle contractures (14%), feeding tubes (18%), and catheters (14%). During the initial 8 months of chiropractic services, 22 individuals received treatment over 394 visits. Mean visit time, excluding documentation, was 25 minutes. Visits occurred in rehabilitation areas (317) or patient hospital rooms (75). Symptoms addressed included spinal pain, stiffness, and extremity pain for patients suffering TBI (36%), stroke with hemiparesis (27%), SCI (14%), and other complex conditions (23%). Treatment often

included thrust and non-thrust manipulation to the spine and extremities. Mechanical percussion was employed during 81% of visits. Myofascial therapy exercise, and stretching were routinely employed. **Conclusion:** Chiropractic care can be adaptively applied for patients with complex neurological conditions within the context of an interdisciplinary team. (This is a conference presentation abstract and not a full work that has been published.)

Attitudes towards chiropractic: A survey of Ontario midwives

Carol Ann Weis, Gloria Cheung, Laurence Dion, Jennifer Garven, Meghan Robinson, Suzannah Bennett, Jason Busse

Objective: To assess the attitudes and opinions of Ontario midwives toward chiropractic. **Methods:** 893 Midwives registered with the Association of Ontario Midwives were invited to complete a survey through an advertisement published once in their monthly newsletter. A link to a 42-item questionnaire was provided, which included the Chiropractic Attitude Questionnaire (CAQ). **Results:** Fifty-seven midwives completed the survey, for a response rate of 6.4%. Overall, 76.1% of respondents endorsed a positive impression of chiropractic, 10.9% were unsure, and 13.0% held negative views. Most (77.6%) referred their clients for chiropractic care. Moreover, 61.2% respondents referred infants for chiropractic care, specifically for: colic, spinal screening/adjustment after birth and constipation. Although most respondents (98%) felt very comfortable discussing chiropractic with their patients, most respondents (86.1%) felt that their training should include information about chiropractic and most (55.1%) were interested in learning more about chiropractic. **Conclusion:** Most midwives in Ontario report a positive attitude toward chiropractic care for pregnant women both during pregnancy and the postpartum period as well as for infants. These positive attitudes create opportunity for collaborative patient management. (This is a conference presentation abstract and not a full work that has been published.)

Association between utilization of chiropractic services for low back pain and use of prescription opioids: preliminary results of a health claims study

James Whedon

Objective: The overuse of prescription opioids for treatment of low back pain in the US is associated with addiction, adverse drug events, and escalating costs. Chiropractic, a non-pharmacological treatment for back pain, may lead to reduced use of opioids. This study was intended to quantify the association between utilization of chiropractic services for low back pain and use of prescription opioids. **Methods:** We analyzed all-payer health claims data for New Hampshire residents aged 18-99 with low back pain. We employed logistic regression to compare recipients of chiropractic services to non-recipients with regard to the likelihood of prescription fills for opioid medication. We quantified the associated charges. **Results:** The rate of opioid use was lower for recipients of chiropractic services (1.5 vs. 5.1 prescription fills per subject). The likelihood of filling a prescription for opioids was 56% lower in the chiropractic recipient cohort (OR 0.44; 95% CI 0.43, 0.444). Average per-person charges for opioid prescription fills were also lower for chiropractic recipients: \$30.69 (SD \$30.96) vs. \$43.37 (SD \$58.03). **Conclusion:** Utilization of chiropractic care may lead to reduced use of opioid medications. Further analysis of these data will focus on reducing risk of selection bias. (This is a conference presentation abstract and not a full work that has been published.)

Association between utilization of chiropractic care for low back pain and risk of adverse drug events: Preliminary results of analysis of New Hampshire insurance claims data

James Whedon

Objective: Chiropractic is an effective non-pharmacological approach to the care of low back pain, but it is unknown how the utilization of chiropractic services affects the risk of adverse drug events (ADEs). We conducted an observational study of patients with low back pain to compare recipients of chiropractic services with non-recipients with regard to the likelihood of ADEs. **Methods:** We analyzed health claims data on New Hampshire residents aged 18-99 with low back pain. We employed logistic regression to compare recipients of chiropractic services to non-recipients with regard to the likelihood of

occurrence of an ADE in an outpatient setting over two years. We identified ADEs by ICD-9 or E code. **Results:** Among 15,000 recipients of chiropractic services and 31,858 non-recipients, the risk of ADEs was significantly lower for recipients of chiropractic services. The 24-month incidence of ADEs was 0.8% among recipients and 3.1% among non-recipients. The likelihood of occurrence of ADEs was 65% lower for chiropractic care recipients (OR 0.35; 95% CI 0.29, 0.42). **Conclusion:** The results lend strength to the hypothesis that chiropractic care may lead to reduced risk of ADEs. Further analysis of these data will focus on reducing risk of bias. (This is a conference presentation abstract and not a full work that has been published.)

The impact of body mass index on pregnancy-related pelvic girdle pain in nulliparous women in Ireland

Francesa Wuytack, Deidre Daly, Elizabeth Curtis, Cecily Begley

Objective: To examine the association between Body Mass Index (BMI) and Pregnancy-related Pelvic Girdle Pain (PPGP) in nulliparous women. **Methods:** A cohort of 1358 women completed a self-administered questionnaire, including a pain diagram, in early pregnancy. Hospital and university ethical approval were granted. Data were analysed using multivariable logistic regression, and adjusted for age, educational level, employment status, pre-pregnancy lumbopelvic pain, heavy periods and severe period pain. We examined the impact of BMI on three outcomes: anterior PPGP, posterior PPGP, and combined anterior and posterior PPGP. **Results:** Compared to women whose BMI was 18.5-24.99 kg/m², women who were obese or very obese (BMI \geq 30.00 kg/m²) were significantly more likely to experience combined anterior and posterior PPGP in early/mid pregnancy (adjusted Odds Ratio (AOR) 2.5 (95% Confidence Interval (CI) 1.5-4.3)). Women who were underweight (BMI <18.5 kg/m²) (AOR 2.2 (95% CI 1.1-4.4)) or obese or very obese (AOR 1.8 (95% CI 1.1-2.8)) were more likely to have combined anterior and posterior PPGP in the last month of pregnancy. BMI was not a significant risk factor for anterior PPGP or posterior PPGP alone. **Conclusion:** All women should be encouraged and supported to achieve optimal weight before becoming pregnant. (This is a conference presentation abstract and not a full work that has been published.)

Work-related risk factors for spinal pain: Data from the 2015 National Health Interview Survey

Haiou Yang, Ming-Lun Lu, Scott Haldeman, Naomi Swanson, Edward Hitchcock, Dean Baker, Sara Luckhaupt

Objectives: The objective of the study is to use data recently available from the 2015 National Health Interview and the Occupation Health Supplement (NHIS-OHS) to explore associations between spinal pain and workplace risk factors that have been understudied in the US population. **Methods:** The variance estimation method is used to conduct multivariable logistic regression analysis to explore the associations in workers (aged 16 and above and employed). Spinal pain is defined neck/low back pain in the past 3 months. The work-related risk factors examined include: job demands/controls, supervisory support, work-family interference, hostile work environment, job insecurity, occupational physical exertion (repeated lifting, pushing, pulling or bending), shift work, and alternative work arrangements. Related demographics, mental health variables, work hours and occupation are controlled as confounders. **Results:** This study indicates significant associations between spinal pain and high job demands, work-family interference, workplace bullying, and job insecurity. This study also demonstrates that occupational physical exertion is associated with spinal pain, especially low back pain. **Conclusions:** This study calls for attention among policy makers, researchers and clinicians, including chiropractors to these occupational psychosocial risk factors for spinal pain. Research using longitudinal study design is recommended in this area. (This is a conference presentation abstract and not a full work that has been published.)

Active and inactive spondylolysis at L5: A case report

Terry Yochum, Alicia Yochum

Objective: Spondylolysis is a common entity that is present in 5-7% of the Caucasian population but has in increased incidence of 15% in athletes participating in hyperextension sports. Bone marrow edema

on magnetic resonance imaging (MRI) adjacent to the spondylolysis would indicate an active spondylolysis while fat adjacent to the spondylolysis would indicate an inactive lesion. Fat can appear bright on both T1 and T2 sequences therefore short tau inversion recovery (STIR) sequencing is needed for accurate identification. **Clinical Features:** A 16 year-old female presented with low back pain exacerbated with soccer participation and extension. She demonstrated a positive stork test. **Intervention and Outcome:** Conservative management was initiated to include spinal manipulation of the lumbopelvic region without improvement of her symptoms after 7 treatments. A MRI was done which revealed an active spondylolysis at L5 on the right and an inactive spondylolysis at L5 on the left. The patient was placed in an antilordotic brace for 3 months and then returned to sports participation, pain free. **Conclusion:** Determining the etiology of various signal intensities on MRI related to spondylolysis is vital to accurately differentiate an active versus inactive spondylolysis which will drive patient management. (This is a conference presentation abstract and not a full work that has been published.)

The long-term effects of brief simulated low velocity variable amplitude loads on neurogenesis in cultured PC-12 cells

Liang Zhang, Chao Hua Yao

Objective: Spinal manipulative therapy (SMT) influences neurophysiological activities. However, a question remains: How these short transient changes of cellular electricity impact patients' long-term health? We hypothesize that manipulative forces have a long-term neuroplasticity effect by promoting neurogenesis. **Methods:** PC-12 neuronal precursor cells were treated briefly (3x15-seconds) with simulated low velocity variable amplitude (LVVA) forces, followed by additional 3-day culturing in the presence or absence of nerve growth factor (NGF). Then cells were stained immunologically or chemically, photographed microscopically, and analyzed for mature neuronal features. **Results:** As expected, NGF produced a remarkable increase of neurogenesis regardless the levels of simulated forces applied, or not applied ($P < 0.01$, $N=6$ for each of the three different loading levels). Regarding the impact of simulated LVVA forces on neurogenesis, only low-level LVVA loads produced a statistically significant promotion of neurogenesis in the absence of NGF ($P < 0.05$, $N=6$). However, this promoting effect became statistically insignificant in the presence of NGF. In addition, increased loading levels did not produce significant changes regardless the presence or absence of NGF. **Conclusion:** Our data indicate brief LVVA loads may have long-term impacts on neurogenesis, which seems to depend on loading levels and interact with biological factors. (This is a conference presentation abstract and not a full work that has been published.)

POSTER PRESENTATIONS

A scoping review of the literature on functioning and disability in manual medicine using the International Classification of Functioning, Disability and Health (ICF)

Ellen Aartun, Hainan Yu, Pierre Cote

Objectives: To identify clinical tests and questionnaires used to measure functioning and disability in patients with low back pain treated with manual medicine and to link them to the ICF framework. **Data sources and selection:** We systematically searched Medline, Embase, PsycINFO, and CINAHL from January 1, 2006 to December 31, 2015. Paired reviewers independently screened 100 randomly selected citations from the retrieved citations. One reviewer extracted all background variables, baseline measurements and outcome measures from relevant studies. We divided the extracted data into meaningful constructs that describe functioning and disability according to the ICF (body structure, body function, activity and participation, environmental factors and personal factors). The constructs will be linked to ICF categories. This process will be repeated for another 100 citations until we reach saturation, i.e., $< 5\%$ difference in ICF categories. **Results:** We retrieved 1995 citations and screened 200. Commonly used instruments include Roland-Morris Disability Questionnaire, Oswestry Disability Index and Visual Analog Scale. How these items link to the ICF will be presented at the conference. **Conclusion:** This study will provide an overview of what

aspects of functioning that are reported in manual medicine in a language that is common across all disciplines. (This is a conference presentation abstract and not a full work that has been published.)

Characteristics of Australian chiropractors treating athletes: Results from a practice based research network

Jon Adams, Romy Lauche, Katie DeLuca, Michael Swain, Wenbo Peng, David Sibbritt

Objective: Sports injuries pose a substantial health burden resulting in pain and can cause long-term disability. A wide range of medical professions provides sports injury management; with 12.5% of chiropractic patient visits specifically for sports injuries. This study reports analyses from a PBRN to determine practitioner and practice-related factors associated with the frequent treatment of athletes by Australian chiropractors. **Methods:** A 21-item questionnaire collecting information pertaining to practitioner characteristics was distributed to registered chiropractors across Australia, as part of the Australian Chiropractic Research Network (ACORN) project. Statistical analyses compared the dependent variable of the frequency of treating athletes against independent variables. **Results:** 936 (49.5%) chiropractors reported frequently treating athletes. These chiropractors were more likely to be male, perform more patient care hours and visits per week and be involved in volunteer work. Chiropractors frequently treating athletes were also more likely to perform multi-modal management, have multi-disciplinary relations, use diagnostic equipment and discuss nutrition and medication use. **Conclusion:** Approximately one in two chiropractors treat athletes frequently. The findings of the current ACORN survey describe a multi-disciplinary, multi-modal management approach by Australian sports chiropractors. (This is a conference presentation abstract and not a full work that has been published.)

Detecting publication bias in chiropractic clinical research

Medhat Alattar

Introduction: Publication bias is the tendency on the parts of investigators, reviewers and editors to submit or accept manuscripts for publication based on the direction or strength of the study findings. Carefully reviewing chiropractic research publications for evidence of bias is needed to secure the selections of higher quality, efficient new methodologies for the implementation of evidence base clinical practice in the delivery of chiropractic care. **Methods:** A random sample of published chiropractic research papers on Low back pain between 2006-2016 were reviewed for the difference between reporting positive and reporting negative results. A remarkable difference between the results could be a reason to include bias as a possible cause. **Results and Discussion:** Several publications did not report clear results but rather indicated the need for further studies. There are no published papers of low study quality, or reporting negative results which may be an indication for publication bias. Limitations: the assumption that ratio (positive/negative) should equals 50:50 is not valid. **Conclusions:** Research with positive results is more likely to be submitted and published which may lead to over optimistic conclusion. Publication bias existence is hard to prove. (This is a conference presentation abstract and not a full work that has been published.)

The relationship between the quality of life of chiropractors and their sense of coherence

Joel Alcantara, Jeanne Ohm, Junjoe Alcantara

Objectives: To assess the relationship between the quality of life (QoL) of chiropractors and their sense of coherence (SOC). **Methods:** A convenience sample of chiropractors completed the PROMIS-29, PROMIS Global Health and the SOC-29 questionnaires, a measure of one's life orientation based on self-reliance and self-confidence to meet life's challenges. The SOC-29 has subscales of comprehensibility, manageability and meaning. The PROMIS surveys measures domains of QoL (i.e., anxiety, depression) and global physical and mental health. Statistical analysis utilized Mplus V7 (Los Angeles, CA, 2007) to determine the relationship between SOC and QoL and Cronbach's alpha for the subscales of SOC-29. **Results:** A convenience sample of 89 chiropractors (mean age=36.52; females=70; mean years practice experience=8.91 years) completed the questionnaires. A correlation matrix demonstrated all correlations in the expected direction. For

example, SOC correlations with: anxiety (-0.70), depression (-0.61), fatigue (-0.50), satisfaction with social role (0.47), pain interference (-0.28), pain intensity (-0.26), global physical health (0.47) and global mental health (0.71). Cronbach's alpha were: comprehensibility (0.70), manageability (0.73) and meaning (0.72) for the SOC-29. **Conclusion:** Correlational analysis supports the positive correlation between SOC and QoL. The SOC-29 for chiropractors has acceptable reliability for its 3 subscales. (This is a conference presentation abstract and not a full work that has been published.)

The physical and mental impact of neurogenic claudication: the patients' perspective

Carlo Ammendolia, Michael Schneider, Kelly Williams, Susan Zickmund, Megan Hamm, Kent Stuber, Christy Tomkins-Lane, Y. Raja Rampersaud

Objective: To determine what was most bothersome among individuals with neurogenic claudication (NC) due to lumbar spinal stenosis and to assess patients' expectations and their experiences with treatment. **Methods:** This qualitative study used semi-structured telephone interviews among patients with NC seeking care from surgical and non-surgical hospital clinics. Interview transcripts were analyzed and managed using the software program Atlas.ti. Two trained qualitative analysts coded transcripts. A final thematic analysis categorized key findings based on the relative importance and impact on participants. **Results:** Among the 28 individuals participating in this study, pain was the most bothersome aspect of NC and limited standing/walking ability was the dominant functional limitation. NC dramatically impacted participants' lives and ability to engage in recreational and social activities. The most surprising finding was the frequency of reported significant emotional effects resulting from NC particularly depressed mood. Patients expected improvement of their symptoms with treatment not prevention of progression. Most participants could accept partial rather than complete improvement over their current state. **Conclusions:** From a patients' perspective neurogenic claudication has a significant multidimensional impact including meaningful emotional effects. Researchers and clinicians need to consider outcomes that matter most to patients with NC. (This is a conference presentation abstract and not a full work that has been published.)

Anatomy gross I palpation review video feasibility and usage

Karen Anthony, Michael Oppelt, Tom Brozovich, Michael VanNatta

Objective: Palpation of important bone features and muscles is a major component to Gross Anatomy I labs at Palmer College Davenport Iowa. The authors wondered if the students would like to see the creation of palpation review videos and if they did, would they use them. **Methods:** A short pre-survey (before the video creation) was given to Gross I students. A post-survey was given to Gross I students after the review videos were created and available for students to utilize. **Results:** The pre-survey revealed that the students did want to see the creation of the palpation review videos and that most would use them if they were available. The post-survey backed up the predicted review video usage when high percentages of students did use the videos (93.3%) and they thought the videos were useful (83.6% very useful and 11.2% somewhat useful). **Conclusion:** The palpation review videos were viewed as useful study tools by Gross I students. (This is a conference presentation abstract and not a full work that has been published.)

Spinal arteriovenous malformation mimicking acute transverse myelitis: A case study

Christopher Arick, Heather Miley

Objective: This case report presents a patient with acute cauda equina symptoms to an emergency room and then to a chiropractic office. The patient was initially diagnosed with transverse myelitis then the diagnosis was changed to arteriovenous malformation.

Clinical Features: A 40-year-old woman presented with progressing severe lumbar and lower extremity pain and numbness, along with progressing weakness with the right lower extremity. **Intervention and Outcome:** An MRI was ordered by the chiropractic physician, which showed inhomologous hyperintensities and cord edema at the level of T12. An initial diagnosis of transverse myelitis was made according to clinical presentation and advanced imaging. After a series of follow-

up MRI scans over the course of 12 months, the diagnosis was changed to arteriovenous malformation. The lesion was excised 24 months after the patient was first admitted to hospital with her initial attack. **Conclusion:** This case illustrates a rare condition of spinal arteriovenous malformation and the delayed proper diagnosis and highlights the importance of further consultation with additional radiologists for appropriate management of the complicated patient. (This is a conference presentation abstract and not a full work that has been published.)

Assessment of cultural competence and attitudes among chiropractic students

Jason Bartlett, Jon Wilson, Rebecca Wates, Mark Pfefer

Objective: The goal of this study was to evaluate student attitudes and cultural competence related to healthcare issues, before and after administration of a government-sponsored educational module. **Method:** An IRB approved, standardized survey instrument titled "The Health Beliefs and Attitudes Scale (HBAS) was administered to chiropractic students before and after completion of course 1 of the Health and Human Services program, A Physician's Practical Guide to Culturally Competent Care, titled Fundamentals of Culturally and Linguistically Appropriate Services (CLAS). **Result:** Instrument items were collapsed into four constructs: opinion (importance of assessing patients' perspectives and opinions); belief (importance of including patients' beliefs in history-taking); context (importance of assessing patients' psychosocial and cultural context); quality (importance of knowing patients' perspective). Pre-course survey scores were obtained from 61 participants and post-course scores were obtained from 46 participants. Descriptive statistical analysis demonstrated an upward trend in scores of three constructs: opinion (pre = 4.2 / post = 4.7), belief (pre = 4.0 / post = 4.7), and context (pre = 5.0 / post = 5.5). **Conclusion:** Although our study was limited, the data suggest a structured educational program can positively impact cultural competence and attitudes among chiropractic students. (This is a conference presentation abstract and not a full work that has been published.)

Progression of solitary bone plasmacytoma to multiple myeloma in a 27-year-old male with low back pain

Patrick Battaglia, Daniel Haun, Mero Nunez, Norman Kettner

Objective: We report progression of solitary bone plasmacytoma (SBP) into multiple myeloma in a 27-year-old male with chronic low back pain (cLBP). **Clinical features:** A 27-year-old male presented with cLBP of 4 years duration. The patient provided radiography and lumbar spine CT obtained at outside institutions that reported a diagnosis of benign hemangioma in the L4 vertebral body. Secondary interpretation of the images raised concern for a more aggressive lesion. Contemporaneous lumbar radiography, CT, and MRI examinations were obtained confirming an aggressive lesion in L4 with pathologic fracture. Biopsy of the lesion was consistent with SBP, a rare malignant bone tumor of plasma cells. Whole-body FDG PET-CT examination demonstrated multiple lesions throughout the axial skeleton, suggesting progression to multiple myeloma. **Intervention and Outcome:** The patient is under oncologic management. Local radiation therapy was applied to L4 prior to initiating chemotherapy. **Conclusion:** This case demonstrates the progression of SBP to multiple myeloma in an unusually young patient. Primary vertebral body neoplasms may be either benign or malignant, and salient imaging features exist which may aid in the differential diagnosis. (This is a conference presentation abstract and not a full work that has been published.)

CMRT and acupuncture in the treatment of dysmenorrhea (oligomenorhea): A case report

Christine Benner, Charles Blum

Objective/Clinical Features: A 31-year-old female patient presented initially to this office for low back and foot pain 5 years prior and wanted preventative wellness care. Approximately 5-years into care, February 2008, the patient discussed the possibility of utilizing acupuncture to help her cope with an irregular menstrual cycle, having only light periods (1-2 days) 2-3 times a year for over 10-years or more. **Interventions/Outcome:** The patient was assessed and treated using sacro occipital technique (SOT) chiropractic, chiropractic

manipulative reflex technique, and acupuncture protocols. Following one-year of integrating sacro occipital technique (SOT) chiropractic manipulative reflex technique (CMRT) for liver (T8), adrenals (T9), and acupuncture her condition has been consistently improving and her cycle has been regulating with periods of monthly cycling and with only 3-months of amenorrhea one-time during a time of high stress and anxiety. **Conclusion:** The chronicity of the patient symptoms, over 10-years, and the temporal relationship between treatment and response to care is of interest. It is also of interest that the patient was receiving chiropractic care on an ongoing preventative basis but not until the treatment changed to include CMRT and acupuncture was there a change in her symptomatology. (This is a conference presentation abstract and not a full work that has been published.)

Epidemiology, diagnosis, risk factors and conservative treatment of paediatric stroke: A literature review

Jean Philippe Berube, Jean-Phillipe Caron, Veronique Lavergne, Chantal Doucet

Objective: Perinatal stroke is the main cause of cerebral palsy and may lead to life long cognitive and behavioural troubles. The aim of this study is to summarize the current knowledge concerning perinatal stroke including epidemiology, risk factors, diagnosis, and the conservative treatment. **Data sources and Selection:** A literature review was conducted on Medline, Academic Search Complete, CINAHL, Scopus, Cochrane, MANTIS, PEDRO and Johanna Briggs. Systematic reviews, guidelines, case reports and other types of articles were deemed acceptable limited to English and French. Results Four guidelines of good quality methodology and eleven literature reviews of low risk bias met all the inclusion criteria and were included in the literature review. Concerning epidemiology, risk factors and diagnosis, studies present similar findings and level of evidence. However, the level of evidence for conservative treatment is low. The current literature focuses on constrained induced movement therapy (CIM). Further research is needed for other treatment options such as mirror therapy and functional electric stimulation. **Conclusions:** Perinatal stroke is a complex condition that includes various risk factors, presentations and outcomes. Further research is necessary in order to make recommendations concerning conservative treatment. (This is a conference presentation abstract and not a full work that has been published.)

Effectiveness of TheraBand kinesiology tape on low back pain patients' pain and disability

Barton Bishop, Jay Greenstein, Jena Etnoyer-Slaski, Robert Topp

Objective: To determine the immediate and delayed effective of TheraBand® Kinesiology Tape(TBKT) on Gmax activation on low back pain(LBP). **Methods:** Twenty subjects(11M,9F) with chronic LBP had surface electromyography applied to the Gmax. At T1, pain was rated and four randomized exercises were performed; Resisted Clams(ClamsR), Standing Hip Abduction Resistance(STAB), Side-lying Hip Abduction(SLAB), and forward bend(FB). After each exercise the patient rated "How hard they were working" on the RISE scale. Next, TBKT was applied to the gluteal area and the EMG exercise protocol was repeated(T2). The tape remained on until patients returned 24-48 hours, where the testing protocol was repeated(T3). Peak activation was determined, compared to the maximum contraction for each muscle group, and expressed as a % of the reference exercise(%REF). **Results:** NPRS significantly decreased($p=0.000$) between all points($T1=4.65, T2=3.98, T3=2.35$). The RISE score significantly declined($p=0.009$) between $T1(x=3.10)$ and $T3(x=2.40)$ during STAB and between $T1(x=3.50)$ and $T2(x=2.30)$ and $T2(x=2.30)$ and $T3(x=2.15)$ for FB($p=0.002$). During ClamsR the $Gmax\%REF$ significantly decreased($p=0.025$) between $T2(x=250.51)$ and $T3(x=162.47)$. **Clinical Relevance:** The combination of decreased $Gmax\%REF$, decreased exercise difficulty, and decreased pain leads to a recommendation of clinicians to use TBKT on the Gmax in the treatment of LBP. (This is a conference presentation abstract and not a full work that has been published.)

Association between the type of first healthcare provider and the duration of financial compensation for occupational back pain

Marc-Andre Blanchette, Michele Rivard, Clermont Dionne, Sheila Hogg-Johnson, Ivan Steenstra

Objective: To compare the duration of financial compensation of workers with occupational back pain who first sought three types of healthcare providers. **Methods:** We analyzed data from a cohort of 5,511 workers who received compensation from the WSIB for back pain in 2005. Multivariable Cox models and logistic regression controlling for relevant covariables were performed to compare the duration of financial compensation for the patients of each of the three types of first healthcare providers. **Results:** Compared with the workers who first saw a physician (reference), those who first saw a chiropractor experienced shorter first episodes of 100% wage compensation (adjusted hazard ratio [HR]=1.20, P-value<0.001), and the workers who first saw a physiotherapist experienced a longer episode of 100% compensation (adjusted HR=0.84, P-value=0.028) during the first 149 days of compensation. The odds of having a second episode of financial compensation were higher among the workers who first consulted a physiotherapist (OR=1.49, P-value=0.040) rather than a physician. **Conclusion:** The type of healthcare provider first visited for back pain is a determinant of the duration of financial compensation during the first five months. Chiropractic patients experience the shortest duration of compensation, and physiotherapy patients experience the longest. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic care of a 30-year-old male patient presenting with cervical spine disc replacement surgery with complications: a case report

Thomas Bloink, Charles Blum

Objective/Clinical Features: A 30-year-old male presented at this office July-2016, 1½-years following C-5/6 disc replacement surgery for a ski-related injury with loss of sensation/function of his right 3rd-4th fingers. Three-months following surgery he felt fine but then noted significant pain in the right neck, scapula, and arm, and occasionally on the left. December-2015 MRI was negative for pathology and was prescribed Neurontin, which helped somewhat. He was using a mandibular mouth-guard since April-2016. He had been an avid runner but couldn't run and only walk ½-mile. **Intervention/Outcomes:** He was assessed with a TMJ disorder: clenching, malocclusion, and craniofacial sensitivities along with cervical spine antalgia, limited ranges-of-motion with pain and weakness of related musculature. Patient was treated with prone SOT pelvic block placement (category-one), intraoral cranial adjustments, and co-treated with a dentist immediately following care. Following the 4th-office-visit he could hike at Yosemite National Park for 10-miles, the first time in over 2-years. By his 11th-office-visit (September-2016) he was able to run 1-mile, had normal cervical ranges-of-motion, no medication, and only occasional pain in his right scapula. **Conclusion:** This case suggests a relationship between the patient's TMJ disorder and cervical spine limited function and pain. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic as part of an interdisciplinary team for the care of a patient with an orbital pseudotumor: A case report

Thomas Bloink, Charles Blum

Objective/Clinical Features: A 47-year-old female woke up over a year prior to seeking care at this office with darkness and limited vision in the right eye lasting two-hours. Her ophthalmologist diagnosed her with an orbital pseudotumor, which was unresponsive to treatment (steroidal anti-inflammatories). A year later the patient presented at this office reporting chronic intermittent headaches in the orbital region worse upon awakening. Her headaches included flashes of light that would become centralized blind spots, and also had a history of tinnitus and bruxism. **Interventions/Outcome:** The patient was found to be a "heavy clencher" with anterior interference malocclusion causing significant forces into the cranium, face and orbits. She presented with an upper dental splint, which was substituted to a mandibular splint, without incisor contact, to relieve compression/pressure. The cranial-dental co-treatment at this office consisted of four-visits (once-per-week) with a dentist, preceded by cranial treatment the same day. She received a total of 10-treatments and following care her symptoms had completely resolved, sustained 1-year post-treatment. **Conclusion:** It is difficult to generalize from case

reports, however the ongoing nature of the patient's condition and the temporal relationship between the care received and his response warrants further study. (This is a conference presentation abstract and not a full work that has been published.)

B6 hypervitaminosis during pregnancy with neurological symptoms: A case report

Charles Blum

Objective: With pregnant patients taking high levels of vitamin B6 and presenting with neurological symptoms, B6 hypervitaminosis may be an important, though rare clinical consideration. **Clinical Features:** A female patient (40-years-old) who was experiencing nausea during her 3rd-pregnancy was advised to take a daily prenatal supplement (Bnexa) that had 100mg of vitamin B6. She took the 100mgs for 2-months, then switching to a 25mg B6 supplement. Within the first 2-months of taking the supplement she began to notice neurological symptoms such as burning behind her eyes, eye floaters, paresthesia into her arms, wrists and fingers. After multiple evaluations by various doctors a blood test was taken that indicated abnormally high levels of B6. Once she stopped the vitamin supplement her symptoms decreased but had not completely resolved and therefore sought care at this clinic. **Intervention/Outcome:** Sacro occipital (SOT) and cranial techniques were used to assess and treat this patient and during the course of care 2-months. The residual signs of her neurological disorders, which had not changed in 6-months, resolved during the 2-months of care. **Conclusion:** B6 hypervitaminosis may be an important part of a differential diagnosis for pregnant/post-partum patients with un-explained neurological symptomatology. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic conservative care of a patient presenting with carpal tunnel syndrome: A case report

Charles Blum

Objective: Effective conservative care of patients presenting with carpal tunnel syndrome may play an important part of improving a patient's ability to return to work, activities of daily living, and quality of life. **Clinical Features:** A 42-years-old female patient presented with carpal tunnel syndrome of 6-month duration unresponsive to rest, splinting, and anti-inflammatory medications. Of significance was her reduced grip strength with pain limiting her activities and worse when arising in the morning. **Intervention/Outcome:** Sacro occipital technique (SOT), SOT extremity techniques, kinesiotaping, and rehabilitative exercises were used to treat the patient's presenting symptomatology. The patient's kinematic chain was assessed and balanced from her lumbopelvic, cervical, thoracic outlet, shoulder, elbow and to her wrist. Her wrist was supported functionally in slight extension with kinesiotape and given exercises using a rubber band to stimulate her forearm extensor muscular, as a means to relax her flexor overuse, was utilized. Her symptoms completely resolved with a return to full grip strength in 3-office visits during a two-week period, and has sustained itself for 2-years. **Conclusion:** Chiropractic with extremity adjusting, kinesiotaping, and rehabilitative exercises may be an important consideration for the conservative treatment of patients presenting with carpal tunnel syndrome. (This is a conference presentation abstract and not a full work that has been published.)

Effect of spinal manipulative therapy on mechanical pain sensitivity in patients with chronic non-specific low back pain: a randomized, controlled trial

Bryan Bond, Christopher Kinslow, Adam Yoder, Wen Liu

Objective: The long-term goal of our study is to improve the understanding of the biological mechanisms associated with spinal manipulative therapy (SMT) in spinal pain. **Methods:** This project involved a prospective, randomized, blinded clinical trial of 3-week SMT in chronic non-specific low back pain (CNSLBP) patients. We recruited 29 participants and randomly assigned them into either a SMT or sham SMT group. Pre- and post-intervention, we quantified the effect of SMT on clinical outcomes (Numeric Pain Rating Scale and Oswestry Disability Index) and pressure pain threshold (PPT) at local (lumbar spine), regional (lower extremity), and remote (upper extremity) anatomical sites. **Results:** SMT and sham SMT reduced hypersensitivity (increased PPT) at local ($p < .01$) and regional ($p < .01$) locations at 3-weeks, as shown in a significant main effect for

time. Furthermore, a significant main effect for time was observed for reduced pain ($p < .001$) and disability ($p < .05$). However, no between-group differences were observed in PPT, clinical pain, or disability between the SMT and sham SMT groups over 3-weeks. **Conclusion:** SMT or sham SMT may influence peripheral and/or central pain pathways in CNSLBP patients, independent of how the spinal manipulation was applied. (This is a conference presentation abstract and not a full work that has been published.)

Self-perceived confidence of chiropractic student interns managing children with Autism Spectrum Disorder: A student survey

Beatrice Borges, Lisa Rubin

Objective: A government survey of parents suggests that one in forty-five children have Autism Spectrum Disorder (ASD). This study was designed to investigate how senior chiropractic interns perceive their confidence and level of competency to manage the care of children with ASD. **Methods:** A 27 question online survey was distributed to senior level chiropractic interns. The JotForms program was used to electronically collect the data. Three categories of questions were asked pertaining to public health, assessment and case management. **Results:** 33 out of 49 interns knew someone diagnosed with ASD. The interns reported competence performing spinal exams. Most interns were aware of educational and social difficulties in children with ASD and changes made to diagnostic criteria in the DSM-5. Mixed results were found regarding awareness of nutritional and neurological deficits and appropriate responses to repetitive behaviors. The interns reported potential deficiencies in their knowledge of prevalence of ASD; cost to society; referral resources; case management and assessment of children with ASD. **Conclusion:** Chiropractors are in a position to educate parents on treatment options and resources for children with ASD. This research suggests further integration is needed in the education system on this topic. (This is a conference presentation abstract and not a full work that has been published.)

Relief of neurological symptoms secondary to surgical removal of thoracic astrocytoma and laminectomy by category I block placement: a case report

William Boro

Objective: To describe the clinical course, treatment and immediate response of a patient suffering from buzzing paresthesia secondary to surgical removal of thoracic astrocytoma which was relieved by Category I Sacro Occipital Technique™ block placement. **Clinical Features:** A 27 year-old nulliparous female had 4" thoracic pilocytic astrocytoma, between T4-T7, surgically removed. Six months of PT provided little improvement and she presented to my clinic with the following symptoms: lower back pain, neuropathy, paresthesias and visceral dysfunction, pain and numbness in both legs, pins and needles and buzzing sensation in both legs. Post-surgery she was unable to walk for 2 weeks and stated that she feels a continuous "buzzing" in her legs. She had difficulty getting in and out of car, sitting at a table, pushing, it was painful to stand more than an hour, and she needed to use a walker. **Intervention and Outcome:** Success was achieved in reducing many of the presenting symptoms. However, Category I block placement produced repeated and immediate relief of paresthesias within 5 minutes of placement, lasting up to 24 hours or more. **Conclusion:** This report describes patient response to Category I blocking and suggests a rationale for its success. (This is a conference presentation abstract and not a full work that has been published.)

The impact of collaborative testing on test anxiety

Breanne Bovee

Objective: High-stakes testing environments may lead to test anxiety in college students and may negatively impact academic performance. Learning strategies related to test taking, test administration and test preparation may reduce test anxiety. Collaborative testing is 1 possible method for reducing test anxiety. This paper examines whether collaborative testing has an effect on test anxiety in students at professional health institutions. **Data Sources and Selection:** The literature was searched using PubMed, Google Scholar, Ebscohost and Science Direct. Indexing terms included collaborative testing and test anxiety. Studies were selected if they discussed test anxiety and collaborative testing at professional health institutions. After review, 4

articles were chosen. **Results:** Results were similar in all studies. Students who took tests collaboratively had reduced test anxiety compared to students who took tests individually. Other interesting findings were improved test scores, increased confidence, enhanced critical thinking skills and higher student satisfaction. **Conclusion:** Collaborative testing may reduce test anxiety. Faculty and administrators may want to incorporate this testing strategy into their classrooms to help reduce test anxiety. Further evaluation of collaborative testing's impact on test anxiety and academic performance is needed. (This is a conference presentation abstract and not a full work that has been published.)

Incidental finding of sinus mucus retention cyst in a chiropractic teaching clinic

Heather Bowyer, Ryan Funderburk, Matthew Richardson

Objective: To discuss discovery of a sinus mucus retention cyst on routine cervical spine radiographs performed on a patient with suspected acute cervical disc derangement in a chiropractic teaching clinic. Although usually incidental, this finding was pivotal to patient management. **Clinical Features:** A patient with a history of headaches, loss of sense of smell and nasal congestion presented with acute cervical spine pain due to suspected disc derangement. Routine cervical spine radiographs also revealed a maxillary sinus mucus retention cyst. **Intervention and Outcome:** The patient was referred to a specialist and subsequently underwent a balloon sinuplasty. **Conclusion:** Chiropractic physicians are in a unique position to identify findings on routine radiographs that may not be related to the presenting complaint, but which may be relevant to other disease in the patient. Identifying non-spinal pathology on radiographs and referring patients for appropriate management of such conditions 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.)

The complex decision-making that radiographic findings require. A secondary analysis of older adults with low back pain screened for a randomized controlled trial

James Boysen, Zacariah Shannon, Yasmeen Khan, Breanne BOvee, Robert Vining

Objective: Describe findings and recommendations requiring complex decision-making contained in lumbar spine radiology reports of older adults with low back pain who sought enrollment in a clinical trial studying collaborative medical and chiropractic care. A model describing the complex decision-making process is proposed. **Methods:** Two reviewers independently abstracted data from 170 lumbar x-ray reports obtained during the eligibility process for the clinical trial. Findings and recommendations were recorded and categorized. A consensus process was developed to resolve discordant findings. **Results:** The mean (SD) age (61% male) was 73.0 (7.13). The most prevalent findings were: degenerative disc disease (n=166, 98%), osteopenia/osteoporosis (n=157, 92%), zygapophysial degenerative joint disease (n=147, 86%), and atherosclerosis (n=131, 77%). Four instances of aortic aneurysms were identified. Eight findings were classified as "probable" and 56 as "suspected." Reports included 70 radiology recommendations with 11 classified as "required" and 59 as "optional." **Conclusion:** Each finding and recommendation in a radiology report requires complex clinical decision-making to inform triage decisions, diagnoses, clinical recommendations, and management/co-management strategies. Deciding what information to communicate or withhold is a complex process as clinicians aim to avoid labeling and victimizing while promoting self-efficacy through constructive education. (This is a conference presentation abstract and not a full work that has been published.)

Swimming and chiropractic adjustment effects in an animal model of osteopenia

Francielle Braz Oliveira da Silva, Sergio Inacio Rech, Gunther Gehlen, Damiel Facchini

Background: There is little discussion on the specific indication of the applicability of chiropractic techniques in the case of osteoporosis, because their effects are unknown. **Objective:** To measure changes in bone density due to chiropractic adjustments using the Activator® in a

dexamethasone induced animal model for osteopenia. **Methods:** Wistar adult female rats, were divided randomly into the following groups: C) Control: no intervention; CD) Control dexamethasone (10 mg/Kg); ND) Swimming and dexamethasone; NAD) Swimming and chiropractic adjustment; AD) chiropractic adjustment and dexamethasone. After the interventions the right femurs and tibias were dissected and radiological images for densitometric analysis were obtained. **Results:** Relative to trabecular bone density, there was change as described in the literature, being significant in the comparisons between groups (AD) and (C) in femurs ($p < 0.01$) and between groups (AD) and (ND) in femurs and tibias ($p < 0.01$). It was observed slight increase in the group (CD) relative to (ND) ($p < 0.05$) in tibias. **Conclusion:** Based on our data, the most significant treatment for trabecular bone microstructure recovery for this model was the chiropractic adjustment, since it presented the highest rates of trabecular bone density in femora and tibias analyzed. (This is a conference presentation abstract and not a full work that has been published.)

The health and injury profile of adult Australian competitive surfers

Andrew Burgess, Michael Swain, Reidar Lystad

Objective: To describe the health and injury profile of adult Australian competitive surfers.

Methods: All registered participants at the 2014 Australian Surfing Titles were invited to complete an online survey comprising: (1) demographic and surfing information; (2) health-related quality of life using the SF-12 questionnaire; and (3) surfing injury history. Descriptive statistics were used to describe the survey responses. **Results:** The sample consisted of 227 (77% male) surfers with mean age of 35.0 ± 13.2 years. They spent, on average, 10.0 ± 6.5 hours per week surfing. The mean SF-12 physical and mental health component scores were 53.3 ± 5.4 and 55.6 ± 6.2 , respectively. A total of 175 (81.0%) respondents reported incurring at least one surfing-related injury in their lifetimes, while 90 (57.5%) respondents reported incurring at least one surfing-related injury in the current season. The most commonly injured body regions were the lower back, foot, knee, and ankle; while the most common types of injury were abrasion and laceration. **Conclusion:** Although adult Australian competitive surfers report greater physical and mental health-related quality of life compared to the age-matched general population, surfing-related injuries are nevertheless relatively common. The present study reveals a higher burden of lower back injuries compared to previous reports. (This is a conference presentation abstract and not a full work that has been published.)

Does a visual teaching guide to Upper Cervical Specific technique improve retention in chiropractic students when compared to a written teaching guide?

Alice Cade, Graham Dobson, Matthew Sherson, Kelly Holt, Heidi Haavik

Objectives: To investigate if visual teaching aids (VTA) enhance recall of upper cervical specific technique (UCST) in chiropractic students when compared to written guides (WG).

Methods: 70 chiropractic students, who completed the UCST-course, were evaluated for UCST recall, pre and post VTA/WG review. Two randomized groups reviewed original course WG's (n = 33) or new VTA's (n = 37). A repeated-measures ANOVA and post-hoc t-tests compared group differences in re-evaluation scores. **Results:** Performance of both groups improved post-intervention ($p < 0.01$). However, the VTA-group improved more than the WG-group ($p = 0.03$). The VTA-group percentage score improved by $24.4\% \pm 12.3\%$ ($p < 0.01$), the WG improved by $17.7\% \pm 13.7\%$ ($p < 0.01$). **Conclusions:** Use of VTA's in reviewing UCST shows significant improvement in student performance compared to a WG. Chiropractic educators may find VTA's assist student's recollection of complex, multi-plane spinal movements. VTA's may be considerably useful, given the understanding of many chiropractic techniques relies on skilled 3-dimensional mental modelling of a functional spinal unit when in a subluxated position. (This is a conference presentation abstract and not a full work that has been published.)

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Shoe orthotics for the treatment of chronic low back pain: a randomized controlled trial

Jerrilyn Cambron, Jennifer Dexheimer, Manuel Duarte, Sally Freels

Objectives-To investigate the efficacy of shoe orthotics with and without chiropractic treatment for chronic low back pain. **Methods-**Two hundred and twenty-five subjects over the age of 18 with symptomatic low back pain of 3 months or longer were randomized into one of three treatment groups (Orthotics, Plus, and Wait-list Groups). The Orthotics Group received custom-made shoe orthotics. The Plus Group received custom-made orthotics plus chiropractic care (manipulation, hot or cold packs, and manual soft tissue massage). The Wait-list Group received no care. The primary outcome measures were change in perceived back pain (Numeric Pain Rating Scale) and functional health status (Oswestry) after 6 weeks of study participation. **Results-**When compared to the Wait-list Group, the Orthotics Group demonstrated significant improvements in pain (p < 0.0001) and function (p = 0.0068). Adding chiropractic care to orthotics treatment (Plus Group) further improved function (p = 0.0278) compared to orthotics alone, but demonstrated no significant difference in pain (p = 0.3431). **Conclusions-**According to the National Board of Chiropractic Examiners, 72% of chiropractors utilized orthotics as an adjunctive procedure. Based on the results of this clinical trial, prescription orthotics may be a beneficial treatment option for patients with low back pain. More research is needed on other conditions. (This is a conference presentation abstract and not a full work that has been published.)

Atypical presentation of hemiparesis following a paediatric stroke: A case report

Jean-Philippe Caron, Jean-Philippe Berube, Veronique Lavergne, Chantal Doucet

Objectives: The purpose of this study is to describe an ambiguous case of hemiparesis, presumably associated with a paediatric stroke that was observed as of 6 months of age.

Clinical features: Other than a traumatic birth at 38 weeks of gestation, the mother and the infant did not present any other risk factors seen in paediatric stroke. At her initial chiropractic visit, she presented an underuse of her left arm and an asymmetric tonic neck reflex abnormality. A referral in neurology was done for suspected paediatric stroke. Other motor deficits such as midline reaching, active range of motion of the upper limbs and spasticity of the affected side were observed in the following visits between 7 and 8 months of age.

Intervention and outcome: Treatments consisted of light mobilisations and soft tissue techniques at a frequency of once or twice a month for 6 months. A multimodal approach intervention was used including several health care practitioners. The patient has seen improvement in

her active range of motion, only having a fine motor skill deficiency. **Conclusion:** Early detection is advised for better patient outcome. Referral is necessary in order to receive the appropriate investigation and care. (This is a conference presentation abstract and not a full work that has been published.)

Alleviating pudendal neuralgia pain and symptoms with super pulsed laser therapy

Christopher Carraway, Douglas Johnson, Robin Schumacher

Objective: The purpose of these case studies is to evaluate the clinical effectiveness of super pulsed laser (SPL) for the treatment of chronic pudendal neuralgia. **Clinical Features:** Pudendal neuralgia (PN) causes severe pain in the genitals and/or anal-rectal area with increased discomfort by sitting and/or any physical contact to the area. Patients presented with PN symptoms and had undergone multiple interventions - medications, nerve blocks and surgical intervention. Each patient was evaluated and diagnosis of PN confirmed. Daily treatments of SPL, treating in two locations along the distribution of the pudendal nerve and to the corresponding dorsal roots was prescribed. **Intervention:** Three (3) female patients diagnosed with chronic PN, were treated with SPL as the only intervention. VAS scores determined pain levels. Treatments were daily and reduced frequency as their pain subsided. Increased tolerance for Activities of Daily Living (ADL) and physical contact to the genitals was observed. **Outcomes:** In each case, SPL achieved a marked reduction of PN pain from the first intervention. Subsequent treatments yielded additional improvement in pain and significant improvements in ADL. **Conclusion:** Super pulsed laser therapy may provide a new method to ameliorate pudendal neuralgia and its associated symptoms. (This is a conference presentation abstract and not a full work that has been published.)

Super pulsed laser therapy for the amelioration of migraine headaches and associated pain

Christopher Carraway, Douglas Johnson, Robin Schumacher

Objective: The purpose of these case studies is to evaluate the clinical effectiveness of super pulsed laser (SPL) in conjunction with chiropractic for patients presenting with migraine headaches. **Clinical Features:** The diagnosis of migraine is formulated from the patient's present and past history of signs and symptoms. The characteristics of the case are evaluated to make a determination of what type of headache the patient is suffering. After concluding the patient has a migraine headache we set up a schedule for treatment. Each patient receives standard chiropractic care with the inclusion of SPL therapy. **Intervention:** Three (3) patients with migraine headaches were treated with standard chiropractic care and SPL therapy. 6 to 12 SPL treatments were applied twice per week. VAS ratings were taken before and after treatment to evaluate the effectiveness of the treatment. Each of the 3 migraine patients received an additional SPL application to the sphenopalatine ganglion. **Outcome:** Chiropractic alone was not significant in the reduction of pain. A significant reduction of pain and symptoms were noted after super pulsed laser therapy treatment. **Conclusion:** Super pulsed laser therapy may provide a new method to ameliorate migraine headaches and its associated symptoms. (This is a conference presentation abstract and not a full work that has been published.)

Latent class regression analysis for clustering stiffness curves: An exploratory analysis

Yolanda Casciaro, Gregory Kawchuk, Narashima Prasad

Objective: Our lab has recently shown stiffness can be reduced as a result of spinal manipulation. As current analysis techniques use a single point to represent an entire stiffness curve, analysis techniques capable of evaluating entire stiffness curves may reveal new sources of clinically significant data. Our objective was to determine if an established statistical technique used to identify clusters of similar patients (latent class regression analysis or LCRA) can be repurposed to identify unique stiffness curves. **Methods:** Two cohorts of data, each consisting of three distinct curve types (linear, exponential, and logarithmic) were analysed in LCRA software to determine if LCRA can effectively differentiate curve types. The first cohort had minimal curve overlap, while the second cohort was interspersed. Output was analyzed to determine if LCRA curve assignments matched known

curve types. **Results:** Even with a small sample ($n=9$), LCRA effectively grouped curves by type and relative rate of change. Misclassification was very low for both cohorts ($n<1$). **Conclusion:** LCRA is suitable for clustering stiffness curves. Next, LCRA will be used with clinical data to determine if unique stiffness clusters exist that can identify patients who may benefit from manipulation prior to its application. (This is a conference presentation abstract and not a full work that has been published.)

Improvement in post-concussion symptoms in 3 female patients utilizing the NUCCA procedure after failed management with high velocity low amplitude manipulation

Jonathan Chung

Objective: To describe the improvements in post-concussion symptoms following upper cervical chiropractic care utilizing the NUCCA procedure after failed management with high velocity low amplitude (HVLA) manipulation. **Clinical Features:** Three female patients presented with complaint of migraine-type headache, vertigo, and neck pain lasting for greater than 3 months following a concussive head injury. **Intervention and Outcomes:** Patients all presented for upper cervical chiropractic care after failed management with another chiropractor utilizing diversified chiropractic manipulation. Patients were evaluated for the presence of the Atlas Subluxation Complex (ASC) using the protocol outlined the National Upper Cervical Chiropractic Association. Low force upper cervical adjustment performed with reduction of ASC verified using post x-ray. All three patients reported improvement in headache and vertigo within 2 weeks of upper cervical care. After 8 weeks, all patients showed full resolution of headache and vertigo. **Conclusion:** Patients with headache and vertigo following a concussion that do not respond to HVLA manipulation may benefit from upper cervical chiropractic with the NUCCA procedure. More research is needed on the role of chiropractic and post-concussion syndrome. (This is a conference presentation abstract and not a full work that has been published.)

Diagnosis and referral of a 26-year-old female with dysmenorrhea due to teratomas

Diane Clark, Matthew Richardson, Bridget Edkin

Objective: To describe the diagnosis and referral of a 26-year-old female who experienced dysmenorrhea for 10 years caused by undetected teratomas. **Clinical features:** A 26-year-old woman presented with hip and low back pain. History and physical examination discovered leg length inequality and pelvic unleveling due to old lower leg fractures. She also noted having dysmenorrhea and migraines for 10 years. **Intervention and outcome:** Lumbopelvic x-rays were taken to evaluate lumbopelvic biomechanics. The x-rays demonstrated bilateral ovarian teratomas. The patient was under treatment by a gynecologist for dysmenorrhea. The gynecologist had prescribed birth control which did not help regulate her condition. The patient was referred back to her gynecologist for further testing (transvaginal ultrasound) and ultimately removal of the teratomas while preserving her ovaries. **Conclusion:** Chiropractors may diagnose conditions not detected by a specialist. Workup in the chiropractic clinical setting including history, physical evaluation and x-rays was key to making the diagnosis of ovarian teratomas. This led to referral, follow-up diagnostic imaging, and surgical treatment that restored a more normal menstruation and decreased migraine headache frequency. (This is a conference presentation abstract and not a full work that has been published.)

Multi-level histopathological analysis of an ovine cervical spine intervertebral disc degeneration model

Christopher Colloca, Julia Kuliwaba, Brian Freeman, Robert Gunzburg, Mostafa Hegazy, Richard Hinrichs

Objective: The objective of this study was to develop an ovine model of cervical spine disc degeneration (DD) and to investigate the effect of disc injury on histopathological progression of DD. **Methods:** Fifty-nine Merino wethers received either surgically induced disc injury to a mid-cervical spine level (Annulotomy) ($n=30$), sham neck surgery ($n=14$), or served as controls ($n=15$). At minimum of 1 year follow-up histopathological analysis was conducted blinded to group allocation using a previously validated DD grading system. Group differences of DD scores were examined using ANOVA and Mann-

Whitney U Tests and linear regression models examined disc injury and adjacent segment DD. **Results:** Annulotomy resulted in significantly greater DD than in controls ($p=0.01$), but not sham surgery. Sham neck surgery resulted in increased DD compared to controls ($p=0.048$). Annulotomy predicted adjacent segment DD ($R^2=0.146$, $p=0.041$) and nucleus pulposus (NP) DD also predicted adjacent segment DD ($R^2=0.152$, $p=0.036$), findings not observed in the sham or control groups. **Conclusion:** Annular injury to the ovine cervical spine produced only mild-moderate cervical spine DD that did not progress to extensive DD but did predict adjacent segment DD. These novel findings provide considerable regional contrast in the pathogenesis of DD. (This is a conference presentation abstract and not a full work that has been published.)

Comparison of chiropractic student values between digital and manual inclinometer mensuration of the spine

Karima Cooper, Joseph Guagliardo

Objective: Active range of motion (AROM) is a concern for clinicians in diagnostic assessments of patients with musculoskeletal disease. These evaluations obtain functional improvements as well as the degree of permanent impairment of an individual. This study focused on determining the accuracy between students in a chiropractic program and their instructor. **Methods:** Our institution's IRB approved a pilot study in which three volunteer students and one instructor collected AROM values on a set of six individual students who were measured on all cardinal ROM for the spine utilizing both manual (M) and digital (D) inclinometer values. **Results:** The data was evaluated to determine the standard deviations of the groups with ranges of M(3.46-13.1) and D(1.5-29.5), Pearson's r was calculated between groups with the greatest correlation of cervical flexion of the D group ($r=0.74$) and the weakest with the M group of cervical flexion ($r=0.015$). All values collected per patient were averaged and the difference between the groups was determined ($M=7.3$ and $D=9.5$). **Conclusion:** This limited study suggests that better efficacy is obtained with digital mensuration. Information from this study can be utilized to help strengthen educational methods for better accuracy in manual mensuration in the future. (This is a conference presentation abstract and not a full work that has been published.)

Improving data literacy and understanding of experimental design in a chiropractic technique laboratory class

Robert Cooperstein

Objective: Chiropractic instruction includes hands-on lab courses and didactic exposure to EBC, but with little integration. The author, experienced in conducting interexaminer reliability studies, hypothesized that manual therapy instruction, understanding of experimental design, and data literacy could be enhanced if laboratory settings were used to obtain and analyze clinical data. **Methods:** Several sessions in an 8th quarter laboratory class included acquiring reliability data for static/motion palpation and pain provocation. Students entered their own data on a white board, which the instructor photographed and analyzed overnight. During data acquisition, the instructor led discussion on experimental design issues. A 21 item survey at quarter's end assessed student satisfaction, and the degree to which the course modification had (a) improved clinical skills; (b) enhanced understanding of research design; and (c) provided practical experience in EBC. **Results:** There was broad satisfaction with the course modifications, more confidence in the examination procedures studied, refined understanding of how clinical research is conducted, and greater data literacy. **Conclusion:** Students serving as simulated researchers/subjects reinforces understanding of evidence-based health care beyond what is learned in purely didactic settings. Students can develop data literacy without necessarily learning how to analyze data themselves. (This is a conference presentation abstract and not a full work that has been published.)

Two clinically contrasting cases of ankylosing spondylitis

Stacey Cornelson, Allison Harvey, David Beavers, Norman Kettner

Objective: This case series compares an unusual with a classic presentation of ankylosing spondylitis (AS). **Clinical features:** One patient, a female, presented with chronic, mechanical neck pain and stiffness while the other, a male, presented with chronic low back and left hip pain. Physical examination failed to identify systemic findings

associated with AS. Laboratory examination of the male patient yielded a positive HLA-B27, but the female patient was HLA-B27 negative. Both patients underwent spinal imaging including sacroiliac joints which revealed bilateral, symmetric sacroiliitis. **Intervention and outcomes:** The male patient underwent a course of diversified spinal and soft tissue manipulation of the lumbar spine and pelvis. The female patient was treated with a course of instrument-assisted spinal manipulation and was given at-home stretches and exercises performed daily. Both have seen some relief of their symptoms. **Conclusion:** We compare both classic and atypical presentations of AS. Ankylosing spondylitis is a seronegative spondyloarthropathy with radiographic non-infectious sacroiliitis and HLA-B27 positive. These findings are noted in 90-95% of patients. The male patient had the typical presentation, whereas, the female patient was atypical. Chiropractic spinal manipulation may be useful in reducing symptomatology of AS. (This is a conference presentation abstract and not a full work that has been published.)

Appropriateness of spinal manipulation/mobilization for chronic low back pain: systematic review

Ian Coulter, Eric Hurwitz, Howard Vernon, Cindy Crawford, Raheleh Khorsan, Margaret Whitley, Marika Booth

Objective: Systematic review of the scientific literature of manipulation and mobilization for the treatment of chronic low back pain. **Methods:** Key databases were searched from 2000 through March 2014. Meta-analysis was performed at the outcome level. Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) methodology was employed to determine the confidence in the effect estimates and quality of the body of evidence. **Results:** A small-medium effect in favor of manipulation for chronic low back pain patients with pain duration of at least 3 months or more. The effect increased over time for reducing pain intensity. Manipulation was also shown to reduce disability. In the case of studies that defined chronic pain as 12 months or more, there is insufficient evidence to draw any conclusions. Evidence to support mobilization interventions is not as strong as the manipulation intervention studies. **Conclusion:** The multimodal studies programs, where the effect of either manipulation or mobilization could be “teased out”, may be the most promising style of interventions for patients’ overall benefit. (This is a conference presentation abstract and not a full work that has been published.)

A Case-series of patients with musculoskeletal conditions presenting to a World Spine Care Clinic in Moca, Dominican Republic

Sophia da Silva-Oolup, Margareta Nordin, Pierre Cote, Paula Stern, Geoff Outerbridge

Objectives: To describe the characteristics and activity limitations of new patients presenting to a primary care spine clinic located in the underserved community of Moca, Dominican Republic. **Methods:** We conducted a prospective case series of consecutive adults between October 2015 and December 2015. A survey was administered to collect socio-demographics, expectation of recovery, comorbidities, and self-reported health status data. Descriptive statistics were calculated for all study variables. **Results:** Forty-two patients (23 females and 19 males) were included. The most common primary complaint was lower back pain (40%) and 57% of individuals reported interfering pain. Half of patients presented with two complaints. Complaints were similar between genders. Most patients (64%) reported chronic pain (> 6 months), but 97% believed that they would recover. Twenty percent experienced depression and/or anxiety and most (57%) reported poor health related quality of life. **Conclusions:** Little is known about patients visiting spine care providers in the developing world. Our study is the first to describe characteristics of patients seeking spine care in the Dominican Republic. Most patients suffered from persistent spine complaints that interfered with their function and daily activities. Nevertheless, they have positive expectations of recovery. (This is a conference presentation abstract and not a full work that has been published.)

The relationship between spinal pain and comorbidity: a cross-sectional analysis of 579 community-dwelling, older Australian women

Katie DeLuca, Lynne Parkinson, Scott Haldeman, Julie Byles, Fiona Blyth

The aims are to report the prevalence, explore the impact and assess the relationship between spinal pain and the type and number of comorbidities. Methods included a cross-sectional study of 579 older Australian women with spinal pain and comorbid chronic diseases. Descriptive statistics and binary logistic regression were performed. Spinal pain is common and has a significant impact on health related quality of life. Spinal pain was significantly associated with overweight/obese, diabetes, pulmonary disease, mental health and cardiovascular disease. Over half of the women with spinal pain reported two or more comorbidities, with the higher number of comorbidities significantly more common among women with spinal pain than women without spinal pain. This is the first study to report a significant incremental increase in the risk associated with increasing comorbidity count. Comorbid chronic diseases contribute to allostatic load, and of interest is the role of spinal pain as a contributor to dysregulated physiological mechanisms. (This is a conference presentation abstract and not a full work that has been published.)

Use of shoe orthotics within Illinois chiropractic physicians’ offices

Jennifer Dexheimer, Abdulla Hafid, Manuel Duarte, Jerrilyn Cambron

Objective: To survey chiropractors’ about their utilization of shoe orthotics in practice.

Methods: Approximately 1500 chiropractors’ within the Chicagoland area were approached through email about completing this Survey-Monkey survey. **Results:** Forty-two respondents prescribe only custom-made orthotics, 16 only non-custom orthotics, 67 both types of orthotics, and 13 did not prescribe orthotics. Custom-made orthotics were prescribed, typically less than once per month and primarily for foot pain (93%), knee pain (88%), plantar fasciitis (84%), ankle pain (78%), and back pain (74%). More than 50% report an average break-in period to last 1-3 weeks. Expense and insurance coverage are the main factors that affect a chiropractors’ decision to prescribe. Non-custom orthotics were recommended, typically 1-2 times per month and mainly for foot pain (85%), plantar fasciitis (71%), ankle pain (60%), knee pain (55%), and heel spurs (54%). The chief factor in recommending non-custom orthotics is inexpensive cost. **Conclusion:** Many chiropractors’ use some form of orthotic care within their practices, but little is known about utilization characteristics. These results demonstrate that the primary focus of care is on lower extremity issues rather than low back pain as expected. Further research is needed with a larger number of chiropractors’ across the United States. (This is a conference presentation abstract and not a full work that has been published.)

Atypical presentation of cervical myelopathy in a chiropractic practice

Robert Donkin

Objective: To present a case of cervical myelopathy with minimal symptoms in contrast to the typical presentation of cervical myelopathy. The resultant treatment and outcome also differ from traditional medical recommendations. **Clinical Features:** This 60 year old patient presents with mild neck pain and upper limb paresthesias. Active cervical rotation was limited without pain. Upper limb reflexes and myotomes were normal. Hypoesthesia noted over C5 dermatome bilaterally. Spurlings, Lhermitte and Hoffman’s sign were normal. No distal weakness was noted. Patient’s gait was normal. In contrast, MRI shows spinal stenosis with myelopathic changes at C5/6 and C6/7. **Intervention and outcome:** Three spinal orthopaedic opinions were : a. operate within three weeks; b. reassess in three months; c. a conservative approach due to the patient’s mild symptoms in spite of the MRI findings. Chiropractic treatment included manual traction, trigger point therapy, posture education combined with resisted cervical isometric exercises. **Conclusion:** A patient with cervical myelopathy may be a more common presentation in a chiropractic setting than previously realized due to the lack of typical symptoms. (This is a conference presentation abstract and not a full work that has been published.)

The quality of life of chiropractic students using the Patient Reported Outcomes Measurement Information System

Brian Dooley, John Hart, Joel Alcantara

Objective: To assess the quality of life of chiropractic students using the patient reported outcomes measurement information system (PROMIS). **Methods:** A convenience sample of chiropractic students completed the PROMIS-29 to assess a number of quality of life domains based on T score metric (mean=50; SD=10) in addition to providing socio-demographic information (i.e., age, gender). Analysis utilized descriptive statistics. **Results:** One hundred eighteen students (56 males) comprised our study population. The majority were 18-25 years age old (N=59) or 26-35 years old (N=48). The majority of responders were in their year 1 of study (N=57) followed by year 2 (N=35) and year 3 (N=26). Their mean T scores were: physical functioning (54.8), anxiety (71.4), depressive symptoms (73.57), fatigue (62.34), sleep disturbance (48.47), ability to participate in social roles (55.14) and pain interference (47.27). The mean numeric pain rating was 1.61. These students have lower quality of life when compared to a representative sample of the US population in terms of anxiety, depression and fatigue but similar mean T scores in physical functioning and pain interference. **Conclusion:** The PROMIS-29 questionnaire was successfully implemented within a chiropractic college. (This is a conference presentation abstract and not a full work that has been published.)

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Expression of a neurogenic inflammation marker at a neurosegmentally linked joint in rats exposed to lumbar facet joint injury

Felipe C. K. Duarte, Derek Zwambag, Stephan Brown, Andrea Clark, Mark Hurtig, John Srebely

Objective: To investigate the expression of the major player in neurogenic inflammation, Substance P, in neurosegmentally linked knee joints in rats exposed to experimentally induced spinal facet joint compression injury at L5-L6. **Methods:** After ethical approval (AUP 2460), adult male Sprague Dawley rats were assigned to left sided L5-L6 lumbar facet compression surgery (n=3), left sided L5-L6 lumbar facet exposure (sham surgery) (n=3) and naïve (no surgery) (n=2) groups. Animals were euthanized at 28 days and the ipsilateral knees were harvested. Serial 5µm histology sections were obtained after tissue fixation and Substance P was analyzed using immunohistochemistry and light microscope. Qualitative analyses were used to assess the level of Substance P expression. **Results:** Substance P expression was higher in knee perichondrium and chondrocytes of operated compared to sham and naïve rats. **Conclusion:** Preliminary results suggest a neurogenically mediated increased expression of Substance P within neurosegmentally linked joints distal to the site of injury. Future research will address the pathophysiologic implications of this observation. (This is a conference presentation abstract and not a full work that has been published.)

Palpatory acuity among chiropractic students and experienced chiropractors

Jens Duehr, Imran Khan Niazi, Rasmus Wiberg, Lisa Baptista, David Russell, Heidi Haavik, Kelly Holt

Objective: To investigate palpatory acuity in students at different stages in a chiropractic training programme and in experienced chiropractors. **Methods:** Palpatory acuity was assessed in 199 chiropractic students from 4 different year levels, and 13 experienced chiropractors. Palpatory acuity was measured by assessing the participants ability to accurately locate a nylon monofilament under a variable number of 80gsm white copying paper sheets while blindfolded. A one-way ANOVA and post-hoc t-tests were used to assess for between group differences. Significance was set at $p < 0.05$. **Results:** There was a significant between group difference in palpatory acuity ($F(4,207) = 4.832, p = 0.01$). Palpatory acuity in years 1 and 2 were similar (25 and 26 sheets of paper), and years 3 and 4 and experienced chiropractors also had similar results (39, 38, 42 sheets respectively). T-tests revealed that palpatory acuity was significantly increased in years 3 and 4 and experienced chiropractors compared to both year 1 and 2 students. No other between group differences existed. **Conclusion:** Palpatory acuity appears to improve 2 years after entering a chiropractic training programme and then does not significantly increase thereafter. This may be important for chiropractic educators when teaching spinal assessment to chiropractic students. (This is a conference presentation abstract and not a full work that has been published.)

Student exam performance: lecture versus e-learning

Nadine Ellul, David Starmer

Objective: Examine the application of an E-learning method of delivery in an applied science course, compare changes in student exam performance, and identify emerging themes around student satisfaction compared to the previous cohort within a lecture-based teaching model. **Methods:** Retrospective cohort study using data collected from two academic years, one using an E-learning model and the other a lecture-based model within an applied science course. Written exam performance was compared using an unpaired t-test for both groups to determine if significant differences between them existed. Qualitative course evaluation data was collected and analyzed for major themes. **Results:** There was a significant difference ($t [371] = 6.68, p = 0.001$) in exam performance between the E-learning ($n=189$) ($M=79, SD=9$) and lecture group ($n=184$) ($M=85, SD=8$). Students consistently reported satisfaction with E-learning due to its accessibility, ease of use, as well as the interactive and collaborative nature of content delivery. **Conclusion:** Our data reinforces the value of active learning strategies such as E-learning to enhance teaching, learning, and engagement. Student performance and course satisfaction increased with the replacement of lectures with E-learning. Such trends provide cautious optimism to encourage further applications of E-learning and transitions away from lecture methods of delivery. (This is a conference presentation abstract and not a full work that has been published.)

Management of back pain-related disorders in a community with limited access to health care services: a case for introducing chiropractors as service providers

Peter Emary, Amy Brown, Doug Cameron, Alex Pessoa, Jennifer Bolton

Objective: Back pain is prevalent among low socioeconomic groups, yet many face barriers to accessing chiropractic care. The purpose of this study was to evaluate a new integrative chiropractic service for back pain patients within a primary care, community health center (CHC) setting. **Methods:** Patients were referred by their medical provider and completed questionnaires at baseline and at discharge from the service. **Results:** Data were obtained from 93 patients. The mean age of the sample was 49.0 (± 16.27) years, and 66% were unemployed. Over three-quarters (77%) had had their back pain for more than a month and 68% described it as constant. Using the Bournemouth Questionnaire, Bothersomeness, and global improvement scales, a majority (63%, 74%, and 93%, respectively) reported improvement at discharge, and most (82%) a significant reduction in pain medication. More than three-quarters (77%) did not visit their

primary care provider while under chiropractic care, and almost all (93%) were satisfied with the service. **Conclusion:** This service was associated with high levels of improvement and patient satisfaction in a sample of complex CHC patients with sub-acute and chronic back pain. Future research and integration of chiropractic services within other CHC settings may be warranted. (This is a conference presentation abstract and not a full work that has been published.)

A novel method for assessing the risk of developing adolescent idiopathic scoliosis - the Scoliscreen pilot trial

Roger Engel, Peter Anderson

Objective: To test the accuracy of a novel method for assessing the risk of developing adolescent idiopathic scoliosis (AIS). **Methods:** 54 adolescents (41 girls) between 11 and 15 years of age were assessed for the risk of developing AIS using a scoliometer (gold standard) and Scoliscreen, an 8-step 'app' designed for use by people who are not healthcare professionals. At the time of assessment, 5 (9%) of the participants had a pre-existing diagnosis of AIS while the AIS status of the remaining participants was unknown. Different assessors performed each measurement and were blinded to the AIS status of a participant. Results from both assessments were then compared. **Results:** Agreement for the risk level of developing AIS was present in 35 (65%) of the assessments. Where agreement was not achieved, 11 were classified as at risk of developing AIS by the scoliometer but not by the Scoliscreen (false negatives), while 8 were classified as at risk of developing AIS by Scoliscreen but not by the scoliometer (false positives). **Conclusion:** The accuracy of Scoliscreen as an alternative method for assessing the risk of developing AIS is sufficient to warrant further testing on a larger cohort. (This is a conference presentation abstract and not a full work that has been published.)

Spinal manipulation for the management of chronic obstructive pulmonary disease – strategy for developing a body of evidence

Roger Engel, Subramanyam Vemulpad

Objective: To describe a strategy for developing a body of evidence supporting the use of spinal manipulation (SM) in the management of chronic obstructive pulmonary disease (COPD). **Methods:** In the absence of current evidence for the use of SM in COPD, a sequence of trials were designed to test whether SM was safe and beneficial for people with COPD. The initial 'proof of concept' trial was conducted on people without respiratory disease; the second demonstrated safety in people with moderate to severe COPD; the third showed efficacy in people with moderate COPD and the fourth investigated effectiveness in people with moderate COPD. **Results:** In the effectiveness trial, 33 people with COPD were randomly allocated to an exercise only or SM plus exercise group. The combination of SM plus exercise produced clinically meaningful increases in lung function compared to exercise alone (0.40 Liters; CI: 0.02, 0.79; $p=0.03$). There were no moderate or major adverse events reported. **Conclusion:** SM has the potential to benefit people with COPD. With appropriate screening, SM appears to be safe for people with COPD. Further testing of the same SM protocol in a larger cohort with mild COPD is currently in progress. (This is a conference presentation abstract and not a full work that has been published.)

Inter-examiner reliability for identifying the first large lower cervical spinous process

Susan Esposito, Linda Mullin Elkens, Ronald Hosek, Nicole Poirier, Frederick Sherkel, Bridgette Kinard

Objective: The spinous process (SP) of C7 is commonly used as a beginning point for counting vertebral levels. It is important that it can be reliably identified for teaching and practice. The purpose of this study was to test inter-examiner and intra-examiner reliability of identifying this first large non-bifid cervical SP. **Methods:** Using both static and motion palpatory techniques, experienced chiropractors marked the skin adjacent to the first large SP of 11 subjects with an invisible black light pen. This was repeated for intra-examiner reliability with each doctor marking 11 subjects 4 times each to obtain working estimates of rater's precision. A Monte Carlo analysis estimated how kappa values might change, due to marking variability, as estimated from intra-examiner reliability. **Results:** Fleiss Kappa, the accepted index of reliability for multiple raters and observations,

was calculated to be -0.0464, p -value = 0.25. The Monte Carlo results for 10,000 runs (min/mean/max): (-0.089/ 0.029/ 0.084). **Conclusion:** Identification of the first large SP was found to be unreliable. Fleiss Kappa values demonstrated very weak reliability, sometimes less than expected by random chance. This may account for the poor validity in studies using static and extension palpation to identify segments. (This is a conference presentation abstract and not a full work that has been published.)

Trauma induced severe refractory motion sickness disorder treated with sacro occipital technique, applied kinesiology, and cranial chiropractic care: A case report

Vincent Esposito, Sr., Vincent Esposito, Jr., Charles Blum

Objective/Clinical Features: A 19-year-old male presented with trauma induced severe refractory motion sickness disorder where slight movements could cause nausea and vomiting. His condition began following repeatedly swinging a baseball bat in a batting cage. Due to the severe and unresponsive nature (over two-years) of other interventions for this patient's presentation, chiropractic manipulative treatments for sensory conflict and proprioceptive dysfunctions associated with the patient's nausea were considered. **Intervention/Outcome:** Patient was treated with sacro-occipital and cranial techniques as well as home rehabilitative methods. The patient was also assessed functionally, incorporating an activator instrument to help adjust vertebra and extremities in a variety of positions, such as sitting, standing, walking, and particularly in sports-specific stances. Over the course of 6-months of care cranial and spinal nerve dysfunctions resolved. While not fully recovered for the first time in close to three-years the patient could begin to move and function without causing nausea and vomiting. By 6-months of care his last motion sickness assessment questionnaire scoring was 18.1, a significant improvement over the initial score of 45.8. **Conclusion:** Future research could include helping to determine what subset of patients presenting with motion-induced nausea may be responsive to chiropractic interventions. (This is a conference presentation abstract and not a full work that has been published.)

Is this back pain killing me? All-cause and cardiovascular specific mortality in older Danish twins with spinal pain

Matt Fernandez, Eleanor Boyle, Jan Hartvigsen, Manuela Ferreira, Kathryn Refshauge, Chris Maher, Kaare Christensen, John Hooper, Paulo Ferreira

Objective: We investigated whether spinal (low back and neck) pain increased the rate of all-cause and disease-specific cardiovascular mortality in ageing twins. **Methods:** A total of 4,391 baseline participants were linked with the Cause of Death Registry with the study ending on December 31, 2014. Two Cox regression analyses determined the rate of all-cause and disease-specific cardiovascular mortality by spinal pain exposure; unpaired (individual) and intra-pair (co-twin) analyses. Analyses also adjusted for confounder's physical functional ability and depressive symptoms. Competing risk regression models determined the rate of cardiovascular mortality, adjusting for similar confounders, and using the unpaired analysis only. **Results:** In the unpaired analysis, spinal pain was associated with an increased rate of all-cause mortality, hazard ratio (HR): 1.13 (95% confidence interval [CI]: 1.06-1.21)]. After adjusting for relevant confounders, the association was attenuated. There was no association between spinal pain and cardiovascular disease mortality, sub-distribution hazard ratio (SHR): 1.08 [95% CI 0.96-1.22)]. Intra-pair analyses were non-significant, although greater in magnitude for monozygotic twins.

Conclusion: Older people reporting spinal pain have 13% increased risk of mortality per years lived. The link is not causal, with spinal pain likely to be an indicator of a poor health. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic management of a 6-month-old male with deformational plagiocephaly, facial asymmetry, delayed constriction, and abdominal rigidity

Melissa Ferranti, Brittany Anastasio, Christopher Varnum

Objective: To discuss the case of an infant with right-sided cranial asymmetry, abdominal rigidity, and vertebral subluxations. **Clinical Features:** A 6-month-old male had deformational plagiocephaly, left

eye facial asymmetry, delayed constriction of the left eye, abdominal rigidity, and refusal to be in the prone position. **Intervention and Outcome:** An inter-professional referral for a consult within our teaching clinic was used. Static and motion palpation along with nervoscope evaluation revealed vertebral subluxations at C1, T5, and sacrum. SOT methods were employed to address cranial plagiocephaly. Abdominal rigidity was no longer present after the third treatment. The left eye appeared more symmetrical, improved sleeping was noted, and the tolerance of tummy time and lying in the prone position was seen. The patient experienced improvements to the deformational plagiocephaly, and was told by a pediatric neurologist that a molding cranial helmet was not required. **Conclusion:** This case study demonstrates the effectiveness of chiropractic care in correcting vertebral subluxation. Positive improvements of deformational plagiocephaly for this child were observed. More research is warranted to investigate the outcomes of chiropractic care for other cases with similar presentations. (This is a conference presentation abstract and not a full work that has been published.)

Management of a 7-year-old competitive cheerleader with an acute isthmic spondylolisthesis

Melissa Ferranti, Michelle Gingras, Cheney Brinkley

Objective: To discuss the case of a 7-year-old competitive cheerleader who sought chiropractic care for acute low back pain and a probable Grade 1 isthmic spondylolisthesis at L5. **Clinical Features:** A 7-year-old female presented for chiropractic care of functional scoliosis with acute low back pain. Positive Stork Test, point tenderness over the L5, and pain with lumbar extension was elicited. After an evaluation was completed, radiographic views of the lumbar spine were obtained, and compared to previous imaging. The impression included a Grade 1 isthmic spondylolisthesis at L5, which had manifested since previous examination. A non-contrast MRI of the lumbar spine was ordered and impression included an incomplete fusion of the posterior elements of S1, but otherwise an unremarkable MRI of the lumbar spine. **Intervention and Outcome:** After discussion with the radiologist, the MRI report was amended to include the pars defect. The young patient was referred to a pediatric orthopedist. **Conclusion:** This case study demonstrates the importance of thorough evaluation, imaging, and actual visualization of any outside imaging to help the diagnosis and proper referral/care of pediatric patients. (This is a conference presentation abstract and not a full work that has been published.)

Experiences with online incident reporting and learning using Chiropractic Patient Incident Reporting and Learning System

Rob Finch, Jatinder Benepal

Objective: The online Chiropractic Patient Incident Reporting and Learning System (CPiRLS) was launched in the UK in 2009 replacing two earlier paper-based systems. CPiRLS aimed to unify the process of safety incident reporting among UK chiropractors, to enhance the learning element, to help educate chiropractors about the types of incidents they should share and to reassure chiropractors that incident reporting can be secure and anonymous. CPiRLS is now licensed for use throughout Europe and Australasia, is available as a separate 'CPiRLS-4S' version for chiropractic students and has recently been redesigned to incorporate a range of contemporary features. **Methods:** We analysed levels of participation in, and trends in the nature of, incident reporting via CPiRLS between 2009 and 2016. **Results:** While incident reports submitted to CPiRLS collectively comprise a diverse and enlightening resource that has the potential to inform clinical risk management processes, levels of engagement have remained remarkably low. **Conclusion:** Routine and confident adverse incident reporting, as part of an embedded culture of safety, is one of the hallmarks of a mature profession. Chiropractic organisations should take active measures to encourage incident reporting among chiropractors to help the profession develop. (This is a conference presentation abstract and not a full work that has been published.)

Queen's Chiropractic Practice Based Research Network: preliminary results

Simon French, Peter Beliveau

Objective: 1) Develop a practice based research network (PBRN) of chiropractors in the Queen's University region; 2) Conduct practice-based research in the PBRN to better understand the nature of

chiropractic members' clinical practice. **Methods:** We invited 20 chiropractors to participate in the PBRN. Each participating chiropractor completed a survey on their attitudes to evidence-based practice, and completed a demonstration practice-based project. Chiropractors recorded consecutive patient encounters on hand written paper encounter forms until 100 encounters were recorded, or when four weeks recording had elapsed. Three inter-related data collections were undertaken including chiropractor characteristics, encounter data, and patient characteristics. Data were analysed using summary statistics and adjusted for clustering. Results were compared to available data on Ontario chiropractic practice profiles. **Results:** Ten chiropractors completed the survey and participated in the observational study. Overall, chiropractor PBRN members had favourable attitudes towards evidence-based practice. Members' practice profiles were similar to that of the practice profile of chiropractors in Ontario generally, with the majority of their patients presenting with musculoskeletal problems and the most common treatment provided was manual therapy. **Conclusions:** Increasing practice-based research in the chiropractic profession is essential, and the PBRN model may facilitate this. (This is a conference presentation abstract and not a full work that has been published.)

Description of musculoskeletal extremity complaints in children and adolescents: A systematic review

Signe Fuglkjaer, Kristina Boe Dissing, Lise Hestbaek

Objective: The objectives of this systematic review were to describe the prevalence and incidence of musculoskeletal extremity complaints in children and adolescents in both general and clinical populations, and where possible to describe mode of onset and differences between general and clinical populations. **Data sources and selection:** MEDLINE and EMBASE were electronically searched and all study designs were accepted. **Results and Conclusion:** In total, 2660 titles were found and 22 studies were included, 19 population-based and three clinical studies. Due to heterogeneity of the included studies an overall estimate of prevalence or incidence was not possible. In general, lower extremity complaints were more common than upper extremity complaints and the ankle/foot and the knee were the most frequent sites of complaint regardless of age and type of population. In the general populations, there were about twice as many non-traumatic as traumatic complaints in the lower extremities, whereas the opposite relationship was found for the upper extremities. In addition, the population-based studies reported relatively more lower extremity complaints than the clinical studies did, indicating that there is large amount of low intensity, possibly over-use, complaints in the population that do not reach the threshold for consultation. (This is a conference presentation abstract and not a full work that has been published.)

Spinal tissue loading created during spinal manipulative therapy applied by different methods

Martha Funabashi, Francois Nougrou, Martin Descarreaux, Narashima Prasad, Greg Kawchuk

Objective: To quantify forces and moments created by three different forms of spinal manipulative therapy (SMT) applied in a cadaveric model. **Methods:** SMT was applied to the L3/L4 vertebra in 12 porcine cadavers using three SMT techniques: a hand-held instrument (ACT), a servo-controlled linear actuator motor device (PRESS) and a manual clinical SMT technique (MAN). The resulting kinematics during the SMT application with each method were tracked optically via indwelling bone pins. The L3/4 segment was then removed, mounted in a parallel robot and the resulting SMT kinematics replayed robotically. Serial dissection of spinal structures was conducted to quantify loading characteristics of discrete spinal tissues. **Results:** The method in which SMT was applied significantly affected the loads experienced by spinal structures. While ACT created forces and moments significantly smaller than MAN and PRESS, MAN created greater torsion moments and PRESS greater extension moments in the intact specimen. In terms of load distribution, while MAN created greater moments on facet joints, capsules and ligamentum flavum, PRESS created greater moments on intervertebral disc and longitudinal ligaments. **Conclusion:** Specific methods of SMT application create unique vertebral loading characteristics which have the potential to influence clinical and

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

Preliminary findings from an active surveillance reporting system among chiropractors

Martha Funabashi, Katherine Pohlman, Silvano Mior, Haymo Thiel, J. David Cassidy, Michael Westway, Jerome Yager, Eric Hurwitz, Greg Kawchuk, Maeve O'Beirne, Sunita Vohra

Objective: To evaluate initial findings from an active surveillance reporting system to identify and report adverse events (AEs) occurring after spinal manipulative therapy (SMT).

Methods: Chiropractors who voluntarily participated in this study were asked to record data from 100 consecutive, unique patients. Data collected at the patient visit included relevant health history, treatment provided (including SMT), and symptoms before and immediately after SMT. Patients were also asked to describe symptom change up to one week after the treatment. Any worsened or new symptom following SMT was considered an AE.

Results: In total, four chiropractors collected data from 400 patients with 237 patients providing post-treatment data. The most common reason for care was low back pain (25.9%) and neck pain (20.6%). For pre-existing symptoms, 52% of patients reported symptom improvement, 45% no change in symptoms, and 3% reported worsened symptoms. About 11% of patients reported new symptoms after SMT of which 36 patients rated their new symptoms as mild, 8 moderate and 3 were rated severe symptoms.

Conclusion: By identifying the AEs observed following an intervention involving SMT, risk factors can potentially be identified and mitigation strategies developed. More data are required for more conclusive findings. (This is a conference presentation abstract and not a full work that has been published.)

The interaction between spinal manipulative therapy input parameters on the loading characteristics of spinal segments

Martha Funabashi, Francois Nougrou, Martin Descarroux, Narashima Passad, Greg Kawchuk

Objective: To determine the influence of force magnitude and application site when spinal manipulation (SMT) is applied to cadaveric spines. **Methods:** In 10 porcine cadavers, a servo-controlled linear actuator motor provided a standardized SMT simulation using 3 different force magnitudes (100N, 300N and 500N) to 2 different cutaneous locations: L3/L4 facet joint (FJ), and L4 transverse processes (TVP). Vertebral kinematics were tracked optically using indwelling bone pins, the motion segment removed and mounted in a parallel robot equipped with a 6-axis load cell. The kinematics of each SMT application were replayed robotically. Forces and moments experienced by the L3/L4 segment during SMT replication were recorded and analysed. **Results:** An interaction between force magnitudes and application site was observed to create significantly greater peak moments around x-axis. Specifically, there was an interaction between 300N at the L4 TVP site ($0.95 \text{ Nm} \pm 0.97$) and 500N at L4 TVP ($1.24 \text{ Nm} \pm 1.24$). Additionally, 500N SMT at the L3/L4 FJ site also created significantly greater mean moment around x-axis ($-0.80 \text{ Nm} \pm 0.72$) compared to other possible interactions. **Conclusion:** The interaction between SMT force magnitude and application site influences the loads within the motion segment, which has the potential to influence clinical outcomes. (This is a conference presentation abstract and not a full work that has been published.)

Comparison of two lumbar manual therapies on temporal summation of pain in healthy volunteers

Charles Gay, Mark Bishop

Objective: To compare the immediate change in temporal summation of pain (TSP) between spinal manipulation (SMT) and spinal mobilization (MOB) in healthy volunteers.

Method: Ninety-two volunteers (24 males; 23.8 ± 5.3 years) were randomized to receive SMT, MOB or no treatment (REST) for one session. Primary outcomes were changes in TSP immediately following the session. A planned subgroup analysis investigated effects across empirically derived TSP clusters. **Results:** Primary outcome: There were no differences in the immediate change in TSP between SMT and MOB, however both treatments were superior to the REST condition. Subgroup analysis: The response to a standard

TSP protocol was best characterized by three clusters: 52% no change ($n = 48, 52\%$); facilitatory response ($n = 24, 26\%$), and inhibitory response ($n = 20, 22\%$). There was a significant time by treatment group by cluster interaction. The inhibitory cluster showed the greatest attenuation of TSP following SMT and MOB when compared to REST. **Conclusion:** These data suggest lumbar manual therapies of different velocities produce a similar attenuation of TSP, compared to no treatment. Attenuation of pain facilitatory processes by manual therapies was greatest in pain-free individuals who demonstrate an inhibitory TSP response. (This is a conference presentation abstract and not a full work that has been published.)

Improvements of pain, disability and quality of life following chiropractic care for back pain

Filip Geden, Viktor Dansk, Tobias Sundberg, Kristina Burdstrom

Objective: To explore changes of PROMs over 4 weeks following chiropractic care for patients with acute or chronic back pain.

Methods: Prospective national cohort study. Back pain patients 18 years and older seeking care at chiropractic clinics ($n=23$) geographically distributed all over Sweden were invited to answer PROM questionnaires at baseline with main follow-up after four weeks: numerical rating scale for back pain intensity, back disability (ODI), self-rated health (EQ-5D & EQ-VAS). **Results:** 246 back pain patients answered baseline questionnaires and 138 completed follow-up after four weeks. Statistically significant improvements were observed for all PROMs of acute back pain patients and for all PROMs except EQ VAS for patients with chronic back pain. The greatest improvement and minimal clinically important difference of back pain intensity after four weeks were observed for acute back pain patients with the following characteristics: 18-44 years, male, non-manual worker, no co-morbidity, on sick-leave, not treated by other practitioner. **Conclusions:** The observational design limits causal relationship between observed PROM changes and chiropractic care. However, the rapid improvement of selected outcomes and subgroup characteristics may be of interest for future studies. (This is a conference presentation abstract and not a full work that has been published.)

The interpersonal processes of care experienced by patients in a chiropractic teaching clinic

Tate Gentile, Brian Dooley, Joel Alcantara

Objective: To examine the interpersonal processes of care (IPC) experienced by patients attending care in a chiropractic teaching clinic. **Methods:** A convenience sample of patients completed the IPC-18 and socio-demographic survey. The IPC-18 examined a patient's experience with their chiropractic intern/clinician with respect to communication, clinical decision making and interpersonal style of the caregiver based on a Likert scale (i.e., 1=never; rarely=2; sometime=3; usually=4; always=5). A higher score indicated a more favorable response. **Results:** Ninety-nine patients comprised our study responders. The majority (55.6%) were ≥ 45 years of age. Sixty-one percent attained some college education or higher. The majority (68%) were referred to the clinic by family/friends or self-referred. The mean response to the IPC-18 survey are the following: communication (i.e., lack of clarity (1.41 ± 0.53 ; $N=97$), elicitation and concern of patient problems (4.67 ± 0.84 ; $N=97$) and explanation of clinical findings (4.40 ± 1.13 ; $N=92$)), decision making (i.e., decided together (4.40 ± 1.71); $N=95$) and interpersonal style (i.e., compassionate and respectful caregiver (4.75 ± 0.81 ; $N=95$), discriminated against (1.13 ± 0.57 ; $N=94$) and disrespectful staff (1.02 ± 0.12 ; $N=97$)). **Conclusion:** The IPC survey demonstrated that patients experienced favorable experience (i.e., good communication and compassionate care) with their interns/clinicians and staff at a teaching clinic. (This is a conference presentation abstract and not a full work that has been published.)

Anterior thoracic adjusting and the relationship to cervical flexion: a retrospective case study of twenty-four patients

Harvey Getzoff, Charles Blum

Objective: This paper is a retrospective analysis of how patients presenting with a specific selection criteria, cervical forward flexion (CFF), responded to a one-time anterior thoracic adjustment (ATA) intervention. In general, the ATA is believed to be used predominately for hypokyphotic thoracic spines and related to two factors: a) the

vertebral subluxation felt anterior (spinous) and b) the adjustive thrust was applied anteriorly. Clinically, in this study, the CFF is used as a pre- and post-adjustment assessment to identify the effectiveness of the ATA. **Methods:** The data [n=24] collected in this study was obtained during one office visit. Pre- and post CFF assessments were performed using a goniometer to measure any changes in CFF following the ATA intervention. **Results:** Twenty-three of 24-patients showed improvement in CFF following ATA with the majority in the ranges of 6-20 degrees. The one-patient that showed no improvement in CFF at the post-adjustment measurements had a significant scoliotic spine. **Conclusion:** The CFF assessment appears to be a helpful method to monitor the functional improvement of the cervical spine before and after a successful ATA. The ATA may also appear to improve some cervicothoracic symptoms that accompany limitations in CFF. (This is a conference presentation abstract and not a full work that has been published.)

Students' perception of changes made to the testing of psychomotor (technique) skills during the 2015-16 academic year at the Canadian Memorial Chiropractic College

Brian Gleberzon, Dominic Guiliano

Objectives: We report on survey results obtained from students at CMCC in Years II and III with respect to their perception of changes made to the assessment of psychomotor skills during the 2015-16 academic year, which including the use of Force-Sensing Table Technology. **Method:** A 11-item paper questionnaire using a modified Likert scale was administered to students immediately following their psychomotor skill assessment. **Results:** Response rate was 80% in Year II and 100% in Year III. Over 80% of Year II and III students Strongly Agree/Agreed that the new testing format was 'more fair', and over 80% of Year II and two thirds of Year III students thought it better graded their skills. At least half of all students Strongly Agree/Agreed the new testing format better identified poor performers and sub-skills that needed improvement, was more objective, held students to a higher academic standard and would make them better chiropractors. Conversely, roughly three-quarters of Year II and III students Strongly Disagree/Disagreed the new format was 'too confusing' or 'too complicated'. More than half of students did not want to return to the previous assessment format. **Conclusion:** These results will enable continued improvement of assessment procedures. (This is a conference presentation abstract and not a full work that has been published.)

Toward a standardized chiropractic technique program: consensus results of two inter-collegiate workshops

Brian Gleberzon, Christopher Roecker, Christopher Good, Charles Blum, Robert Cooperstein

Objective: We report the consensus opinions of two inter-collegiate workshops that sought to develop a standardized chiropractic technique program. **Methods:** The authors of this study facilitated small groups of attendees tasked with answering Seed Statements during Workshops held during ACC-RAC conferences in 2014 and 2016. **Results:** Overall, attendees reported that it was acceptable to rely on clinical experience and patient preference when providing patient care, even in the absence of research evidence, provided procedures are safe and biological plausible. Selection of curricular content should not be based on traditional or ritualistic dogma alone, which sometimes appears to be the case. Licensing bodies should not be involved in this process. Attendees reported diagnostic procedures either do or should include static and motion palpation, postural and gait analysis, joint spring palpation, ranges of motion and functional (orthopedic) testing. There was no consensus with respect to teaching leg length analysis, x-ray film line marking analysis and thermography. **Conclusion:** This information is an important first step in developing a standardized chiropractic technique program for all teaching institutions. Future workshops will focus on resolving areas of disagreement as well as reaching consensus of what therapeutic procedures ought to be taught. (This is a conference presentation abstract and not a full work that has been published.)

Association of biopsychosocial factors with back pain in adult Americans

Bart Green, Claire Johnson, Jeff Snodgrass, Monica Smith, Patricia Risica

Objective: To explore biopsychosocial variables that may be risk factors for back pain. **Methods:** This was a cross-sectional U.S. population-based study on 34,525 adults from the 2012 National Health Interview Survey. Direct multiple logistic regression assessed the association of back pain with several biopsychosocial variables. **Results:** Back pain prevalence was 29%. Variables associated with back pain were: anxiety (OR = 2.58; 95% CI, 2.37-2.82), depression (OR = 1.81; 95% CI, 1.67-1.98), current smoker (OR = 1.57; 95% CI, 1.44-1.71), former smoker (OR = 1.32; 95% CI, 1.22-1.43), obesity (OR = 1.41; 95% CI, 1.30-1.53), overweight (OR = 1.10; 95% CI, 1.02-1.20), not meeting physical activity recommendations (OR = 1.16; 95% CI, 1.08-1.24), male (OR = 1.13; 95% CI, 1.06-1.20), and being white (OR = 1.13; 95% CI, 1.03-1.24). Education and age had no significant association with back pain. **Conclusion:** Anxiety, depression, smoking status, and obesity had the greatest odds of being associated with back pain. This information may better help identify people who are at higher risk for back pain and stimulate further research into psychosocial influences on the back pain experience and on potential psychosocial prevention strategies for back pain. (This is a conference presentation abstract and not a full work that has been published.)

The effect of TheraBand kinesiology tape on post-manipulation neck pain and range of motion

Jay Greenstein, Jena Etnoyer-Slaski, Barton Bishop, Robert Topp, Phil Page

Objective: To determine if post-neck manipulation taping with TheraBand® Kinesiology Tape(TBKT) can impact neck range of motion(ROM) and pain. **Methods:** 50 patients who presented with acute non-complicated neck pain were recruited and randomly assigned into 2 groups; Control(n=23) and Tape(n=27). Pain, using the Numeric Pain Rating Scale 0-10, and neck ROM were recorded at (T1)pre-cervical manipulation, (T2)within 5 minutes of cervical manipulation, and (T3)within 48 hours after manipulation. The Control received manipulation only, while the Tape had TBKT applied to the posterior neck immediately following cervical manipulation prior to T2. Six cervical ROM values were recorded including, flexion(F), extension(E), left side-bending(LSB), right side-bending(RSB), left rotation(LR), and right rotation(RR). **Results:** Pain significantly declined(p<0.000) in the Tape group between T1(x=6.15) and T2(x=5.37) and between T1(x=6.15) and T3(x=4.89). A significant group by time interaction(p=0.036) for E was detected, indicating groups were initially different and both groups increased between T1(E=34.30; C=32.39) and T3(E=41.74;C=36.87).For LSB, both groups realized gains between T1(E=27.89;C=27.96) to T3(E=36.70;C=32.22). For RSB, only the Tape exhibited significant gains(p=0.002) between T1(x=31.56) to T3(x=38.96). **Clinical Relevance:** Results from this study support the clinical use of TBKT in maintaining proper decreasing post-manipulation pain for acute non-complicated neck pain. (This is a conference presentation abstract and not a full work that has been published.)

Effectiveness of Biofreeze on shoulder pain and in-office exercise performance: A preliminary pilot study

Jay Greenstein, Jena Etnoyer-Slaski, Barton Bishop, Robert Topp

Objective: To determine the effect of adding Biofreeze® to an in-office shoulder exercise program on pain and disability. **Methods:** Patients with mechanical shoulder pain who were prescribed an in-office exercise program, were recruited and randomized into two groups. The Control Group received exercise alone while the Intervention (BF) applied Biofreeze® to their affected shoulder just prior to initiating the in-office exercise program. Values of pain (NPRS) and disability (ASES) were recorded at baseline (B), 2 weeks (T2), and 4 weeks (T3). **Results:** 18 (10 BF, 8 Controls) participants completed the 4-week protocol. There was a significant difference in ASES over time (p=0.008) for the BF and Control. The BF significantly increased from B(x=60.5) to T2(x=72.6) and maintained this increase from B to T3(x=74.4). The Control increased from B(x=59.1) to T2(x=68.8) and significantly increased from B(x=59.1) to T3(x=77.1). The Control also significantly decreased NPRS over time (p=0.008) from B(x=5.5)

to T2($x=3.8$) and from B($x=5.5$) to T3($x=2.6$). The BF did not significantly change NPRS values over the duration of the study, but values did decrease (T1=4.2, T2=2.9, T3=2.6). **Conclusion:** While both groups improved disability scores, the addition of Biofreeze to standard care appeared to accelerate improvements. (This is a conference presentation abstract and not a full work that has been published.)

EMG activation of cervical musculature during therapeutic exercise with theraband resistance vs manual resistance in neck pain population

Jay Greenstein, Jena Etnoyer-Slaski, Barton Bishop, Robert Topp

Objective: To compare cervical muscle activation during elastic (ER) versus manual resistance (MR) in neck pain patients. **Methods:** 15 participants with cervical pain who reported no history of neck surgery, corticosteroid treatment within two weeks, or radicular symptoms. Surface electromyography was used to quantify activity of the bilateral sternocleidomastoid (SCM), anterior scalene (AS), Cervical Paraspinal (CP), and Upper Trapezius (UT) during 6 isometric exercises with ER, using Thera-Band® Resistance Bands, and MR totaling 12 trials of 5 repetitions. Isometric exercises included cervical: flexion, extension, L rotation (LRot), R rotation (RRot), L side-bending (LSB), and R side-bending (RSB). Peak activation was compared to standardized movement peak for each muscle group, and expressed as %P. Repeated measures ANOVAs comparing MR vs ER for each exercise. **Results:** Muscle activation during MR was significantly greater than ER for: Flexion RAS/RUT, Extension LCP/RUT, LRot LSCM/LAS/LUT, RRot RUT, LSB LSCM/LAS/LCP, and RSB RSCM/RAS/RCP/RUT. ER was significantly greater than MR for: LRot RAS/RUT, RRot RAS/LUT, and LSB RAS. Clinically significant differences (>25%) were seen in 4/8 muscles for flexion, 6/8 in extension, 7/8 for LRot, 5/8 for RRot, 7/8 in LSB, and 5/8 in RSB. **Conclusion:** Overall, there was a reduction in musculature activation when using ER compared to MR. (This is a conference presentation abstract and not a full work that has been published.)

The radiographic interpretation experience of chiropractors and chiropractic students

Julie-Marthe Grenier

Objectives: The goal of this project was to describe the radiographic interpretation experience of chiropractors in order to discover if the experience varies according to their expertise level, and to then explore any differences found. **Methods:** A qualitative, ethnographic research methodology was utilized along with a thematic analysis of the experiences of 44 participants: students, clinicians, and radiology experts. Data were acquired through interviews, document analysis, and radiographic interpretation sessions. **Results and Conclusion:** Topics examined included: radiographic interpretation patterns and habits; radiographic challenges and ways to overcome them; documentation processes and their relationship with observation patterns; evolution of radiographic reading abilities and strategies utilized to maintain competency; and finally roles of chiropractors in radiographic interpretation. This study revealed that students and clinicians experience radiographic interpretation similarly. They generally utilize rigid observation patterns that they perceive facilitate documentation and they utilize very few references. Students and clinicians are unaware of potential sources of interpretation error and thus do not take steps to minimize risks. They express a high degree of confidence in their radiographic interpretation abilities. In contrast, experts employ a variety of approaches to interpretation, utilize multiple references and take steps so minimize interpretation error. (This is a conference presentation abstract and not a full work that has been published.)

A scoping study of knowledge translation theory and factors influencing research evidence use related to the Canadian chiropractic setting

Diane Grondin

Objective: Chiropractic organizations have made great efforts to improve the use of research evidence among Canadian chiropractors. However, aspects such as culture, scope and evidence base may characteristically influence the determinants of research evidence use

among this group. The aim of this scoping study was to identify the determinants of research evidence use among Canadian chiropractors and to identify relevant knowledge translation theory. **Data sources and selection:** A scoping study of the peer-reviewed literature following the Arksey and O'Malley (2005) framework was conducted and guided the identification and review of relevant literature, summary of findings and development of themes. A relevant knowledge translation framework was identified and discussed. **Results:** There is little scientific research explicitly investigating the determinants of research evidence use. Of the documented studies three determinant themes were identified: the evidence itself, attitudes and beliefs and professional legitimization. These relate to the Consolidated Framework for Implementation Research. **Conclusion:** More work is needed to better identify the factors influencing research evidence use and their relationships. Further exploration of the inner and outer setting of the profession using professionalization as a sensitizing concept will yield valuable insight. (This is a conference presentation abstract and not a full work that has been published.)

Comparison of beginner and advanced student scores on objective structured clinical examinations in a chiropractic program

Joseph Guagliardo

Objective: A skill needed by all clinicians is the ability to accurately gather data in a physical examination and to critically think though that process. The purpose of this study is to investigate whether there is a correlation between individual components of OSCE's during the 2nd and 3rd year of our program. **Methods:** A retrospective study comparing OSCE scores was conducted (n=483) over six academic terms. Data analysis includes descriptive statistics, one-way ANOVA, correlation and linear regression. Comparisons were made between the case history scores (OSCE1HCT, OSCE2HCT), physical examination scores (OSCE1PE, OSCE2PE) and critical thought exam scores (OSCE2CT). **Results:** There was moderate correlation between OSCE1PE:OSCE2PE ($r=0.368, p<0.001$), OSCE2PE:OSCE2CT ($r=0.378, p<0.001$), OSCE1PE:OSCE2CT ($r=0.333, p<0.001$) and OSCE2HCT:OSCE2CT ($r=0.226, p<0.001$) and weak correlation was found between OSCE1HCT:OSCE2HCT ($r=0.040, p=0.193$) and OSCE1HCT:OSCE2CT ($r=0.36, p=0.218$). One-way ANOVA revealed no variances among groups ($F=55.01, p<0.001$ and $F=1.902, p<0.001$ respectively). Linear regression demonstrated the greatest relationship with OSCE1PE ($B=.151$ to $0.246, p<0.001$) and OSCE2PE ($B=0.229$ to $0.2400, p<0.001$). **Conclusion:** Stronger correlations were found between the physical exam performance and critical thought exam with weaker relationships between patient interviewing and critical thought exam. Information gathered from this project can be used to help curriculum changes in the future. (This is a conference presentation abstract and not a full work that has been published.)

Reliability of a new technique for measuring spinal stiffness in asymptomatic participants

Malieh Hadizadeh, Greg Kawchuk, Isabelle Page, Martin Descarreaux

Objective: Current techniques that measure spinal stiffness typically assess force-displacement at a static location. Our objective was to quantify the reliability of a new technique able to acquire stiffness data continuously over entire spinal regions. **Methods:** Continuous stiffness testing employs a weighted roller that moves uninterrupted over the spine while measuring the resulting spinal deflection along a subject-specific, laser-defined trajectory. Asymptomatic participants were recruited and data collected for T2-L1 and T12-S1 regions (n=19 and 14 respectively). Each subject was assessed in 2 sessions occurring 1 to 4 days apart. Data were collected in 3 trials each of 0N and the maximum tolerable load (~60N) as defined from familiarization trials. Multiple reliability indices (intraclass correlation coefficients, 95% agreement limits and standard measurement error) were computed along each trajectory. **Results:** With the exception of the points of wheel application and removal, all reliability indices were found to be excellent in both spinal regions as well as within and between sessions. **Conclusion:** Continuous stiffness testing was found to have excellent indices of reliability in asymptomatic subjects. This form of stiffness testing offers several advantages including rapid, low-cost evaluation of spinal stiffness over entire spinal regions. (This

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

Chest pain and posterior rib misalignment: a differential diagnosis

Chad Hagen

Objective: This case study is meant to add a valuable differential diagnosis to patients that present with chest pain. Ruling out myocardial infarction is necessary in certain circumstances, but not the most cost effective choice in certain presentations. **Clinical Features:** Middle aged male presents with chest pain in the sternocostal joint area and was concerned that he might be having a "heart attack." No history of injury other than manual labor. No shortness of breath. Decreased localized rib motion noted in inspiration and expiration. Patient rated pain an 8 out of 10 on the VAS. **Interventions/Outcomes:** Sacro occipital technique (SOT) trapezius fiber analysis was used along with palpation to localize a posterior rib fixation, which was corrected and his chest pain decreased to a 2 out of 10 on the VAS in 24 hours. **Conclusion:** Posterior rib dysfunction can present itself as chest pain, mimicking a myocardial infarction, and chiropractic care could have a place in a cardiac interdisciplinary setting, when a myocardial infarction has been ruled out but the pain remains. (This is a conference presentation abstract and not a full work that has been published.)

Sacro occipital technique (SOT) cranial therapy with an occlusal splint for the treatment of fibromyalgia and obstructive sleep apnea with blocked sinus

Rachel Hamel, Mamal Rahimi, Charles Blum

Objective/Clinical Features: A 47-year-old female patient presented for chiropractic care with a thirteen-year history of TMJ pain, vision disturbances, deviated septum, fibromyalgia, chronic fatigue, excessive daytime sleepiness, chronic headaches, cognitive impairments, insomnia, chronic myofascial neck and shoulder pain, low back pain with radicular syndromes. She has also taking amitriptyline medication for thirteen-years. **Interventions/Outcome:** Examination revealed narrow dental arches with an anterior premature contact, poor TMJ translation, and evidence of clenching and bruxism. Palpatory pain noted in the muscles of mastication and cranial assessments revealed left temporal bone and sphenomaxillary imbalance. Treatment consisted of eight-SOT cranial dental appointments (over 5-weeks) incorporating SOT intraoral and sphenomaxillary adjustments in conjunction with a lower occlusal dental splint. Following care the patient reported significant reduction in all symptoms without the need of medication, sleeping 7-hours without interruption, breathing freely, and exercising for first time in 13-years. Sleep studies were performed one prior to instituting care (without a dental appliance) and another 6-weeks after instituting care (dental appliance in her mouth) with the post-study noting a significant clinical improvement. **Conclusion:** Greater study is needed to identify the subset of apnea patients with fibromyalgia that could benefit from this approach. (This is a conference presentation abstract and not a full work that has been published.)

A survey of attitudes toward evidence-based clinical practice among doctors of chiropractic specializing in pediatrics

Julie Hartman, Christine Goertz, Dana Lawrence, Katherine Pohlman

Objective: The chiropractic profession has encouraged evidence-based clinical practice (EBCP). A first step to increase EBCP utilization in pediatric chiropractic is to understand current opinions of EBCP. This study describes the findings of a cross-sectional survey that evaluated attitudes, skills, utilization, and barriers/facilitators of pediatric chiropractors toward EBCP. **Methods:** All members of the American Chiropractic Association and International Chiropractic Association Councils on Chiropractic Pediatrics (n=397) with a valid email were invited to participate in an anonymous online survey in January 2016. The survey was a modification of Leach's Evidence-Based Practice Attitude and Utilization Survey. Descriptive data were summarized using frequency counts and percentages. **Results:** The response rate was 19% (74/397). Over 75% of respondents felt EBCP is necessary in chiropractic; over half had training in EBCP through chiropractic or diplomate programs. Resources used most commonly were professional literature and research. Barriers for using EBCP were lack of

time and lack of available evidence; access to free online resources like PubMed facilitated EBCP. **Conclusion:** Pediatric chiropractors were positive about using EBCP but lack of time was a barrier. Possible solutions include incorporating more EBCP into current chiropractic education and increasing knowledge translation between clinicians and researchers. (This is a conference presentation abstract and not a full work that has been published.)

Robotic simulation of clinical exams: Describing the mechanical effect of alar ligament injury

Robert Hartman, Karthik Hiarharan, Robert Tisherman, Michael Schneider, Michael Timko, Gwendolyn Sowa, James Kang

Objective: Involvement of the upper cervical spine in chronic symptoms following concussion and whiplash injuries is frequently ignored and poorly understood. Alar ligaments are suspected to be damaged causing hypermobility and latent symptoms. This study aims to examine the role of Alar ligaments as a restraint and sensitivity of simulated physical exams on cadaveric specimen in 3 states; intact, unilateral and bilateral alar ligament resection. **Methods:** Kinematic trackers (VICON) and a robot testing system (Staubli) were used to perform physiological motion and simulate clinical mobility exams to examine the role of alar ligaments. Quantitative data on overall and intersegmental motion in all states were obtained. This was then repeated by replaying intact motion paths to determine changes in forces and moments to quantify the ligament's role as a restraint. **Results:** Simulation of the Flexion-Rotation Test reveals an increase in motion with alar resection, suggesting its sensitivity to alar injury. Simulation of the Alar Ligament Test shows a decrease in C2 "kick" with unilateral and bilateral alar resection. **Conclusions:** Simulated clinical exams show sensitivity to alar resection, suggesting they may be a reliable clinical tool in evaluating alar injury. Further testing required to establish validity. (This is a conference presentation abstract and not a full work that has been published.)

Leg pain location and neurological signs relate to outcomes in primary care patients with low back pain

Lisbeth Hartvigsen, Lise Hestbaek, Alice Kongsted

Objectives: The objectives of this study were to explore whether patients in Quebec Task Force categories 1-4 (QTFC), based on the location of pain and neurological signs, have different characteristics at baseline, whether these QTFC are associated with outcome, and if so whether there is a ranking of the four QTFC on the severity of outcomes. **Method:** 1300 adult patients seeking care for LBP in chiropractic or general practice were classified according to the QTFC based on self-reported information and clinical findings. Analyses were performed to test the associations between QTFC and baseline characteristics as well as the outcomes: general perceived effect and activity limitation after 2 weeks, 3 months, and 1 year and also 1-year trajectories of LBP intensity. **Results:** QTFC were statistically significantly associated with most of the baseline characteristics, with activity limitation at all follow-up time points, with general perceived effect at 2 weeks, and with trajectories of LBP. Severity of outcomes increased gradually from QTFC 1 to 4. However, the variation within the categories was considerable. **Conclusion:** This study supported the use of the QTFC as a simple way to classify patients with non-specific LBP into subgroups with expected different outcomes. (This is a conference presentation abstract and not a full work that has been published.)

Sport specific rehabilitation for a paralympic rugby prospect: A case study

Lacey Hatfield, Kelley Humphries

A 32-year-old white male presented with a history of C5-C6 dislocation resulting in an incomplete spinal cord injury, with plans on trying out for USA Paralympic Rugby. **Objective:** The patient has no motor control below the level of C6 and uses a manual wheelchair for transportation. He presented with right shoulder pain and sport specific goals to work on in the clinic. **Clinical features:** The patient was diagnosed with subacromial impingement and supraspinatus tendinopathy of the shoulder, aggravated by physical activity and complicated by degenerative changes within the acromioclavicular joint. **Intervention:** The treatment plan included chiropractic manipulation, soft tissue therapy, laser therapy and rehabilitation exercises

with the goal of improving sport performance. Outcome: The patient improved in range of motion in the right shoulder, as well as decreased pain during certain active ranges of motion. **Conclusion:** Although the case presented challenges and inherited limitations, it was found that paraplegic athletes can benefit from conservative care and individualized rehabilitation programs. (This is a conference presentation abstract and not a full work that has been published.)

Unique ultrasound features of bilateral plantar fibromatosis

Daniel Haun, Patrick Battaglia, Shannon Kuhn, Norman Kettner

Objective: To demonstrate the utility of ultrasound in the differential diagnosis of painful plantar masses of the foot. **Clinical Features:** A 31-year-old male presented with bilateral painful plantar masses. The masses were along the medial sole of the foot, were firm and non-mobile, and mildly tender to the touch. Provocation occurred during long periods of standing or walking, including playing golf. There were no signs of infection. **Intervention and Outcome:** Ultrasound examination of the foot was performed bilaterally. On the right, a fusiform 9.5mm X 2.9mm mixed echogenicity mass was identified within the plantar fascia. On the left a larger 40.3mm X 10.3 mm mixed echogenicity mass was seen. Extended field of view imaging confirmed confluence with the plantar fascia. Both masses demonstrated internal flow on power Doppler imaging suggesting vascularity. Shear-wave elastography demonstrated increased stiffness of the masses compared to the surrounding fat pad and adjacent plantar muscles. The characteristic location and imaging findings supported a diagnosis of bilateral plantar fibromatosis. **Conclusion:** Plantar fibromatosis is a rare cause of painful plantar masses in the foot. Ultrasonography is a low cost and effective tool in the work-up of suspected plantar fibromatosis. (This is a conference presentation abstract and not a full work that has been published.)

SWOT analysis of chiropractic education and services provided within the hospital setting according to students, residents and new graduates of a North American chiropractic program

Navine Haworth, Linda Jones

Objective: Explore the perception of final year students, residency students and new graduates in regards to SWOT analysis of chiropractic clinical education within a hospital setting. **Methods:** A qualitative exploratory descriptive design was used for this research. All cohorts were invited to participate via email. Semi structured interviews were conducted with 23 final year, 6 residency students and 6 new graduates lasting 60 minutes. **Results:** Strengths were considered access to complex and varied patient case mix; the interprofessional learning and practice opportunities; improved student clinical competence, confidence and professional preparedness. Weaknesses include sense of reduced autonomy and professional barriers. Opportunities include perceived cost savings and reduced burden, and easier access to care for patients. Threats include long wait list times for patients, patients referred for chiropractic as last resort, blurred lines between similar competing professions in the same setting, with some questioning the appropriateness of chiropractic in the hospital. **Conclusion:** There appears still much work needed in integration of chiropractic within this setting, and further opportunities. Few employment opportunities were seen as a major issue with providing this setting within the educational context, not being able to seek opportunity beyond this experience. (This is a conference presentation abstract and not a full work that has been published.)

Exploration of new graduate collaboration experiences

Navine Haworth, Linda Jones

Objective: To explore the perception of new graduates from two North American Chiropractic colleges regarding their level and understanding of interprofessional engagement. **Methods:** A qualitative exploratory descriptive design was used for this research. New graduates of less than 3 years were invited to participate from two North American Chiropractic programs. Semi-structured interviews were conducted with 13 new graduates lasting 60 minutes. **Results:** Participants expressed favorable experiences of interprofessional clinical educational experiences with few weaknesses. They reported mostly low levels of interprofessional exposure within their clinical educational experience. Perceived obstacles to interprofessional

engagement were lack of knowledge about other health professions. Mostly informal interprofessional engagements were experienced with lack of formal arrangements, despite opportunities available in the clinical settings of hospitals and community settings. Most participants were willing to be interprofessional post licensure. Their clinical education experience was not being duplicated in the professional setting. **Conclusion:** Despite the evidence in the literature in support of interprofessional education in clinical training, in practice it was evident that there is need for more work in implementation in the professional setting. The desire to be interprofessional post licensure was prevalent amongst participants. (This is a conference presentation abstract and not a full work that has been published.)

The impact of depression on academic performance of chiropractic students

Shawn He, Niu Zhang

Objective: To assess the level of depression in students and the relationship between students' depression levels and their test performance. **Methods:** Depression levels in 195 randomly selected first quarter students was measured with the Center for Epidemiologic Depression Scale (CES-D). The levels of depression were range from 0-60. Total grades from all written examinations given in the course, including 2 formative exams and 1 final summative exam, were used as test performance measures. **Results:** The mean CES-D score for all students was 8.68 ± 7.27 (mean \pm SD). There was no statistically significant difference in mean CES-D scores between genders ($p > 0.05$). Of the 195 students, 12.8% (25) were classified as depressed (CES-D ≥ 16). On the other hand, there were no statistically significant differences in means grades of 3 written exams between the depressed group (CES-D ≥ 16) and the not depressed group (CES-D < 16). **Conclusion:** Overall level of depression was lower than reported. Gender played no role of level of depression. Academic performance was not affected by the level of depression, possibly due to less academic challenges yet. (This is a conference presentation abstract and not a full work that has been published.)

The forces exerted by a chiropractor on pediatric patients during high-speed low amplitude spinal manipulative care

Walter Herzog, Peter Kevorkian, Brent Russell, Joel Alcantara

Objectives: To quantify the forces exerted by a chiropractor on children during high-speed, low-amplitude (HVLA) thrust type spinal manipulation. **Methods:** The force-time histories of HVLA spinal manipulative treatments were measured in 48 children (age range; 14 weeks-17 years) and 20 adults in a clinical setting. Peak, preload and thrust forces, thrust times and impulses, and rates of force application were quantified. Comparison across age groups utilized Kruskal-Wallis testing with Dunn's post hoc analysis. All outcome variables were also fitted with linear regression approaches across age ($\alpha=0.05$). **Results:** Most outcome variables (i.e., peak and thrust forces) increased with increasing age. The rate of force application was positively correlated with age, while thrust times remained constant across all ages and preload forces decreased slightly with age for cervical spine manipulations. **Conclusions:** In general, the forces applied to children increased with age but at a slower rate of force application. In the very young children (i.e., <4 years), the thrust phase is small or not identifiable. We conclude that chiropractic spinal manipulative treatments are performed more cautiously in children than adults. Concerns of safety and benefits of care in children need to be carefully evaluated in future work. (This is a conference presentation abstract and not a full work that has been published.)

McKenzie, manipulation, and therapeutic neuroscience, the three legged stool to the PROMIS of function: a case study

Nathan Hinkeldey, Zach Jipp

Objective: To provide case evidence illustrating successful use of manipulation, McKenzie Classification and neuroscience education in a young chronic low back pain patient. **Clinical Features:** The 27 year old Veteran reported a 2 year history of low back pain. He used vivid descriptions of his DDD and reported that his spine was deteriorating. He was considering leaving his job as a firefighter as a result. Muscle motor, sensation, and reflexes were intact without red flag pathology. **Intervention and Outcome:** Therapeutic neuroscience education, McKenzie extension exercises and thoracic manipulation

took place over four visits. Education consisted of the difference between hurt and harm, appropriate imaging findings, and pain related to deconditioning and the sensitive nervous system. The PROMIS Pain Interference 6B was performed on each visit with the patient scoring 30, 22, 17, and 15 respectively. The patient returned to work and exercise at a normal rate. **Conclusion:** Chronic pain patients must be adequately screened and educated with accurate information about their condition. Directional preference examination allowed for the identification of non-threatening movements. This case exemplifies the importance of appropriate patient education and identifying non-threatening movements. (This is a conference presentation abstract and not a full work that has been published.)

Patient disability: a case for the detrimental effects of patient education

Nathan Hinkeldey, Jace Peters

Objective: To provide case evidence illustrating the detrimental outcome the pathoanatomical model of patient education can have, and provide a case of successful reeducation with Therapeutic Neuroscience Pain Education. **Clinical Features:** A 31 year old Veteran patient presented to the hospital-based chiropractic clinic with a 10 year history of severe neck, low back, and hip pain. Other healthcare providers correlated the patients pain with some "abnormal" imaging findings present on radiographs and explained to him that the degeneration would only get worse. He was hopeless, disabled, withdrawn from society, and had high level of fear related to movement after receiving a pathoanatomical explanation of why he was having pain. **Intervention and Outcome:** Treatment included therapeutic neuroscience of pain, explanations of normal imaging findings, education related to hurt vs. harm, guided graded exposure to movement, and manipulation (on two visits). In 9 visits, the ODI improved from 56 to 24, FABQ from 23 to 4, and NDI from 56 to 6. He resumed participating in work, social activities, and began class at junior college. **Conclusion:** Incorporating evidence-based patient education provided significant improvement self-reported disability. It also resulted in a large decrease of fear avoidance behavior. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic treatment of a post-concussion syndrome secondary to volleyball injury in a 14-year-old female: A case report

Marilyn Holbeck

Objective/Clinical Features: A 14-year-old female was struck in the frontal bone (glabella) by a volleyball with impact (March-2012) from inferior to superior, while twisting to the left. She was seen by her pediatrician and ped-neurologist, told to take Tylenol, and rest. She presented at this office July-2012 with no memory of the volleyball game, decreased visual fields, dizziness, nauseated, extreme fatigue, and headaches since impact. Pain in occipital and glabella were dominant. Due to her symptomatology, she was unable to attend school. **Intervention/Outcomes:** The patient was treated with SOT category two supine block placement, cervical staircase adjustments, and parietal sagittal suture release cranial techniques. Following the first treatment, she was able to return to school since the injury and pain in her occipital region had subsided. She was seen for three more visits with the focus on cranial adjusting of the craniofacial region and by August-2012 she was symptom-free. Until she was treated there had been no change in symptoms with consistent improvement noted following each visit. **Conclusion:** Based on the finding of this case report SOT and cranial treatment for the care of post-concussion syndromes in athletes warrants further study. (This is a conference presentation abstract and not a full work that has been published.)

Influence of open-lab attendance on student performance using force sensing table technology(FSTT)

Dana Hollandsworth, Daniel Armstrong, Eric Russell

Objective: With one FSTT lab, providing open-lab opportunities for students can be challenging. However, it provides opportunity for measurable and objective feedback to students. Study assessed if open-lab attendance improved student ability to produce target preload, peak force, and speed in a prone thoracic diversified

adjustic thrust on a simulation mannequin. **Methods:** Students in Diversified technique (n=51) were given formal instruction (week 3) in FSTT lab. They were encouraged to attend FSTT open-labs, 12 hours were available weekly. Students were assessed during midterm practical (week 6) and during final practical (week 12) on ability to produce target preload (225-275 N), peak force (550-650 N), and speed (<150 ms) of a prone thoracic Diversified adjustic thrust on a simulation mannequin. **Results:** Female students (n=24) were 4 times more likely to attend open-lab (OR4.33-CI1.24,15.21) than male students. Students who attended open-lab (56.9%, n=29) were 8 times more likely to meet the target preload on their first attempt vs students who did not attend (OR8.13-CI1.60,41.36) and were 6 times more likely to meet preload overall (OR6.30-CI1.16, 34.26). There were no other statistically significant findings. **Conclusion:** Study found open-lab attendance benefits students' ability to meet thoracic adjustment preload forces. (This is a conference presentation abstract and not a full work that has been published.)

Self-reported lifestyle and health ratings may correlate with time under chiropractic care: results from a practice-based pilot study

Ronald Hosek, Eric Plasker, Edward Owens, Stephanie Sullivan

Objective: To utilize practice-based patient-reported pilot-study data to investigate possible associations between health, wellness and lifestyle measures and chiropractic care and demographic factors. **Methods:** 110 Patients from 12 geographically-distributed chiropractic clinics volunteered to answer a 100-item online survey comprising demographic and chiropractic-care measures as well as validated instruments for assessing physical, mental and overall well-being and flourishing. In addition, a series of face-valid questions for self-rating healthiness of lifestyle were included. **Results:** Possible positive associations were noted between flourishing and all well-being variables and time-under-care (TUC). The rate of increase in these variables was greater for TUC of 2 years or less than for > 2 years. This effect was supported by 2nd-order regression modeling. The same effect was seen for the lifestyle variables. These effects were not confounded by age or gender, nor seen for care frequency. **Conclusion:** These preliminary results suggest that long-time chiropractic care may be salutary, with the effect being more pronounced in the first 2 years. (This is a conference presentation abstract and not a full work that has been published.)

An evaluation study of the for reduction of temporomandibular joint dysfunction symptoms using low-level laser therapy

Jennifer Illes, Clara Quadra

Objective: This study investigated the efficacy of using low-level laser therapy (LLL) with varying doses with subjects diagnosed with temporomandibular disorders (TMDs). **Methods:** Sixty patients with TMD participated in the study. Patients were randomly assigned to either 2 treatment groups: High-dose LLLT (n=20), regular dose LLLT (n=20); or to 1 control group. LLLT was performed with a 685 nm red probed diode laser. The energy density was 6.0 J/cm² for a medium dose level, and 12.0 J/cm² for a high dose level. **Results:** A one-way between-groups analysis of variance was conducted which demonstrated statistically significant difference at the p<.05 level in VAS scores for the three groups [F(2, 57)=38.9, p<.01]. The effect size, calculated using eta squared, was 0.58. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for Group 1 (M=9.85, SD=1.226) and Group 2 (M=8.75, SD=2.074) was significantly different from Group 3 (M=5.65, SD=1.226). **Conclusions:** There was a significant improvement in pain measures in all treated groups, but the high dose (Group 1) and medium dose (Group 2) LLLT patients demonstrated no statistically changes in means between groups. (This is a conference presentation abstract and not a full work that has been published.)

Student self-assessment and learning using ExamsSoft tools

Fiona Jarrett-Thewel, Deborah Barr, Jeanmarie Burke

Objective: The purpose of the study was to determine if students are using ExamSoft (ExamSoft Worldwide, Inc., Dallas, TX) student reports to self-assess and improve their course performance. **Methods:**

A survey was administered during class to six cohorts of students that measured the utilization of ExamSoft student reports (Yes or No), their self-rated ability to interpret and understand the reports (Yes, Some Parts, No) and their perceptions of the usefulness of the reports to help them self-assess and improve course performance (Likert Scale from 1 (Not Helpful) to 5 (Very Helpful)). **Results:** There were 520 surveys completed. Sixty-five percent (65%) of respondents indicated that they used the ExamSoft strengths and improvement opportunities report and that they understood the categories in the report (73%) and were able to interpret all (45%) or some (45%) of the report. However, only 15% of the respondents found this report to be helpful towards either assessing or improving their course performance. Only 18% of the respondents reported that they used ExamSoft longitudinal analysis report. **Conclusions:** Institutions may need to provide more training to students on the practicality of using ExamSoft data to self-assess and improve their course performance. (This is a conference presentation abstract and not a full work that has been published.)

Biopsychosocial risk factors associated with low back pain in stroke survivors

Claire Johnson, Bart Green

Objective: This cross-sectional study determined the prevalence of back pain in United States stroke survivors and associated biopsychosocial variables. **Methods:** Multiple logistic regression was used to analyze 2013 National Health Interview Survey data. The NHIS uses a multistage, complex sampling design. **Results:** Of 905 stroke survivors, 44.3% reported having back pain for a day or longer in the prior three months. The logistic regression model was statistically significant, $X^2(24, n = 905) = 167, p < .001$, estimated to a population size of 5,412,765 adults, explained between 26.6% and 35.6% of the variance in back pain status, and correctly classified 72.7% of cases. Significant factors were: female (OR = 1.7; 95% CI, 1.2-2.4), poor/fair perceived health (OR = 1.8; 95% CI, 1.2-2.9), neck pain (OR = 4.1; 95% CI, 2.6-6.6), joint symptoms (OR = 1.8; 95% CI, 1.1-2.9), and arthritis (OR = 2.2; 95% CI, 1.4-3.3). Increasing age was significant and inversely associated with back pain. Several variables associated with back pain in the general population were not significant in this model. **Conclusion:** Biopsychosocial factors associated with back pain for stroke survivors appear to be different than the general population and warrant further investigation. (This is a conference presentation abstract and not a full work that has been published.)

Bibliometric analysis of publications from European Chiropractic Union member countries in the JMPT from 2000 to 2015

Claire Johnson, Bart Green

Objective: To analyze Journal of Manipulative and Physiological Therapeutics (JMPT) publication characteristics from European authors. **Methods:** A bibliometric analysis was performed of MEDLINE-indexed JMPT content for 2000 through 2015 using Scopus. Number of articles, authors' declared country, institutional affiliation, and number of citations were retrieved as of March 2016. All article types were included; letters, notes, and errata were excluded. The search was limited to articles with at least one author from a European Chiropractic Union member country. **Results:** Of 1403 JMPT articles published, 363 originated from 17 of the 23 ECU member European countries. The countries with the largest number of publications were: Great Britain (74), Denmark (65), Spain (63), Netherlands (42), Sweden (34), Belgium (32), and Switzerland (19). Of the 363 articles, 168 had 1 to 10 citations, 120 had 11 to 40 citations, 28 had 41 to 80 citations, and 4 had over 81 citations. Institutional affiliations included: Anglo-European College of Chiropractic, Karolinska Institutet, Nordisk Institut for Kiropraktik og Klinisk Biomekanik, Syddansk Universitet Odense, Odense Universitetshospital, and Universitat Zurich. **Conclusions:** In the past 15 years, ECU member countries have shown robust publication efforts and strong citation rates. (This is a conference presentation abstract and not a full work that has been published.)

"I'm afraid I'll offend them!" Learning how to approach a sensitive topic using standardized patients

Martha Kaeser, Michelle Anderson

Objective: Motivational Interviewing (MI) is a collaborative, person-centered form of guided conversation used by health professionals to elicit and strengthen patients' motivation to change. The purpose of this study is to assess the feasibility of training chiropractic students on MI techniques and the ability to broach sensitive topics with patients. Development of this program can serve as a first step to improving student confidence in discussing behavior change; specifically weight management. **Methods:** Thirty-three Trimester 1 students in a Doctor of Chiropractic program participated in an introduction to MI activity with didactic and experiential components. Outcomes were assessed via a modified version of the Motivational Interviewing Treatment Integrity (MITI) scoring tool as well as standardized patient, self and peer reflections. **Results:** Thirty-three students participated in the didactic portion. Sixteen students were assessed using the modified MITI tool. Ninety-three percent evoked from their standardized patient during a clinical simulation the desire to change and demonstrated respect for the patient's choice. Fifty percent of students reflected and demonstrated discrepancies and summarized what the patient was saying. **Conclusion:** It is feasible to provide direct instruction of MI skills and an experiential opportunity using standardized patients in a clinical simulation. (This is a conference presentation abstract and not a full work that has been published.)

Concussion knowledge among sport chiropractors

Mohsen Kazemi, Khushboo Vora, Mary Bogumil

Objectives: The objective of this study is to investigate the degree of knowledge of sports chiropractors have in regard to concussion diagnosis and management. **Methods:** A survey, which was used from a study conducted by Boggild & Tator (2012) at the University of Toronto, and again by Kazemi (2014) at the Canadian Memorial Chiropractic College, was administered to Sport Chiropractic Fellows from the Royal College of Chiropractic Sports Sciences – Canada (RCCSS(C)) (n=43) via SurveyMonkey.com. This survey, which was scored from 0 to 9, asked nine concussion knowledge based questions. **Results:** Sport Chiropractors scored slightly higher on the survey when compared to chiropractic residents (mean = 5.56 vs. 5.25; $t=0.81$; $p>0.01$) and to fourth year chiropractic interns (mean = 5.56 vs 5.2; $t=1.39$; $p>0.01$); however, this difference was not statistically significant. Several knowledge gaps were identified in the sample population. **Conclusion:** Sports chiropractors prove to possess the skills and knowledge to diagnose and manage concussion. However, although sports chiropractors excel at identification and mechanism of concussion, knowledge gaps regarding concussion diagnosis and management were found in the sample population. (This is a conference presentation abstract and not a full work that has been published.)

The effects of chiropractic spinal manipulation on urinary incontinence in patients with low back pain and radiculopathy: a retrospective case-series report

Mohsen Khamessipour, Michael Hall

Objective: The effects of Chiropractic spinal manipulation on urinary incontinence (UI). Many patients with low back pain demonstrate pelvic symptomatology attributable to lower sacral nerve root compression that is most commonly the result of lumbosacral disc lesion. Urinary incontinence is not an uncommon finding in the low back pain patient. **Methods:** A total of 119 patients' data with low back pain and leg pain that all admit to have urinary control problems were reviewed. Chiropractic manipulative therapy involved high-velocity, low-amplitude manipulation and flexion distraction manipulation. **Results:** After 1-8 weeks of chiropractic treatment, the overall urinary frequency and incontinence was significantly reduced from 4.2 to 1.3 episodes ($P < 0.001$), resolved in 77 patients, considerably improved in 33 cases, and slightly improved in 3 cases, and had no improvement in 6 cases. **Conclusion:** Chiropractic treatment may be an effective means of treating pelvic disorders secondary to lower sacral nerve root compression. Future studies may look at segmental and suprasegmental influences from spinal manipulative procedures and UI. (This is a conference presentation abstract and not a full work that has been published.)

Effects of a single session of chiropractic care on voluntary activation and maximum voluntary contraction of the biceps brachii

Mat Kingett, Kelly Holt, Imran Khan Niazi, Rasmus Wiberg, Michael Lee, Heidi Haavik

Objectives: This study investigated whether a single session of chiropractic care changed maximum voluntary contraction (MVC) and voluntary activation (VA) of the biceps brachii in subclinical neck pain subjects using the interpolated twitch methodology. **Methods:** Nineteen sub-clinical neck pain volunteers participated in this randomised controlled crossover study. Transcranial magnetic stimulation was used to elicit twitch interpolation at several percentages of voluntary contraction in the biceps brachii before and after chiropractic care or a passive movement control. Outcome measures were MVC's (strength) and VA (cortical drive). A repeated measures ANOVA was conducted to assess within and between group differences. Significance was set at $p \leq 0.05$. **Results:** There was a significant between group difference in MVC [$F(1,18)=5.30, p=0.03$] and voluntary activation [$F(1,18)=5.50, p=0.03$]. There were small increases in MVC and VA in the SM group and small decreases in the control group. **Conclusions:** A single session of chiropractic care resulted in increased biceps brachii MVC and VA compared to the control intervention. This study is congruent with previous research results and adds to our understanding of the effects of chiropractic care on motor control. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic manipulative reflex technique (CMRT) treatment for GERD of a 3 year old male child: A case report

Robert Klingensmith, Charles Blum

Objective/Clinical Features: This is a single case study involving a 3-year old male being treated medically for gastroesophageal reflux disease with various prescription antacids since the age of 2-months and Prilosec since 24-months-old. Sacro occipital technique (SOT) and chiropractic manipulative reflex techniques (CMRT) were used to treat the patient's gastroesophageal reflux disease (GERD) presentation. **Interventions/Outcome:** The patient received 5-treatments of CMRT protocol for occipital fiber-3, line-2 T5 which consisted of occipital fiber manipulation, vertebral adjustment and the stomach reflex manipulated at intervals of one-day and then every 3-days. By the fifth-visit, two-weeks after the initial treatment, the mother reported the child appeared to have no reflux pain, sleeping well, no "belly aching," and that she had discontinued the Prilosec after the second treatment. **Conclusions:** Positive outcomes such as this offer the incentive to warrant further pediatric studies to determine consistency of outcome with chiropractic interventions and particularly CMRT for GERD. While it is essential to determine what subset of pediatric patients with GERD may benefit from this care a short period of trial therapy may function as a diagnostic test and a viable option to GERD that is unremitting in a young child. (This is a conference presentation abstract and not a full work that has been published.)

Validation of a non-invasive, non-ionizing technique for three-dimensional measurement of the lumbar spine

Terry Koo, Wingchi Edmund Kwok

Objective: Comprehensive assessment of the spine requires repetitive three-dimensional (3D) measurements of motion segments at different functional postures. We present a novel, non-invasive, non-ionizing technique, namely hierarchical ultra-short echo time (UTE) magnetic resonance (MR) to ultrasound registration, to quantify 3D poses of lumbar motion segments. **Methods:** A hierarchical approach was developed to minimize the detrimental effects of speckle noise and artifacts on registration accuracy. The technique used UTE MR images to construct subject-specific geometrical models of individual vertebrae and registered them with 3D freehand ultrasound dataset acquired during pose measurements. It was first validated on a human dry bone specimen and a fresh porcine cadaver by comparing with a gold standard fiducial-based registration. It was then applied to a live human subject. **Results:** The technique was accurate with bias in sub-degree and sub-millimeter level, precision of 1.1 degrees in rotation and 0.9 mm in position for the human dry bone specimen, and 1.3

degree and 1.2 mm for the porcine cadaver. Superimposing the registered MR model and ultrasound dataset confirmed its workability in live human subject. **Conclusion:** Given its non-ionizing nature, the technique is particularly useful for longitudinal follow-up of scoliotic deformity and spinal instability. (This is a conference presentation abstract and not a full work that has been published.)

The use of infrared cameras to detect pain: Determining the specificity and sensitivity

Bon Kwan, Shari Wynd, Aladin Boriek, Jack Fulkman

Objective: To determine the specificity and sensitivity of an infrared camera in the detection of musculoskeletal pain. **Methods:** We collected imaging data using an ICI 7640, P-series infrared camera from ten subjects with pain rated ≤ 1 and five patients with pain rated ≥ 4 all between 24-32 years old. Images were obtained at the location of the pain or chosen arbitrarily by the observer if no pain was present. A blinded researcher was asked to classify each infrared image as either "pain" or "no pain". The researcher was informed that areas of highest heat were white, and the areas of lesser heat would be red and taper into cooler colors, such as blue. **Results:** Sensitivity and specificity was found to be 100% and 58% respectively. This indicates that the blinded researcher was able to identify when a patient has no pain with great accuracy and had moderate success predicting pain using images alone. The positive likelihood ratio was 2.4, which correlates to a 15% increase in post-test probability of predicting pain. **Conclusion:** The blinded and untrained researcher could accurately predict when a patient had no pain. There was moderate specificity associated with predicting pain. (This is a conference presentation abstract and not a full work that has been published.)

Differences between neuromechanical responses to spinal manipulation and mobilization: a crossover randomized trial

Arnaud Lardon, Isabelle Page, Francois Nougrou, Martin Descarroux

Objective: The objective of this study was to compare the effects of spinal manipulation to those of mobilization on clinical pain and spinal stiffness in patients with recurrent thoracic pain. **Methods:** Twenty-two patients participated in two experimental sessions within 72 hours. During the first session, participants randomly received spinal manipulation or mobilization delivered by an apparatus using a servo linear motor. The second treatment modality was delivered during the following session. Before and after each treatment, spinal stiffness was assessed from T5 to T8 while pain was evaluated using a visual analogue scale following each stiffness measurement. **Results:** Generalized linear models for repeated-measures yielded a statistically significant Treatment X Time interaction for pain ($F(1,21)=8.8811$; $p=0.00714$) characterized by a statistically significant decrease in pain following spinal manipulation (from 47.6/100(± 22.3) to 35.2/100(± 23.1)) and no changes following mobilization (from 44.5/100(± 23.5) to 41.8/100 (± 24.1)). Dependent t-test showed a statistically significant difference in stiffness changes following both manipulation and mobilization ($p=0.0114$). Following manipulation, global stiffness decreased by 0.20(± 0.89) N/mm whereas it increased by 0.21(± 0.83) N/mm following mobilization. **Conclusion:** These results are consistent with the findings of previous studies which also reported that clinical improvements were related to stiffness changes. (This is a conference presentation abstract and not a full work that has been published.)

Opinions of sports clinical practice chiropractors, with sports specialty training and those without, about chiropractic research priorities in sports health care: a centering resonance analysis

Alexander Lee, Kaitlyn Szabo, Kirstie McDowell, Sydney Granger

Objective: The chiropractic profession has yet to publish a research agenda for the sports chiropractic specialty. To explore the research priorities of this discipline, an interview study utilizing a centering resonance analysis was conducted to identify the research opinions of sports chiropractors, and investigate whether there is a difference between those who have their sport specialization and those who do not. **Methods:** Fifteen sports clinical practice chiropractors who have their sports specialty designation and fifteen without, were interviewed with four questions about sports chiropractic research priorities. A centering resonance analysis, which creates word networks from

transcribed conversations, was used to identify central themes, and a cluster analysis was conducted to determine whether the responses could be clustered into distinct groups. **Results:** The centering resonance analysis identified influential words and word pairs from the responses. The cluster analysis revealed the groups differed in their responses to questions one to three about research priorities, while they were similar in question four that inquired about research collaborations. **Conclusion:** Sports clinical practice chiropractors, with their sports specialization and those without, differed in their opinions about sports chiropractic research priorities; however, they had similar opinions about research collaborations. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic care alters nociceptive processing at spinal and supraspinal levels

Dina Lelic, Imran Khan Niazi, Kelly Holt, Muhammad Samran Navid, Ashjorn Mohr Drewes, Heidi Haavik

Objective: This study aimed to investigate how chiropractic care affects spinal and supraspinal nociceptive processing. **Methods:** Fifteen volunteers attended two sessions (full-spine chiropractic care and passive movement control) in random order, in a crossover design randomized controlled trial. As a proxy of spinal pain transmission, nociceptive withdrawal reflexes (NWRs) to electrical stimulation on the sole of the foot were recorded at tibialis anterior before and after either intervention. For the supraspinal activity, 61-channel electroencephalogram evoked potentials (EPs) were simultaneously recorded. Areas under the curve of the NWR signals were analyzed. Latencies and amplitudes were computed for the major EP peaks. Brain source analysis of the EPs was performed. **Results:** The NWR decreased due to the chiropractic intervention ($P=0.01$). The EPs had two main peaks at 116 ± 19 ms and 258 ± 22 ms. The amplitudes at both peaks were decreased due to chiropractic intervention at the frontal electrode ($P=0.03$). Brain source localization revealed no differences in location of brain activity but the strength of anterior cingulate activity decreased following the chiropractic intervention ($P=0.04$). **Conclusion:** Chiropractic care alters nociceptive processing at spinal and supraspinal levels. This study adds to our understanding of how chiropractic care influences nociceptive processing. (This is a conference presentation abstract and not a full work that has been published.)

Developing student experience: Creation of a therapy practice lab

Marc Lucente, Sean Norkus, Mark Murdock, John Lockenour

Objective: Students have expressed a desire for more “hands-on” learning opportunities for both active and passive care modalities, including muscle stretching, rehabilitative strengthening, electric stimulation, ultrasound, and cold laser. These modalities are performed by the vast majority of chiropractors practicing in the United States. A practice lab was designed to offer students a new learning opportunity. **Methods:** Outpatient clinic faculty have reported dissatisfaction with student abilities in the delivery of active and passive care modalities. We therefore decided to make a lab available to students early in the curriculum before they entered the outpatient clinic. Second year students cannot only use the lab to practice their skills, but can also volunteer as interns mentoring first-year students, thereby creating a new learning opportunity. Only therapies included in the existing curriculum are allowed to be practiced in the lab. **Discussion:** Positive student response was demonstrated by the large number of therapies performed in the first ten weeks. 523 therapies on 223 student patients shows a very high level of usage for a learning experience which is not compulsory. **Conclusion:** This practice lab was created to improve students’ understanding of and skills in performing active and passive care. (This is a conference presentation abstract and not a full work that has been published.)

Instrument-assisted soft tissue mobilization increases range of motion in traumatized ankle: a case study

Inajara Maciel, Danilo Messa da Silva, Daniel Facchini

Objective: To report and analyze the clinical outcomes and chiropractic management through instrument-assisted soft tissue mobilization (IASTM) of a post automobile collision patient. **Clinical**

Features: Male, 55-year-old patient with a BMI of 27.92 had a history of multiple fractures and extensive soft tissue damage in the left lower limb, treated with Ilizarov external fixation and skin grafts. At presentation, under ongoing physical therapy, his left foot had a red, planar scar with slight hypertrophic appearance and associated functional limitations impairing physiological ROMs. There was pain hypersensitivity at light touch, no active left ankle ROM and severe reduction in passive ROM. **Intervention and outcome:** IASTM procedures were made weekly through 7 months. After 10 interventions the patient was able to ambulate assisted by a walker. Ankle mobility increased throughout treatment and after 30 interventions the patient could ambulate using a crutch. **Conclusion:** IASTM as an adjunctive procedure was associated with increased active and passive ROM and ability to bear weight, helping this patient to walk with intermittent use of walking aids. (This is a conference presentation abstract and not a full work that has been published.)

Quality assessment of case reports on a technique website

Dana Madigan, Jerrilyn Cambron

Objective: Many technique specific websites publish case reports that are not available in peer-reviewed journals or databases, which limits the audiences that will access this literature. This study aims to assess the quality of case reports published on a technique website and identify possible recommendations for quality improvement. **Methods:** Case reports regarding the cervical spine were downloaded from the Cox Technic website, excluding any case reports that have been published in journals or other trade publications. Two reviewers independently assessed all eligible case reports using the CARE Checklist. **Results:** A total of 31 possible cases were identified, of which 26 were eligible for inclusion. Out of a possible 29 points, scores ranged from 3 to 21 (average=11). Diagnostic evaluations were included in every case report while patient consent for publication was not stated in any. **Conclusion:** The quality of these case reports varied greatly. Technique websites could provide author guidelines such as the CARE checklist. If the submitted case report meets most of the recommendations of the guidelines, technique websites could consider recommending the authors pursue publication in a peer-reviewed journal for a broader distribution of clinical information. (This is a conference presentation abstract and not a full work that has been published.)

Associations of blood lead and cadmium levels with bone mineral density in men aged 50 and older

Dana Madigan, Yuri Korvatko, Mary Turyk

Objective: The risk of osteoporotic fracture is higher than that of prostate cancer in men, however, studies of risk factors for low bone mineral density (BMD) have predominantly focused on post-menopausal women. This study examined the impact of environmental lead and cadmium exposures on spine and femoral neck BMD in men aged 50 and older. **Methods:** Cross-sectional data from 1,782 men was obtained from 2005-2010 National Health and Nutrition Examination Survey. Linear regression models for BMD were examined with quintiles of exposures, adjusting for time, age, race/ethnicity, BMI, smoking status, and poverty income ratio. **Results:** There was an inverse dose-response for cadmium and BMD at both the spine and femoral neck ($p<0.05$), which was partially attenuated after adjustment ($p>0.05$). We did not find an association of lead with BMD or an interaction of these metals on BMD. **Conclusion:** This study found limited evidence that cadmium exposure in men is associated with decreased BMD, suggesting that additional prospective studies are warranted. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic management of cervical degenerative spondylolisthesis: a case report

Celia Maguire

Objective: Instability is an absolute contraindication to chiropractic manipulation. The threshold for post-traumatic instability in the cervical spine has been established; however, these thresholds have not been established for degenerative instability. This case report provides the clinical examination, imaging findings, and successful management plan for a patient presenting with cervical degenerative spondylolisthesis. **Clinical Features:** Patient is a 52 year old female

with a 3 year history of neck pain following motor vehicle collision. Pain, weakness and paresthesia contributed to a neck disability index of 42%. Radiographs reveal degenerative disc disease from C5 to C7, severe left facet arthrosis at C4/5 with 2mm degenerative spondylo-lithesis of C4. **Intervention and outcome:** Patient was adjusted three times a week for 4 weeks using diversified technique. Neck disability index improved to 20%. **Conclusion:** Had thresholds for traumatic instability been applied to this case, the patient would not have received chiropractic care. As done with post-traumatic instability, thresholds should be developed for chiropractors to deliver safe, high-quality care for patients with cervical degenerative spondylo-lithesis. (This is a conference presentation abstract and not a full work that has been published.)

A relationship between undergraduate science courses and success in the first year of a chiropractic program and on National Board Of Chiropractic Examiners, part I

Carissa Manrique, Gene Giggelman

Objective: To determine if undergraduate science courses improve first year performance in a doctorate of chiropractic program (DCP) and on National Board of Chiropractic Examiners (NBCE) Part I. **Methods:** DCP student's undergraduate transcripts (n=141) were evaluated as to whether they took general chemistry, organic chemistry and/or an anatomy/physiology (A&P) course. Independent t-tests were used to compare those who took a course to the year 1 DCP cumulative GPA (cGPA) and NBCE Part I scores (Chemistry-CHEM; Spinal Anatomy-SPA; General Anatomy-GEA). **Results:** Taking any undergraduate science course had no effect on cGPA ($p > 0.05$). For the NBCE Part I, students who took general chemistry (n=141) did better on the CHEM (42 points average increase), SPA (50 points) and GEA (41 points) ($p < 0.05$). Students who took organic chemistry did better on the CHEM (76 points) section ($p < 0.05$). There was no statistical significant effect on any NBCE scores for students who took A&P. **Conclusion:** This study found, students taking undergraduate science courses perform better on science section of the NBCE Part I, but no effect was found on the overall year 1 cGPA. Based on these results we recommend further evaluation of prerequisite requirements of the DCP. (This is a conference presentation abstract and not a full work that has been published.)

Perianal abscess mimicking levator ani syndrome: A case report and approach to the differential diagnosis of anorectal pain

Paul Mastragostino, Alex Lee, Patrick Battaglia

Objective: We present a case of a patient with a perianal abscess initially misdiagnosed as levator ani syndrome. **Clinical Features:** A 41-year-old woman presented to an academic chiropractic clinic with pain localized to her sacrum, coccyx, and gluteal region, accompanied by internal and external rectal pain. She was diagnosed with a suspected levator ani syndrome by her gastroenterologist, and was instructed to seek physical therapy for management. **Intervention and Outcome:** Due to the severity of her pain and the erratic nature of her symptoms, radiographs of the sacrum and coccyx were ordered. These demonstrated enlargement of the pre-sacral soft tissues. The patient was referred to her family physician, who ordered a pelvic MRI that revealed a circumferential horse shoe shaped abscess in the intersphincteric plane. She received urgent surgery to drain the abscess. Following the surgery, she was treated at the chiropractic clinic for symptomatic relief of associated low back pain. **Conclusion:** Anorectal pain can be a debilitating condition for patients and a diagnostic challenge for health care practitioners. This case emphasizes the importance of considering a comprehensive differential diagnosis for patients presenting with anorectal pain. (This is a conference presentation abstract and not a full work that has been published.)

Comparison of final practical exam scores between students who prepared for a multiple choice exam and students who prepared for a fill-in-the-blank exam

Chris Major

Objective: Evaluate whether preparing for fill-in-the-blank (FITB) or multiple choice (MC) exams is more beneficial to students. **Methods:** Final exam scores were analyzed for one cohort of students who were

informed that the final exam would be MC, and a second cohort of students who were informed that the exam would be FITB. Immediately before taking the exam, the second cohort was offered the option to complete the exam in either format. Final exam scores were analyzed for statistical significance. 22% of the students in the second cohort completed an optional post-exam survey regarding their choice of test, preparation, and anxiety. **Results:** 100% of students in the second cohort, who prepared for the FITB exam, chose to take the MC exam and performed better on the identical MC exam (p -value = 0.00005). They also reported decreased anxiety during the exam and indicated that preparing for the FITB exam increased their understanding of the material. **Conclusion:** Preparing for the FITB exam improved students' understanding of course content, as compared to students who prepared for the MC exam. The MC option reduced anxiety during the exam. The impact on long-term retention of content requires further assessment. (This is a conference presentation abstract and not a full work that has been published.)

Correcting thoracolumbar adolescent idiopathic scoliosis using a new 3D bracing approach: a case study

Jeb McAviney, Juan Du Plessis

Objective: To demonstrate the treatment results of a new type of 3-dimensional scoliosis brace in a 13-year-old girl with a 33° thoracolumbar adolescent idiopathic scoliosis managed by a chiropractor. **Clinical features:** At presentation the patient was Risser 1, with a 33° left thoracolumbar scoliosis, with 12° of thoracolumbar rotation, 60mm of left coronal imbalance, TRACE sore of 9/12 and mild thoracolumbar pain. **Intervention:** The 3D ScoliBrace custom spinal orthosis was prescribed and supported by a rehabilitation program of SEAS (Scientific Exercise Approach to Scoliosis) and ScoliRoll. The ScoliBrace uses a 3D "Mirror Image" approach rather than the traditional 3-point pressure used in most scoliosis braces. **Outcome:** At the end of treatment (22 months), the patient was Risser 4, the scoliosis had reduced to 6° - a correction of 27° (out of brace), there was an improvement in thoracolumbar rotation down to 5°, the coronal imbalance was reduced to 14.5mm, the TRACE score improved to 2/12 and the patient had no pain. **Conclusion:** The result of this case suggests that this new approach to scoliosis treatment may be more effective than traditional non-surgical approaches which have not previously demonstrated the ability to improve thoracolumbar AIS curvatures. (This is a conference presentation abstract and not a full work that has been published.)

The use of rehabilitation exercises as an adjunct for patients with chronic neck pain

Abigail McGuinness, Adrian Hunnisett, Christina Cunliffe

Objective: To investigate chiropractor use of rehabilitation exercise, specifically for patients with chronic non-specific neck pain. In addition, what is considered the most effective exercise used in this patient group. **Method:** Following ethical approval, a cross sectional survey was undertaken of a group of UK chiropractors. The survey investigated views on rehabilitation exercise, use of exercise in conjunction with chiropractic care, and nature of exercises used. **Results:** Results indicated high use of rehabilitation exercise as an additional modality in conjunction with chiropractic (90%). The majority of respondents (88%) advised rehabilitation exercise for the neck, with postural exercise considered the most effective rehabilitation exercise in reducing symptoms and/or improving function in patients with chronic non-specific neck pain (48%). A majority (74%), also indicated that patients with chronic neck pain responded better and faster to the combination of rehabilitation exercise and chiropractic, especially if a home exercise program is used. **Conclusion:** The majority of respondents in this study use rehabilitation exercise generally within practice in conjunction with chiropractic care. Postural exercise is regarded as the most effective rehabilitation exercise in reducing symptoms and/or improving function in patients with chronic non-specific neck pain. (This is a conference presentation abstract and not a full work that has been published.)

Thoracic musculoskeletal pain presenting with myocardial infarction symptoms

Craig Mencl

Objective: The purpose of this case report is to describe the Chiropractic management of a patient with symptoms of myocardial infarction after being released from the Emergency Department and referred for a musculoskeletal evaluation. **Clinical features:** A 33 year old woman presented to the clinic following release from the Emergency Department (after 2 days in the hospital). She reported chest pain radiating to the left shoulder and arm. She also reported shortness of breath and pain radiated into the neck and jaw. **Intervention and outcome:** The patient was evaluated after release from the hospital. Pain and tenderness were noted in the thoracic spine with muscle spasms and trigger points. Pain was rated an 8 out of 10. The patient was treated with electrical stimulation, myofascial work and an adjustment. After treatment the symptoms resolved. **Conclusion:** This case describes a patient presentation with thoracic pain and myocardial infarction symptoms. The medical tests were unremarkable and a referral was made by the hospital emergency department for a musculoskeletal evaluation. The Chiropractor found a musculoskeletal complaint. The treatment rendered by the Chiropractor resolved her symptoms. (This is a conference presentation abstract and not a full work that has been published.)

Using OSCE quality assurance to train the raters

Heather Miley, Robert Tatum, Jamie Bedle, Doug Lawson

Rater feedback in objective structured clinical examinations can be minimal. Selection of raters is sometimes based on who is available, or who has demonstrated NOT to score at the extremes of the stringency/leniency trait. **Objective:** the objective of the study was to apply quality assurance methods to data from the certification examination for chiropractic radiologists. **Methods:** Both classical test theory and Rasch mathematical models were used to determine what information could best be used to guide raters. **Results:** With respect to the raters only, the analysis confirmed provided feedback on the stringency/leniency quality of each rater, the association with the scoring of other raters, the amount of variance of each rater, and the appropriate application of the rating scale. **Conclusion:** Each rater, during training and actual testing, can be guided by reports that highlight her/his position on the stringency/leniency spectrum, the association of scores to all other raters, the variance of scores compared to the variance of other raters, candidates, and cases used, and the appropriate use of the rating scale. Raters that do not separate strong from weak candidates do not assist in the decisions that must be made based on OSCE scores. (This is a conference presentation abstract and not a full work that has been published.)

A critical integrative review of manual therapy use for headache disorders: Prevalence, profiles, predictors and communication

Craig Moore, Jon Adams, David Sibbritt

Objective: Evaluate the prevalence and key features associated with patient use of manual therapies (MT) for headache treatment. **Data Sources:** Critical integrative review of peer-reviewed literature (English) identifying between 2000 – 2015 searching databases (MEDLINE, AMED, CINAHL, EMBASE, EBSCO). **Results:** The combined prevalence rate of MT use for migraine across chiropractic, physiotherapy, osteopathy, massage averaged 15.9% within general populations; 18.4% within headache-clinic patient populations and 1.7% in one MT patient population. General headache averaged 17.7% within general populations; 32.3% within headache-clinic patient populations and 9.25% within MT patient populations. They are more often older, female, greater comorbidities, higher rate of medical visits, higher level of headache chronicity and disability. They seek MT for reasons of 'seeking pain relief' (mean: 60.5%) followed by concerns about 'safety or side effects' (mean: 43.8%) or 'dissatisfaction with medical care' (mean: 26.1%). Concurrent use of medical care was 29.5% - 79.0% (mean: 60.0%) while non-disclosure of manual therapy to GP was 25.5% - 72.0% (mean: 52.6%) primarily for reasons of "doctor never asking" (mean: 58.5%). **Conclusions:** There is a need for more public health and health services research to improve headache healthcare policy, practitioner education and coordination of healthcare services. (This is a conference presentation abstract and not a full work that has been published.)

Using the Personal Background Preparation Survey to identify the at-risk student in the first year of a doctor of chiropractic program

John Mrozek

Objective: Early identification of the at-risk student, along with supportive services, has been shown to improve academic performance and retention. The Personal Background Preparation Survey (PBPS) instrument is used in nursing education to identify the at-risk student, along with support, to improve retention. The purpose of this study is to determine the correlation between the PBPS risk level, determined at matriculation, and the Adverse Academic Status Event (AASE) code assigned to a student in the first three trimesters of a 10-trimester chiropractic program. **Methods:** The PBPS data set, n 298, is from fall 2010 to spring 2014. Students, stratified into categories of high, medium, or low risk by the PBPS, are assigned one of 24 AASE codes each trimester. The 24 AASE codes are associated with retention-related outcome categories ranging from good academic standing to attrition. **Results:** Trimester one results are significant at the $p < .01$ level. Trimester two and three results are significant at the $p < .05$ level. **Conclusion:** A significant positive relationship is found between the PBPS risk level, and the assigned retention-related AASE code, at the 95% confidence interval. Spearman's correlation coefficient $r_s = .233$ represents a small effect size. (This is a conference presentation abstract and not a full work that has been published.)

Management of fibromyalgia in female veterans presenting to a VHA chiropractic clinic: a retrospective case series

Jason Napuli, Karim Ali, Ryan Diana

Objective: To describe female veteran patients presenting with Fibromyalgia (FMS) and their response to chiropractic treatment. **Clinical Features:** Fibromyalgia (FMS) is one of the most popular studied chronic wide spread pain syndromes due to its unknown etiology. FMS has a population prevalence of approximately 2-7% in the US. Women are 10 times more likely to develop fibromyalgia than men and this occurrence tends to increase with age. It is also found similarly in female veterans. Recommendations for treatment include interdisciplinary, team-based combined care approaches and limited opioid use. **Intervention and Outcome:** A retrospective review of patients in one VHA chiropractic clinic was conducted. Intervention included the use of heat, soft tissue treatment, and multiple impulse instrument assisted spinal manipulation. Twenty six female patients were identified with an average visit frequency 8.2 visits. Overall, there was a 22% decrease in pain levels and 32% in Bournemouth Back Questionnaire. Adverse events were mild, transient, and limited to localized soreness. **Conclusion:** Chiropractic care can be used to positively affect female veteran patients with FMS and possibly offer an safe alternative or even adjunctive therapy to complement interdisciplinary care. (This is a conference presentation abstract and not a full work that has been published.)

Dishabituation of central nervous system to tonic pain following chiropractic care - a standardized low resolution brain electromagnetic tomography (sLORETA) based study

Muhammad Samran Navid, Dina Lelic, Imran Khan Niazi, Kelly Holt, Esben Bolvig, Ashjorn Mohr Drewes, Heidi Haavi

Objective: To determine the changes in brain activity during tonic pain after single session of chiropractic care in a sub-clinical pain population by utilizing source localization of the EEG. **Methods:** 61-channel EEG was recorded in fifteen healthy volunteers before and after chiropractic or control intervention on separate days in random order during 72s of cold pressor test at 2°C (left hand). sLORETA was performed on four EEG frequency bands: delta (1-4Hz), theta (4-8Hz), alpha (8-12Hz) and beta (12-32 Hz). Volunteers rated the pain and unpleasantness on two separate numeric scales 0-10 (no unpleasantness/pain to maximum unpleasantness/pain). **Results:** The pain scores decreased in control arm ($p < 0.05$) whereas the unpleasantness scores decreased for both interventions ($p < 0.05$). In the control experiment, the brain activity decreased in all frequency bands ($p \leq 0.05$), whereas no change in activity was seen after the chiropractic session ($p > 0.05$). **Conclusion:** The decrease in brain activity in the control arm reflects central habituation which occurs due to painful stimulation. The lack of this phenomenon in the

chiropractic arm could imply that the chiropractic care normalizes the central nervous system leading to central dishabituation. (This is a conference presentation abstract and not a full work that has been published.)

A descriptive study of sports chiropractors

Luke Nelson, Henry Pollard, Rick Ames, Brett Jarosz, Peter Garbutt, Cliff Da Costa

Objective: The primary objective of this study was to examine the demographic and practice characteristics of those chiropractors that hold the FICS ICSSD qualification. This study was in response to criticisms that sports chiropractors are unimodal in their treatment approach (manipulation only), treat the spine only, are non-evidenced based and do not work as part of the healthcare team. **Methods:** A cross sectional self-report web survey was conducted of the 240 chiropractors who held an ICSSD qualification. **Results:** 152 surveys were completed for a response rate of 63%. 90.8% of practitioners delivered multimodal treatments; with manipulation (100%) and soft tissue therapy (97.4%) the most commonly utilised modalities. 76% prescribed rehabilitative exercises, 68.3% gave ergonomic and 39.4% nutritional advice. 96.7% read health care research. 100% treated non-spinal (extremity) musculoskeletal conditions, 20.4% currently worked with a sports team full time, 64.5% of chiropractors currently treat professional and 79% treat semi professional athletes. **Conclusion:** The Sports Chiropractors surveyed in this study were multimodal in their approach, read scientific research, treated non-spinal musculoskeletal conditions, co-treated and referred to other health professionals and frequently treated athletes. Based on this research, common complaints about sports chiropractors are incorrect and non-evidence based. (This is a conference presentation abstract and not a full work that has been published.)

Incorporation of motivational interviewing into a pre-clinic course

Lia Nightingale

Objective: Motivational interviewing is a communication tool utilized extensively in clinical practice used to elicit behavioral change. The goal of this project was to incorporate this communication technique into a pre-clinic wellness-related course as a means of making the course more clinically relevant. **Methods:** During the Spring 2016 term, motivational interviewing was added to a pre-clinic course. Students were assigned weekly readings from a recently published book entitled Motivational Interviewing in Nutrition and Fitness. The instructor developed engaging activities for each session related to the assigned chapter, such as speed dating to practice engaging and evoking through use of open-ended questions. **Results:** Utilization of weekly motivational interviewing activities in a pre-clinic course was extremely useful. Informal feedback from students illustrated that the vast majority felt that utilization of the motivational interviewing book and activities were helpful. Most students felt that learning this communication style improved their confidence in communicating with patients. More research is necessary to determine whether incorporation of this communication technique had any impact on communication skills once in clinic. **Conclusion:** Incorporation of motivational interviewing into a pre-clinic course had a favorable outcome for both students and faculty involved. (This is a conference presentation abstract and not a full work that has been published.)

A picture is worth a thousand words: Using a visual aid in diagnosing during clinical competency testing

Brett Nielsen

Objective: Does the addition of pictures to verbal description effect student performance in diagnosing conditions during clinical competency testing? **Methodology:** This pilot study evaluated diagnosis scores from a clinical barrier exam using three identical case descriptions/scenarios. Performance in diagnosis between students provided a picture accompanying the scenario and those not provided a picture was examined analyzing the p-value with a significance level of 0.05. **Results:** In case #1, students (n=91) received a mean score of 91% when provided a picture as compared to students (n=11) with a mean score of 88% when not provided a picture. Similarly, in case #2 students (n=89) received a mean score of 66% when provided a picture as compared to students (n=88) with a mean score of 62%

without picture. Lastly, in case #3 students (n=84) received a mean score of 85% when provided a picture as compared to students (n=95) with a mean score of 74% without picture. **Conclusion:** Data reflect that the addition of pictures to verbal description increases student performance in clinical competency testing. Further study and development of picture case types are needed to determine outcome of the objective. (This is a conference presentation abstract and not a full work that has been published.)

Correlation of body composition and low back pain in a cross-section of United States Veterans

Casey Okamoto, Andrew Dunn, Bart Green, Lance Formolo

Objective: Back pain is more prevalent in the obese. Whether back pain severity is directly correlated to increased body composition in Veterans is unknown. We sought to determine if there was a correlation between body composition and low back pain severity in a sample of Veterans. **Methods:** Spearman's rho was used to test for correlation between Back Bournemouth Questionnaire scores and body mass index measurements in 1768 Veterans. **Results:** On average, the sample was predominantly male (91%), over the age of 50 years, and overweight (36.5%) or obese (48.9%). There was no correlation between body mass index and Back Bournemouth Questionnaire scores, $r = .088$, $p < .001$. **Conclusion:** There was no correlation between back pain severity and body mass composition in this sample of Veterans. (This is a conference presentation abstract and not a full work that has been published.)

Peer review in a chiropractic college - lessons learned

Tolu Oyelowo

Objective: To report on the lessons learned from implementing a peer review process within one department of a chiropractic college. **Methods:** Six faculty in one department participated in the process. Each reviewed one or two colleagues. The review process included a minimum of six hours in classroom to evaluate teaching, the review of course syllabi, review of all online materials including Moodle pages, and a summary report which was placed in the reviewed faculties departmental file. **Results:** Methods of gaining buy in from faculty included, using standardized instruments to evaluate faculty, assurance of non-punitive consequences during the initiation of the process; allowing faculty the time to evaluate peers by allotting FTE's, and promoting a spirit of collaboration and mutual benefit. **Conclusion:** The concept of peer review evokes many emotions in faculty, including fear, anxiety, and excitement. Implementation of a process necessitates buy in from both faculty and administrators and ultimately facilitates collaboration. (This is a conference presentation abstract and not a full work that has been published.)

Rate-dependent anti-nociceptive effect of a spinal manipulative therapy on adult rat chronic peripheral neuropathic pain behavior

Stephen Onifer, Randall Sozio, Denielle DiCarlo, Qian Li, renee Donahue, Bradley Taylor, Cynthia Long

Objective: Chronic neuropathic pain associated with low back pain substantially increases debilitating burdens. Low velocity variable amplitude spinal manipulation (LVVA-SM) treatments improve chronic low back pain severity especially in persons with peripheral nerve involvement. We determined whether a simulated LVVA-SM treatment had anti-nociceptive effects in a chronic peripheral neuropathic pain rat model for mechanistic investigations. **Methods:** Following baseline hindpaw allodynia assessments, tibial and common peroneal, but not sural, branches of the sciatic nerve were transected. Allodynia was assessed 2 weeks later. Anesthetized experimental rats underwent 10 minutes of L5 vertebra LVVA-SM at 2 rates. Allodynia assessments began 10 minutes afterwards. Control rats underwent the same procedures without LVVA-SM. **Results:** Mechanical and cold allodynia were present in all rats at week 2. Mean mechanical thresholds at 10 ($P < 0.001$) and 25 ($P = 0.04$), but not 40, minutes after 0.16Hz LVVA-SM were significantly higher compared to control rats. They were higher ($P = 0.07$) 10 minutes after 0.15Hz LVVA-SM compared to control rats but were less ($P = 0.02$) than 0.16Hz LVVA-SM rats. Mean cold response durations did not differ between groups. **Conclusion:** Short-term, rate-dependent anti-nociception after LVVA-SM is similar to clinical findings. Mechanis-

tic investigations using this approach to enhance LVVA-SM are warranted. (This is a conference presentation abstract and not a full work that has been published.)

Ethical issues in chiropractic research

Julie O'Shaughnessy, Martin Descarraux

Objective: The objective of the present work is to review basic principles in research ethics in order to identify and discuss key issues related to the ethical conduct of chiropractic research. **Data Sources and Selection:** Broad ethical principles and issues gathered from the Declaration of Helsinki, the Interagency Advisory Panel on Research Ethics (Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans) and the National Institute of Health (NIH) Department of Bioethics were reviewed to identify and analyze specific ethical issues commonly faced by research ethics board when assessing chiropractic research protocols. **Results:** Six key issues were identified as topics of particular interest for chiropractors and will be presented: patients' best interests, risks and benefits, scientific integrity, informed consent and confidentiality, placebo and control group as well as trial registration. **Conclusion:** Even though chiropractic research quality and volume has greatly increased over the past decades, related research ethics issues remains a constant challenge for our profession. Therefore, chiropractic students, clinicians and researchers should be sufficiently trained in research ethics, not only to properly conduct health studies but also to critically appraise research in realm of manual and other related biomedical disciplines. (This is a conference presentation abstract and not a full work that has been published.)

Amplitude and speed of Gonstead technique side-posture lumbopelvic adjustments in humans

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

Objective: Transmitted and contact loads reported for chiropractic Diversified Technique high-velocity low-amplitude manipulative thrusts show great variability in magnitude and speed. Gonstead-style thrusts appear similar, but the thrust amplitude and speed have not been documented for lumbar side-posture adjustments. **Methods:** We sampled 24 lumbar and pelvic adjustments performed on student volunteers with subluxation indications by 7 elite experienced (mean = 20 years) Gonstead practitioners, all members of the Gonstead Clinical Studies Society. Thrusts were delivered with the participants in side-posture on a flat-bench equipped with a lumbar section force-plate. Doctors were allowed to contact the participants with the thrusting hand on the spine or pelvis, and a supporting leg on the patient's thigh. **Results:** Preloads averaged 70 +/- 55 N and thrust peak amplitudes averaged 1011 +/- 102 N. Loading rates during the thrust were 8.2 +/- 2.5 N/ms; unloading rates were -3.5 +/- 1.9 N/ms. Thrusts were 166 +/- 25 ms in duration; the unloading phase was 274 +/- 74 ms. **Conclusion:** Lumbo-pelvic side-posture adjustments by Gonstead practitioners are generally uniform in magnitude and speed and tend to be on the high end of the load and speed ranges reported for Diversified thrusts. (This is a conference presentation abstract and not a full work that has been published.)

Using private electronic health care databases when public ones do not exist

Edward Owens, Joe Esposito, Ronald Hosek

Objective: Research describing chiropractic care in Europe has advanced due to the availability of public health databases. In the US, the only comparable system is Medicare, and it is limited to persons over 65. Also, since the US Centers for Medicare Services places severe restrictions on chiropractic services covered, that model does not well represent care provided to the general population. We are studying the utility of a private Electronic Health Care (EHR) system created specifically for chiropractors with the aid of its developers.

Methods: Previously, we looked at demographics across 40,000 patient records, as well as the diagnostic findings for those patients. This current study examines how enhancements to the software could increase its research utility. **Results:** Analysis suggests that the addition of special fields to code chief complaint and health status indicators not typically included in EHR would be most useful. Also, an efficient

means of extracting SOAP-note data would be highly desirable. Finally, we consider what incentives would encourage software designers to develop these improvements, and practitioners to use them. **Conclusion:** Appropriately modified and properly utilized, private EHR systems may be very useful in chiropractic research. (This is a conference presentation abstract and not a full work that has been published.)

Spinal manipulation increases maximum bite force in healthy individuals

M. Gorkem Ozyurt, Heidi Haavik, Imran Khan Niazi, Kelly Holt, Oguz Sebik, Gizem Yilmaz, Kemal Turker

Objectives: The aim of this study was to understand the influence of chiropractic care on maximum bite force. **Methods:** 28 participants with subclinical spinal pain were recruited to participate in this parallel group randomized controlled trial. Maximum bite force was measured before and after a session of chiropractic care (n=14) or a passive movement control (n=14). Repeated measures ANOVA was used to compare data between the 2 groups. Post-hoc t-tests were used to compare within and between group differences when a significant group by time interaction was found. **Results:** There was a significant effect of the chiropractic intervention compared to the control intervention on maximum bite force [F(1,26)=5.96, p<0.02]. Maximum bite force increased by an average of 11.0% (S.D. 18.6, p=0.04) following the chiropractic intervention and decreased slightly following the control intervention (-2.33%, S.D. 9.0%, p=0.4). **Conclusions:** This study suggests that a single session of chiropractic care increases maximum bite force in individuals with a history of mild spinal problems. Further studies are now required to investigate whether chiropractic care may play a role in improving motor control in the muscles of mastication in individuals who have disorders of the stomatognathic system. (This is a conference presentation abstract and not a full work that has been published.)

The impact of chiropractic Activator adjustments on analytical abilities and reaction time task performance: a pilot study

Jacob Palmer, Angelo Pierce, Stephanie Sullivan, Mark Amos, Tim Guest, John Markham

Objectives: This study sought to evaluate the effects of chiropractic care on analytical abilities, simple reaction time, and memory utilizing computerized cognitive testing.

Methods: Twelve healthy participants were randomized to two groups: chiropractic or sham (six per group). Analytical abilities, simple reaction time, and memory assessments were adapted for computerized assessment (Superlab 4.0). Assessments were conducted at baseline and immediately post intervention. Participants were assessed using Activator® Methods Basic protocol and thrusts were delivered using an Activator® IV instrument. For sham participants, an Activator® II was set to zero, and clicks were applied to all participants according to a pre-defined pattern. **Results:** The chiropractic group demonstrated statistically significant changes in analytical abilities response times (p=0.01, moderate effect size). For the simple reaction time task response times decreased from baseline by 27.58% for the chiropractic group compared to 7.7% for the sham group, although no results reached statistical significance. No remarkable results were observed for the memory assessment. **Conclusion:** Treatment with Activator® chiropractic care demonstrated significant improvement in participant analytic abilities response times, with a trend towards improved simple reaction times. (This is a conference presentation abstract and not a full work that has been published.)

Conservative management of recurrent bladder infection and urinary retention in neurogenic bladder: A case report

Amanda Panuska, Julia Liebach

Objective: The purpose of this case report is to describe the conservative management of a patient with neurogenic bladder due to permanent cauda equina syndrome. **Clinical Features:** A 55-year-old male presented with neurogenic bladder and associated urinary retention and recurrent bladder infections of 15 years after a truck versus pedestrian accident. The patient's symptoms included reduced urinary output and change in urine odor and color with bladder infections. The patient was seeking alternative options to chronic

antibiotic use due to recurrent bladder infections, and wanted to avoid intermittent catheterization. **Intervention and Outcome:** Dietary changes were recommended in conjunction with administration of a probiotic, D-mannose, fish oil, gamma-aminobutyric acid, and a urinary supportive botanical blend containing *Agathosma betulina*, *Arctostaphylos uva-ursi*, *Chimaphila umbellata*, *Berberis aquifolium*, *Vaccinium macrocarpon*, and *Althaea officinalis*. At 1 month, self-measured urinary volume increased to normal functional bladder capacity and the patient declined intermittent catheterization. Prevention of bladder infection was achieved for the 6 months duration of intervention. **Conclusion:** This patient with neurogenic bladder experienced improvement in urinary output and resolution of recurrent bladder infections following implementation and compliance with conservative care, allowing him to discontinue chronic antibiotic use and intermittent catheterization. (This is a conference presentation abstract and not a full work that has been published.)

Manual therapy for the pediatric population: a systematic review

Carol Parnell Prevost, Brian Gleberzon, Beth Carleo, Kris Anderson, Katie Pohlman

Objective: To conduct a systematic review of manual therapy utilization in the pediatric population. **Data Sources and Selection:** Six databases were searched using the following criteria: Children under the age of 18 years; treatment using manual therapy from any profession; from 2001 to January 2016; English language. Case reports were not included in this review, but we did include case series. Reference tracking was performed on 6 published relevant systematic reviews. Each article was screened by two authors to (i) determine its suitability for inclusion and (ii) summarize the results reported. **Results:** Of the 2,333 articles identified, 100 full articles were screened, and 44 studies met the inclusion criteria. Thirty articles were included in prior reviews with 14 new studies identified. The most common conditions evaluated were colic, otitis media, prematurity, scoliosis, and extremity dysfunctions. Musculoskeletal conditions were evaluated in 5 studies. Treatment consisted of mobilizations, spinal manipulative therapy and osteopathic manipulation (often cranial therapy). **Conclusions:** Similar to prior reviews, we found few studies on the use of manual therapy to treat childhood musculoskeletal complaints, despite this being the most common reason manual therapists are consulted. (This is a conference presentation abstract and not a full work that has been published.)

UQTR's first chiropractic community outreach clinic: a pilot project with important educational and social impacts

Caroline Poulin, Danica Brousseau, Karina Patenaude

Objective: Residents of social housing complexes (SHC) have lower financial resources and rarely afford to seek chiropractic care. The objective of this project was to launch a chiropractic community outreach clinic within a SHC in Trois-Rivières, Quebec. **Methods:** Nine interns and six faculty members associated with UQTR academic program volunteered for this pilot project in the summer of 2016. Patient demographic information, clinical data on the main complaint, perceived levels of improvement and satisfaction with care were gathered. **Results:** Over eight half-days of operation, 33 patients (mean age: 62 years; females: 79 %) were admitted for a total of 45 complaints. A total of 133 treatments were provided, for an average of four visits per patient. 85% of patients encountered were considered complex cases. Even with a short-lived pilot project, patients reported significant improvement of their condition and a high level of satisfaction for care. **Conclusion:** In addition to making care more accessible to the underprivileged local population, this project proved to be highly valuable for learning purposes by exposing the interns to chronic spinal conditions with significant co-morbidities. The positive results support the creation of an official outreach clinic in the fall of 2016. (This is a conference presentation abstract and not a full work that has been published.)

Importance of biofeedback therapy in chiropractic management

Dewan Raja, Bahar Sultana

Biofeedback is a practice that trains people to enhance their health by adjusting certain biological processes that normally occur involuntarily. Such processes include the heart rate, blood pressure, muscle tension, and body temperature. Biofeedback is an effective therapy to manage hypertension, anxiety disorders, tension headaches, migraines, seizures, fibromyalgia, rheumatoid arthritis, asthma, urinary incontinence, and chronic pain. Biofeedback uplifts the mind, improves self-efficacy, makes one aware of the body's internal processes, and can help individuals gain control over their health. We searched multiple literature and websites through PubMed and Endnote. We found that biofeedback addresses a wide range of diseases across multiple age groups, with many biofeedback devices available both for office and home use to assess temperature, brain waves, muscle tension, and heart rate variability. Biofeedback relieves stress and prevents diseases. The implications of biofeedback are strong for chiropractors in particular. They may add biofeedback therapy in their day-to-day patient management practices. The chiropractor's office is an ideal setting for biofeedback therapy due to the routine access to relevant patients. As chiropractors do not use pharmaceutical products, instead providing health education, body work, and nutrition consultation, they can apply biofeedback therapy in a cost-effective way. (This is a conference presentation abstract and not a full work that has been published.)

An Assessment of musculoskeletal medicine deficiencies in chiropractic education: a survey of chiropractic clinical clerks

Michael Ramcharan

Objective: The purpose of the study was to investigate whether chiropractic clinical clerks in their clinical clerkship year of training, exhibit any particular area of educational deficiencies in musculoskeletal medicine using a validated questionnaire by Freedman and Bernstein (1998). **Methods:** This observational study examined a convenience sample of chiropractic clinical clerks in the south central part of Texas. Descriptive statistics and a two-sample t-test were used to identify the demographics of the study population and the 25 item open-ended questionnaire. **Results:** Sixty-seven clinical clerks participated in the study with 57% being male. According to the standard basic competency benchmark mean score of 73% suggested by the program chairs of orthopedic residency departments, 94% of chiropractic clinical clerks failed to demonstrate basic competency in musculoskeletal medicine. Only four clinical clerks met the standardized basic competency benchmark in musculoskeletal medicine, however most were deficient in upper and lower extremity diagnosis. **Conclusion:** Using a t-test, the aggregate scores between trimester seven and trimester ten clinical clerks revealed no statistical significance on the 25-item questionnaire. To our knowledge, this is the first study assessing chiropractic clinical clerks basic competency in musculoskeletal medicine using the Freedman and Bernstein questionnaire. (This is a conference presentation abstract and not a full work that has been published.)

Altered common drive to cervical multifidus motoneurons in neck pain patients

Tim Raven, Lise Lothe, Torsten Eken

Objective: Neck pain (NP) causes rapid deterioration of paraspinal muscle function. The underlying neurophysiology is poorly understood. The cervical multifidus (CM) muscle is postulated to have a stabilising effect on the cervical spine. The aim of this study was to investigate the degree of coordination of motoneuron activity in CM in subjects with NP and healthy controls (HC). **Methods:** Fine-wire electromyography (EMG) electrodes were implanted bilaterally into CM in 15 HC and in 10 subjects with NP under CT guidance. EMG was recorded during spontaneous sitting and standing, and during voluntary force production. Effects of a number of independent variables on common drive coefficient (CDC) between concurrently active units were assessed using linear mixed models. **Results:** Viable EMG data was available from 22 electrodes in 13 of the 15 HC, and from 17 electrodes in 9 of the 10 NP subjects providing 348 unilateral and 263 bilateral motor-unit (MU) pairs. There were significant effects of sitting vs. standing, unilateral vs. bilateral pairs, and NP vs. HC on CDC. CDC in uni- and bilateral MU pairs was lower in NP subjects compared with HC.

Conclusion: Our findings suggest altered bilateral control of the spine in NP. (This is a conference presentation abstract and not a full work that has been published.)

A novel method for insertion of intramuscular EMG electrodes in the cervical multifidus muscle

Tim Raven, Lise Lothe, Gunnar Sandbaek, Torsten Eken

Objective: Precise electrode placement in the correct muscle is essential for obtaining useful electromyographic (EMG) recordings. Ultrasound guidance is traditionally used. Our aim was to develop a protocol for computerised-tomography (CT) guided fine-wire (FW) electrode placement that permits confirmation of the final electrode position in the cervical multifidus (CM) musculature. **Methods:** FW-EMG electrodes were custom-made from 50 µm diameter Teflon-insulated platinum/iridium wires with a cross-sectional area of 0.002 mm². The electrodes were inserted bilaterally in the deep posterior cervical musculature in 15 healthy adult subjects under CT guidance. The final position of the electrode placement was confirmed in reconstructed 2D and 3D images. **Results:** Of the 25 FW-EMG electrodes successfully inserted in the left and right posterior cervical musculature, placement was on target in the CM in 21 cases. Raw electromyographic recordings from the CM demonstrated clearly definable motor-unit action potentials with good signal to noise ratio. **Conclusion:** CT guided implantation provided excellent visual documentation in three dimensions of the final placement of the electrode tip, not possible utilising ultrasound. The technique affords confidence in studies of motoneuron activity in CM. (This is a conference presentation abstract and not a full work that has been published.)

Resolution of benign paroxysmal positional vertigo using torque release chiropractic adjustments

Robert Rectenwald, Indira Malpica

Objective: The paper reports the outcomes of treatment utilizing Torque Release (TRT) chiropractic adjusting technique for a patient with benign paroxysmal positional vertigo (BPPV). **Clinical Features:** A 77 year old female presented with complaint of dizziness while in recumbent positions and described feeling like the room was spinning. She had been sleeping in a seated position since the diagnosis was made by a medical neurologist 18 months earlier. Prescribed medications and physical therapy treatments, including the Epley's maneuver, were ineffective in reducing symptoms. **Intervention and Outcome:** Examination findings included restricted cervical active range of motion and nystagmus was present. Cervical x-rays revealed degenerative disc disease. TRT adjustments of the spine, coccyx, pelvis, occiput and sphenoid were performed on 14 visits. The Dizziness Handicap Inventory score reduced from 60 to 3. The patient was able to sleep in a recumbent position after 2 weeks. Dizziness was resolved in 5 weeks. Range of motion was 60% improved. Nystagmus was resolved. **Conclusion:** The outcome in this atypical case of BPPV indicates that TRT adjustments was an effective treatment option and may be considered for cases which do not respond to conventional medical treatment. (This is a conference presentation abstract and not a full work that has been published.)

Improved sensory perception, fine motor coordination and balance in patient with brain injury following lifting event: a case report

Paula Rhodes, Jon Eberle

Objective: Restore balance, sensation and fine motor coordination after a sudden-onset neurological event following strenuous lifting. **Clinical features:** A 26-year-old left-handed male complained of numbness and tingling of his entire left body, poor balance, decreased coordination, and handwriting deficits. Symptoms began the morning after vigorously performing hack squats with a heavily-weighted machine. He had received 3 MRI's, 2 spinal taps, 2 CT scans, anti-seizure medication and corticosteroids. MRI and CT scan showed a lesion at the basal ganglia which was nearly absent in imaging performed 15 days later. No diagnosis was rendered. **Intervention and outcome:** Examination revealed cervical spine hypertonicity and decreased ROM, decreased arm swing and instability, and tandem gait was unable to be performed. Motor testing and optokinetics (OPK) revealed marked deficits. Treatment involved active move-

ments, specific ocular exercises, somatosensory stimulation and spinal manipulative therapy (SMT). After treatment, abnormal initial findings including cervical spine ROM, tandem gait, OPK, heel-to-shin and finger-to-nose tests were normal. **Conclusion:** Rapid progressive improvement in sensory perception, fine motor coordination, gait and balance was achieved with functional neurological rehabilitation and SMT, suggesting the importance and efficacy of early functional neurological intervention with brain injury cases. Further studies are indicated. (This is a conference presentation abstract and not a full work that has been published.)

Does adding cryostimulation influence the outcomes in conservative care for lateral epicondylitis?

Nadia Richer, Andree-Anne Marchand, Martin Descarroux

Objective: The purpose of this pilot study was to evaluate the feasibility and efficacy of adding cryostimulation to conservative care in patients with chronic lateral epicondylitis. **Methods:** The control group (N=19) was treated conservatively with manual soft tissue therapy and radial head mobilization. The experimental group (N=18) received cryostimulation in addition to conservative care similar to the control group. Both protocols consisted of 8 treatments over a 4-week period. Outcome measures included pain intensity (VAS), pain-free grip strength (handheld dynamometer) and functional index (PRTEE questionnaire). Assessments were performed at baseline, post-intervention and at 3-month follow-up. Adherence and drop-out rates were also considered. **Results:** Both groups showed significant improvements in pain intensity and functional index at post-intervention assessments, which were maintained at follow-up. All participants attended the prescribed number of treatments but 27% were lost to follow-up. Minor adverse events were reported following cryostimulation in 4 cases. **Conclusion:** The combination of cryostimulation and conservative care did not provide any additional benefits at both short- and long-term. Myofascial and mobilisation techniques yielded positive outcomes on chronic lateral epicondylitis. Further studies should focus on the sole therapeutic effect of cryostimulation in both patients with acute or chronic conditions. (This is a conference presentation abstract and not a full work that has been published.)

A pilot program to determine if video recording via a tablet computer is an effective teaching tool for coaching chiropractic students as they begin practicing adjusting skills

Thomas Ring, Virginia Barber

Background: For decades athletic teams have been using video recording as a training tool for developing and refining motor skills. The chiropractic adjustment is a motor skill that could also be taught using video feedback. **Objective:** The purpose of this pilot is to see if video recording and playback can be utilized in a chiropractic teaching clinic to improve the psychomotor learning process of beginning student interns as they first start practicing their adjusting skills on other students. **Methods:** An iPad is used for both video recording of students as they perform adjustments on each other and for immediate viewing of the recording coupled with detailed verbal feedback from the supervising doctor. **Conclusion:** Video feedback can be an effective learning and teaching tool when used in conjunction with more traditional methods of training. (This is a conference presentation abstract and not a full work that has been published.)

Influence of a review sheet on chiropractic student's evaluation and management coding

Christopher Roecker, Adam Sergeant, Gregory Cofano

Objective: To evaluate whether an educational worksheet would influence the accuracy of simulated evaluation and management (E/M) coding among students in a doctor of chiropractic program. **Methods:** An educational worksheet was developed as well as survey questionnaire involving simulated patient scenarios. Two groups were analyzed in this project. All members of the intervention group received the educational worksheet and were able to use them while completing their E/M coding questionnaires; the control group completed their E/M coding questionnaires without the educational worksheet. The E/M coding questionnaires were scored for each group and the mean group scores were evaluated and between group differences were analyzed using a 2-tailed t-test. **Results:** The

intervention group recorded significantly higher scores ($p < 0.001$) on the E/M coding questionnaire, which indicates fewer errors. **Conclusion:** Doctor of Chiropractic students who were provided with an Evaluation and Management educational worksheet had fewer errors on a simulated E/M coding questionnaire. (This is a conference presentation abstract and not a full work that has been published.)

Establishing pre-rehabilitation baselines in a post-operative lumbar spine: a case report

Maria Romano-Young

Objective: To identify post-operative baseline measures establishing treatment parameters for non-specific low back pain following minimally-invasive lumbar foraminotomy. **Clinical Features:** A 67-year-old female patient with non-specific low back pain who had undergone lumbar foraminotomy at a single level 6 months prior sought care. Baseline assessments were carried out using mechanical diagnosis and therapy. Clinical outcome was assessed using the Oswestry Disability Index and functional movement assessment. **Intervention and Outcome:** Proper rehabilitation prescription was based on functional deficits, movement dysfunctions, and reduction of fear avoidance behavior. Rehabilitation consisted of myofascial release, joint manipulation, therapeutic exercise, and home-care instruction. After 6 weeks of treatment, full resolution of low back pain and return to activities was documented. **Conclusion:** Identified predictors in post-operative baselines suggest the need to employ rehabilitation concepts soon after the procedure is performed. Establishing functional baselines in the conservative management of non-specific low back pain in the post-operative spine makes this current case unique. However, the long term outcomes for minimally invasive spine surgery remain unknown; thus, rehabilitation may be limited to identifiable musculoskeletal pain generators with no known identifiable risk factors. (This is a conference presentation abstract and not a full work that has been published.)

Mind the gap: Using ExamSoft to reveal hidden learning deficiencies in students with A or B grades in a course

Kevin Rose, Jesika Babajanian

Objective: Grades are considered unreliable indicators of student learning because they cover a wide range of content and non-academic activities such as attendance. ExamSoft is an examination creation, administration and analysis software package that allows for more granular assessments of student performance through tagging questions and performance rubrics with learning outcomes. This study sought to uncover students who had received an A or B grade in a course but had deficiencies in performance in at least one of its learning outcomes. **Methods:** Grades for two cohorts of students were merged with their ExamSoft course learning outcomes scores and frequencies were calculated. **Results:** Of the 1,704 A grades earned in the courses, there were 196 cases where the student had performed at less than 70% in a course learning outcome and 72 cases at less than 60%. Of the 2,184 B grades earned in the courses, there were 615 cases where the student had performed at less than 70% in a course learning outcome and 222 cases at less than 60%. **Conclusion:** It was common for students who received a good grade in a course to have deficiencies in one or more of its learning outcomes. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic care of a two year-old diagnosed with gastroesophageal reflux and a hiatal hernia: A case report

Martin Rosen, Charles Blum, Erin Rosen

Objective/Clinical Features: A one-year-old female was seen at this office reported with gastroesophageal reflux (GER), hiatal hernia (HH), not sleeping more than 1.5-hours at a time, wouldn't eat solid food, didn't crawl as an infant, wouldn't lay prone/supine, ongoing vomiting, and was irritable and inconsolable. **Intervention/Outcomes:** Analysis and treatment utilized Sacro Occipital Technique (SOT) spinal, cranial and chiropractic manipulative reflex technique (CMRT) adjusting protocols. After the first 3-4 visits the patient's symptoms began to subside, she did not cry in pain as often, her reflux and vomiting reduced dramatically, she no longer needed to take the prescribed medications and she was able to sleep through the night without waking up crying in pain. After 4-weeks of care, the patient started crawling for the first time in her life and a couple months later

began eating solid foods with any nausea. **Conclusions:** It is possible the child might have outgrown her condition but the temporal nature of her response to care compellingly coincided with her ability to eat, sleep and cease medication. The findings from this study suggest that a subset of pediatric patients with GER/HH may benefit from SOT, CMRT, and cranial care. (This is a conference presentation abstract and not a full work that has been published.)

Resolution of a left sided 5th phalangeal 2nd inter-phalangeal joint stenosing tenosynovitis (trigger finger) in a 2 1/2 year-old female: A case report

Martin Rosen, Charles Blum, Erin Rosen

Objective/Clinical Features: While a condition such as stenosing tenosynovitis (trigger finger) is not usually considered neurological or musculoskeletal in nature it is relevant that in this case standard chiropractic care applied mainly at the spinal level appeared to facilitate a complete resolution of the patient's trigger finger. A 2 1/2 year old female was seen for her first chiropractic evaluation on June 22, 2012 presenting with stenosing tenosynovitis (trigger finger), unresponsive to prior care (e.g., medication, injections, and physical therapy) and parents were hoping for an alternative to surgery. **Intervention/Outcomes:** Based upon the examination findings and previous treatment history, chiropractic adjustments using sacro occipital technique (SOT) protocols were directed to C4, T6, left scapula, left 1st rib-head and left wrist. After seven chiropractic adjustments this 2 1/2 year-old child's trigger finger was 80-90% resolved. At 6-month follow-up the mother indicated the child's trigger finger had continued to improve following care and was completely resolved. **Conclusion:** Because allopathic intervention for this condition appears to be have questionable outcomes and risks, chiropractic care may be a viable and safe initial step to take before exploring the more invasive and costly options. (This is a conference presentation abstract and not a full work that has been published.)

Triage and case presentations in chiropractic pediatric clinics: A follow-up with international participation

Drew Rubin, Mary Phillips

Objectives: In a 2007 study, the two most common pediatric presentations in a chiropractic office were spinal pain and respiratory issues, and the two most common presentations for a pregnant woman were malposition of the fetus and back pain. This current study was to investigate if these findings remained consistent 11 years later, and if there were international differences. **Methods:** The authors, one from the US and the other from the UK, performed a retrospective 1-year record analysis, analyzing what sort of cases presented to family centered, pediatric chiropractic offices. **Results:** In 2016, the most common presentation for a pediatric patient had switched to wellness, stomach issues, pain, and neurobehavioral issues (i.e. Autism and ADHD). The most common chief complaints of the pregnant woman remained the same (pain and malposition). There were interesting nuances between US and UK presenting issues. **Conclusion:** In the 11 years since this article was published, the main author noted that case presentations of new pediatric patients has changed dramatically, but not case presentations of the pregnant population. (This is a conference presentation abstract and not a full work that has been published.)

Pilot peer mentoring program in an educational setting

Lisa Rubin

Objective: Recent research found 71% of chiropractic students that volunteered in a youth leadership program performed better as a student due to the volunteer work. Leadership skills were also improved 88% through volunteer experience. A follow-up pilot study utilized peer mentoring, connecting lower and upper term chiropractic classes with a goal to improve 1st term engagement and connectedness and 8th term leadership and communication skills. **Methods:** Mentors and Mentees were surveyed after weeks 3, 7 and 10 for a follow-up to the experience in the 1st term (mentee) and 8th term (mentor) classes. **Results:** Both terms reported from 86 to 94% that the mentoring interaction helped them feel more engaged in the classroom setting, and 91% of the 8th term class reported that they perceived this would help their leadership skills. The majority of students reported that mentoring helped them better acclimate to the Chiropractic program,

and more than 90% of students in 1st and 8th term classes reported having a positive impact.

Conclusion: Overall positive impact was reported by this pilot program on both 1st and 8th term class students. (This is a conference presentation abstract and not a full work that has been published.)

Balance, gait, eye movement, and chiropractic care: a case of chronic progressive external ophthalmoplegia

Brent Russell, Ronald Hosek, Stephanie Sullivan, Kathryn Hoiriis

Objective: This report describes changes in a 66-year-old male diagnosed with Chronic Progressive External Ophthalmoplegia and vestibular hypofunction. CPEO is a mitochondrial myopathy with no established effective treatment; it manifests as decreased eye movement and ptosis. **Clinical Features:** The patient complained of dizziness, light-headedness, and balance problems. Our lab evaluated his postural sway, eye movements, and aspects of walking. Assessments were conducted pre-care, mid-care, and post-care. **Intervention and Outcome:** The patient received 17 chiropractic visits in 8 months and continued previously-recommended eye and balance exercises. Postural sway during static standing improved substantially. Eye movements improved in vertically following moving targets and in completing an optokinetic evaluation (which caused dizziness pre-care). Post-care increases in self-selected walking speed and decreases in step width suggested small improvements in gait stability. Other aspects of eye movements and walking gait showed mixed post-care findings. The patient subsequently reported hiking on a moderately challenging trail with no difficulty. **Conclusion:** This patient showed improvements in balance, eye movements, and walking gait while undergoing chiropractic care and practicing eye and balance exercises. These modes of care could be helpful symptomatic treatment for CPEO; vestibular hypofunction may be a confounding factor in this case. (This is a conference presentation abstract and not a full work that has been published.)

Evaluation of chiropractic lexicon at a chiropractic institution: a cross-sectional survey

Eric Russell

Objective: Chiropractic lexicon is often contested. This study is to compare student versus faculty perceptions. **Methods:** A paper-based survey, developed by another chiropractic teaching institution, was distributed to students in trimester 1-7 during class (n=511), as well as academic faculty (N=36) by mailbox. The survey assessed: 1) likelihood of using 8 terms, 2) cultural authority, and 3) predominate views of the conditions chiropractors treat. **Results:** A total of 455 surveys were completed by 435 students and 20 faculty (83% response rate). "Vertebral subluxation" was the most likely used term for both students and faculty, along with "nerve flow interference" for students and "joint dysfunction". "Spinal lesion" and "dis-ease" were the least utilized terms by both the students and faculty. Chiropractic's cultural authority was thought to be "neuromuscular experts" by all respondents. From the perspective of the predominate condition a chiropractor treats, the student population had a different perspective compared to the faculty. **Conclusion:** Although there were differences, both faculty and students commonly utilized the same terms and had the same conceptualization of cultural authority for chiropractic, but differed on the conditions chiropractors treat. (This is a conference presentation abstract and not a full work that has been published.)

Evaluation of team-based learning implementation in a chiropractic curriculum

Richard Salazar, Georgina Pearson, Miguel Chiusano, Sandra Norton, Christopher Smoley, Katherine Pohlman, William Watson

Objective: Team-based learning (TBL) helps students improve long-term knowledge retention in healthcare curricula; however, limited studies have been conducted on its impact in chiropractic curricula. This study compares students' knowledge retention in courses that were redesigned to include TBL strategies. **Methods:** Students in a year one (Y1) course (n=145) and a year two (Y2) course (n=137) were evaluated before and after the implementation of TBL strategies. A comparison analysis, using repeated measures ANOVA, was done for responses to twenty questions given as part of the final exam and given again up to 16 weeks later. **Results:** Response rate for Y1 course was 84.8% and Y2 course was 47.4%. For Y1 course, the pre-TBL

cohort had higher knowledge retention ($p < 0.05$) than the TBL cohort. For Y2 course, the pre-TBL cohort had similar knowledge retention ($p = 0.45$) to the TBL cohort. **Conclusion:** Unlike results from other studies, the TBL cohorts did not show any significant improvement in knowledge retention. Further evaluation will assess factors impacting TBL's effectiveness to promote knowledge retention. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic spinal manipulation improves the onset of contractions of female pelvic floor muscle

Jenna Salmons, Imran Khan Niazi, Rasmus Wiberg Nedergaard, Kelly Holt, Heidi Haavik

Objectives: Previous research has shown that the superficial pelvic floor muscles ideally contract on average 21ms before the deep. This study investigated whether chiropractic care improves the timing of deep vs superficial pelvic floor muscle contractions. **Methods:** To date 20 nulliparous women with no symptoms of pelvic floor muscle dysfunction have attended a screening session. Onset timings of the deep and superficial pelvic floor muscles were recorded using a 64 channel EMG vaginal probe during pelvic floor muscle contractions. 8 subjects demonstrated deep PFM's contracting before the superficial muscles. 6 subjects were retested with no intervention, then all subjects received a session of chiropractic care before retesting. Differences in deep to superficial contraction timing were assessed using a paired sample t-test. **Results:** Preliminary findings for this study showed abnormal contraction patterns were consistent when no intervention was applied ($r = 0.77$). After the chiropractic session the onset timings of the deep and superficial pelvic floor muscles improved by 45.1ms ($p = 0.03$). **Conclusion:** The preliminary findings of this study suggest that a single session of chiropractic care improves the onset of contractions of the deep vs superficial pelvic floor muscles in women with no symptoms of pelvic floor dysfunction. (This is a conference presentation abstract and not a full work that has been published.)

Social network analysis of a chiropractor during initial integration into the clinical staff of a rehabilitation hospital

Stacie Salisbury, Robert Vining, Qian Li, Jeb Thurmond, Donna Gosselin, Carl Cooley, Christine Goertz

Objective: Depiction of professional network established by a doctor of chiropractic (DC) over one year of integration into the clinical staff of a rehabilitation specialty hospital.

Methods: A part-time DC documented workday interactions with clinical staff by role, formal (meetings) or informal ('curbside') interactions, and discussion topics. Social network analysis (sociograms) mapped the structure, connections and dynamics of these professional relationships over time. **Results:** The DC interacted with therapy staff on most workdays: physical therapists/assistants (95% of workdays), occupational therapists/assistants (91%), rehabilitation technicians (81%), and recreational therapists (63%). Nursing staff interactions included registered nurses (83%), licensed nursing assistants (56%), and case managers (47%). Medical staff interactions involved an internist (66%), pediatrician (50%), nurse practitioner (48%), psychologist (45%), psychiatrist (6%) and physiatrist (6%). Predominant communication patterns with therapists included formal and informal interactions, informal interactions with nursing staff, and formal interactions with medical staff. Discussions focused on patient care issues, professional knowledge, and organizational policies. Sociograms depict interprofessional communications increasing over time and expanding across clinician groups, suggesting a gradual integration of chiropractic within the hospital. **Conclusion:** This novel social network analysis demonstrates the complex and evolving processes of chiropractic integration within an interdisciplinary healthcare setting. (This is a conference presentation abstract and not a full work that has been published.)

New, brief questionnaires that assess nonspecific factors and pain outcomes

Michael Schneider, Carol Greco, Lan Yu, Nathan Dodds

Objective: Introduce new, brief questionnaires that assess non-specific factors such as treatment expectations, and determine whether these factors predict pain treatment outcomes. **Methods:** Patients (N=178) with chronic back and/or neck pain completed the Healing

Encounters and Attitudes Lists (HEAL) computerized questionnaires early in their treatment and 6 weeks later. HEAL includes: Patient-Provider Connection (PPC), perceptions of the Healthcare Environment (HCE), Treatment Expectancy (TE), Positive Outlook (PO), Spirituality (SP), and attitudes toward Complementary and Alternative Medicine (CAM). Treatments included chiropractic, physical therapy, injections, acupuncture, or medications. **Results:** Overall, patients' self-reported pain intensity was significantly improved during their treatment ($t=7.03$, $p<.001$). HEAL Patient-Provider Connection, Treatment Expectancy, and Attitude toward CAM predicted improvement (Clinical Global Impression of Improvement). In regression models that included adjustment for age and depression, Treatment Expectancy predicted improvement in pain intensity at 6 weeks. Patients stated that HEAL questionnaires were easy to understand and relevant to their treatment. Clinicians generally found the HEAL summaries useful and important, and they valued graphical displays of scores. **Conclusions:** HEAL measures are relevant to nearly any type of treatment, and nearly any clinical condition, and can enhance patient care as well as contribute to research precision. (This is a conference presentation abstract and not a full work that has been published.)

Treatment of acute TMJ pain and dysfunction with sacro occipital technique and cranial techniques

Jason Scoppa

Objective/Clinical Implications: A 63-year-old male patient was seen for acute unremitting TMJ pain (closed lock without disc recapture), which started insidiously a few days prior to his first office-visit. His VAS for his TMJ (dull pain) was 4/10 at rest, which became (sharp pain) a 8/10 when he attempted to open his mouth or move his neck. For three-days prior to the initial office visit chewing had become impossible so he had resorted to a liquid diet. **Intervention/Outcomes:** His TMJ translation was limited and the patient was unable to open his mouth more than two-fingers-width. The patient was treated using sacro occipital technique (SOT) and cranial protocols. After the first office visit the patient was able to open his mouth without pain and noted only a small amount of tension and soreness remained in his jaw. He returned for a follow up office visit five-days later and reported that the VAS for his TMJ was 0/10 and his TMJ was functioning normally. **Conclusion:** If pain and loss of function persists following a TMD episode ideally conservative care such as what was rendered in this case that is low risk and cost effective would be optimal. (This is a conference presentation abstract and not a full work that has been published.)

Treatment of knee pain in an athlete sprinter with sacro occipital technique and cranial techniques

Jason Scoppa

Objective/Clinical Features: The patient was an 18-year old female, semi-pro sprinter. She started experiencing insidious unremitting right lateral knee pain eight-months prior to her first visit. She had attempted self-care directed by her coach, physical therapist guided rehab-based exercises, saw a medical doctor who ruled out major structural damage, and received a series of twelve-visits with a Rolfer with no change in symptoms. **Interventions/Outcomes:** The patient was treated using sacro occipital technique (SOT) category two and SOT extremity technique protocols along with cranial techniques. Directly following her first treatment she was asked to walk, and then run in the hallway outside of the office. Walking caused no pain, but running in the hallway still produced minor pain in her right lateral knee. One-week later on her follow up visit she reported that she felt improvement of 60% and after the 3rd office visit was able to return to normal activities for the first time in 8 months. **Conclusion:** In this case study intervention using SOT pelvic stabilization and extremity technique, and Vector Point cranial technique appeared to produce significant and rapid results (3 office visits) that enabled the athlete to get back to her activities. (This is a conference presentation abstract and not a full work that has been published.)

Abdominal aortic aneurysm and chiropractic manipulation: A literature review

Adam Sergent, Heather Bowyer

Objective: To perform a literature review of chiropractic adjustments performed on patients diagnosed with Abdominal Aortic Aneurysm. A need for this review was prompted when reviewing Medicare absolute contraindications for a significant Abdominal Aortic Aneurysm without defining what significant means. **Data Sources and Selection:** Peer reviewed articles were accessed from PubMed from years 1986-2016, Index to Chiropractic Literature 1995-2016; and Medline Complete 2012-1986, using the search terms Chiropractic and Abdominal Aortic Aneurysm. A total of 10 articles with those search terms were returned. **Results:** For patients diagnosed with Abdominal Aortic Aneurysm and undergoing chiropractic adjustments in the lumbar spine, there is currently insufficient evidence according to current peer reviewed literature to support or disagree with such treatment being an absolute contraindication. However the chiropractic physician should be mindful of signs of symptoms of AAA. **Conclusion:** Patients with Abdominal Aortic Aneurysm should be treated with special care and chiropractors need to be up to date on identifying and screening for AAA. More evidence is needed to assess whether chiropractic adjustments are in fact an absolute contraindication for AAA. (This is a conference presentation abstract and not a full work that has been published.)

Delayed CNS complications from chemotherapy: a case study in delayed neurotoxicity and the importance of it's identification to successfully manage post cancer survivors

Peter Shipka, Brad Semeniuk

Delayed CNS complications from chemotherapy: a case study in delayed neurotoxicity and the importance of it's identification to successfully manage post cancer survivors. **Objective:** The rate of cancer deaths from breast cancer has been declining since the 1980s due to better detection and improvements in treatment protocols. However with these treatment regimens comes an increase in CNS complications from the chemotherapy. **Clinical Features:** Our case study examined such a presentation in a 53 year old breast cancer survivor. She presented with a variety of CNS symptomatology that affected both her central and peripheral nervous systems but had been undiagnosed or failed explanation. Imaging studies failed to diagnosis the primary source of her pain. **Intervention and Outcome:** Only after a systematic review of the literature was it discovered that in 33% of patients undergoing chemotherapy develop a delayed severe neurotoxicity from their treatment. Once been identified, a course of chiropractic and supportive care was provided for their centralized pain condition. **Conclusion:** It is the objective of this case to create awareness of this effect from cancer treatment and to illuminate that chiropractic care can be beneficial in the palliative management of these chronic pain patients. (This is a conference presentation abstract and not a full work that has been published.)

Dental chiropractic interdisciplinary care of three patients with different conditions yet similar symptom presentation: A case series

David Shirazi, Richard Gerardo, Charles Blum

Objective/Clinical Features: Three cases presented with jaw pain, limited cervical range-of-motion, and some related headaches. Patient A was a "cervical primary," Patient B was a primary "temporomandibular joint (TMJ) and cranial," and Patient C was a "TMJ primary." In these three cases each patient presented with jaw, head, and neck pain but with each case the treatment varied. **Interventions/Outcomes:** The dentist prescribed a nighttime deprogramming orthotic. The chiropractor focused on sacro occipital technique (SOT) and cranial/TMJ treatments. Six-months post-treatment commencing the patient no longer had any jaw pain or had TMD, improved posture, and improved CO/C1/C2 space. Patient B: The dentist prescribed a daytime and nighttime deprogramming orthotic. The chiropractor focused on SOT and cranial/TMJ treatments. Five-months post-treatment was initiated the patient had no TMJ pain and improved stability with improved spinal posture and reduced cervical spine pain. Patient C: The dentists prescribed a daytime and nighttime deprogramming orthotic. The chiropractor focused on SOT and cranial/TMJ treatments. Five-months post-treatment commencing treatment the patient had no TMJ pain and improved stability with greater cervical posture and no headaches. **Conclusion:** This study suggests that patient's with both musculoskeletal and dental issues

may need a referral for co-treatment. (This is a conference presentation abstract and not a full work that has been published.)

A survey of chiropractic students' perceived business preparedness at the time of graduation

David Sikorski, Paul Wanless, Anumapa Kizhakkeveetil, Gene Tobias

Objective: To determine chiropractic college graduates' business experience, education and needs for further education at the time of graduation. **Methods:** An IRB-approved survey of new graduates was conducted. Questions included prior business experience, business courses taken before and during chiropractic education, areas of business abilities and needs, and practice plans. The survey was pretested for face validity prior to its administration. Data were analyzed using SPSS for descriptive statistics. **Results:** The survey was distributed to 114 graduating students and 81 responded (77%). Thirty percent of respondents had one or more years of business experience prior to enrolling in chiropractic school, and 47% had taken at least one business course. Ninety percent of the respondents took one or more of three elective courses in business skills during their chiropractic education and 65% plan to associate after graduation. More than 90% plan to be in private practice after 5 years. The respondents indicated that they are more prepared in the business abilities of ethics, law, management, and marketing, and less prepared in operations, accounting and billing. **Conclusion:** Chiropractic graduates feel the need for additional business education in several specific areas of practice management. (This is a conference presentation abstract and not a full work that has been published.)

Post surgical spine rehab

Jerrold Simon

An understanding of Post-Surgical Spine Rehabilitation is necessary for those chiropractic doctors who are interested in providing follow-up care for patients who have recently undergone spinal surgery. This two hour presentation will focus mainly upon rehabilitation protocols that are particularly useful for patients who recently underwent minimally invasive spinal surgery and now present in your office for post-surgical rehab. During the first hour of this presentation, attention will be focused on recognizing when spine surgery might be appropriate, pre and post-surgical considerations and understanding the various types of surgical options that are available. In particular, what are the advantages of minimally invasive surgical procedures vs. traditional "open back" surgical procedures. Surgical approaches to degenerative disc disease, disc bulges and herniations and spinal stenosis will be explored. Minimally invasive surgical techniques such as endoscopic laminotomy, foraminotomy and destruction thermal ablation (DTA) will be discussed. During the second hour, important medical clearance procedures will be discussed. Finally, prior to commencing rehab, the PAR-Q and PAR-Q+ Questionnaires will be explained and functional, rehabilitative theory will be covered. The lecture will conclude by determining how long the rehab program should be based upon the patient's functional capacity baseline analysis. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic intervention and rehabilitative exercises in an adolescent with a recent incomplete spinal cord injury: A case report

Rebecca Skiljan, Kelly Humphries, Melissa Engelson

Objective: To describe the clinical management of a patient with an incomplete spinal cord injury (SCI), through using multiple upper extremity and core exercises to promote independence and confidence. **Clinical features:** A 17 year-old paraplegic male with an incomplete stretch SCI at T4-T6, presented to the Logan University Human Performance Center (HPC) with the primary goals of obtaining posture and core stabilization both in and out of his manual wheelchair. **Intervention and outcomes:** Various 8 and 12-week programs were integrated with chiropractic care to help strengthen the patient's upper extremity and core. The exercises focused on targeting independent muscle groups and the functional movements of these muscle groups during activities that require sound posture and stabilization. Progressions and adaptations for exercises were created based on the individual's level of ability and the limited literature currently available. Outcomes were interpreted through the patients'

verbal reporting and his ability to perform various exercises correctly. **Conclusion:** The individual experienced an increase in abdominal and upper extremity muscle strength, as well as core stabilization. The individual also experienced an increase in his ability to independently perform basic ADLs and participate in a number recreational activities. (This is a conference presentation abstract and not a full work that has been published.)

Developing evidence-based quality standards for chiropractors

Stuart Smellie, Rob Finch

Objective: The UK National Institute for Health and Care Excellence (NICE), a Public Body established in primary legislation, works to improve health and social care service outcomes by publishing evidence-based guidance and quality standards for those providing and commissioning services. While some NICE guidance is pertinent to chiropractors and chiropractic service commissioners, it is outside NICE's remit to develop quality standards of direct relevance to chiropractic. We have embarked on a programme of developing Chiropractic Quality Standards (CQSs) to help chiropractors deliver the best possible outcomes for patients. **Methods:** We undertook a systematic literature evaluation and professional/public consultation. **Results:** A series of CQSs, each comprising specific, concise quality statements with associated measures, have been produced. These provide aspirational but achievable markers of high-quality evidence-based patient care, and a clear description of what a high-quality service looks like. **Conclusion:** We have developed a clearly-defined process for producing CQSs, which includes detailed literature review and professional/public consultation. The resulting CQSs, along with associated measurement and training tools, support improvements in care quality. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic utilization of exercise in the treatment plan: A cross-sectional study

Brynne Stainsby, Lauren Quattrocchi, Curtis Turner, Julie Yaworski

Objective: The purpose of this study is to investigate if Canadian doctors of chiropractic consider incorporating exercise as part of their treatment plan. Specifically, this study will examine which clinical scenarios chiropractors decide to include exercise in their plan of management. **Methods:** Four hundred and four practicing, licensed chiropractors in the province of study were recruited to complete an online survey regarding their education, experience, chiropractic philosophy and patient cases in which they would incorporate exercise into their treatment plans. Participants were asked yes or no if they included exercise in acute, chronic, active, and older patient cases to reflect common presentations to a chiropractor's office. **Results:** The response of participants in this study suggests that chiropractors in the province of study incorporate exercise as part of their plan of management. **Conclusions:** This study of practicing licensed chiropractors suggests that exercise strategies are utilized by chiropractors in the province of study. Although there were slight differences in the prescription of exercise depending on the patient scenario, the majority of responses demonstrated that they would prescribe exercise. (This is a conference presentation abstract and not a full work that has been published.)

Research resources in Canada: taking inventory before setting priorities

Kent Stuber, Andre Bussieres, Gerg Kawchuk

Objective: Prioritizing research activities having the greatest significance to chiropractors and their patients is crucial. An initial step is to establish current research capacity and resources. **Methods:** The Canadian Chiropractic Association (CCA) membership (n=7200) was invited to access an e-survey on research capacity and resources. Canadian chiropractic stakeholder organizations received an invitation to a related survey. Data were collected over 3 months in 2015. **Results:** 505 CCA members (65% males, 19% with graduate degree) self-identified as researchers (26 full-time and 67 part-time). Clinical research and systematic reviews were the greatest areas of involvement. Over 530 authorships were published over 5 years with federal (4), provincial (8) or university (7) funding. Only 9 had regular research meetings with chiropractic organizations. Ten trainees were being supported. Stakeholder respondents (3 national, 10 provincial

and 1 educational) reported their needs for research activity included member education, negotiation with government or funders, direct inquiries and increased credibility. Only 42% discussed research needs every 5 years or more. Six stakeholders produced reports describing research needs or priorities. **Conclusions:** While the research capacity in chiropractic is growing, poor communication and little coordination between knowledge producers and knowledge consumers persists. (This is a conference presentation abstract and not a full work that has been published.)

A study of patient-centered care in patients with chronic health conditions attending chiropractic practice: outcome of a pilot of the protocol

Kent Stuber, Mark Langweiler, Silvano Mior, Peter McCarthy

Objective: To report on a pilot project to determine the feasibility of conducting a mixed-methods study assessing the extent patients with chronic health conditions perceive chiropractic care to be patient-centered. **Methods:** Adult patients with chronic health conditions from two clinics completed a demographic and health information questionnaire and a modified version of the Patient Assessment of Chronic Illness Care (PACIC). Data were analyzed using descriptive and inferential statistics. Participating clinicians and patients were invited to participate in semi-structured interviews, which were analyzed using thematic analysis. **Results:** Patient respondents (n=78; mean age, 47.1 years) comprised approximately 60% female and averaged 1.8 chronic conditions with 60% having chronic spinal pain. Respondents had averaged 12.9 chiropractic visits and seen an average of 2.9 other health professionals in the past year. The average overall modified PACIC score was 3.29 on a 5-point scale. Interviews suggest the importance of trust and communication in the doctor-patient relationship. **Conclusions:** Pilot study results support taking the protocol to a full study with no significant changes. Findings suggest modified PACIC scores may be generally higher among chiropractic patients with chronic conditions than in other professions and may be explained by enhanced communication. (This is a conference presentation abstract and not a full work that has been published.)

A multimodal approach to the conservative management of meniscus tear

David Sundy, Charles Blum

Objective: To present a case of successful a multimodal therapy for the treatment of a torn medial meniscus of the knee. The meniscal tear was documented by magnetic resonance imaging (MRI). **Clinical Features:** A 35-year-old male landscaper in excellent health suffered a severe, traumatic onset meniscus tear while practicing Capoeira. He lost all of his athletic capabilities as a result of his injury with his knee "locked" in 20 of flexion. He had seen an orthopedist who recommended partial meniscectomy and warned of eventual knee replacement. However the patient chose to seek a conservative approach and had unsuccessful treatments with a Rolpher, Acupuncturist, and Chiropractor prior to being seen at this office. **Intervention and Outcome:** The patient received 24-treatments combining Sacro-Occipital Technique, Activator Methods Chiropractic Technique, Hendrickson Method, and Cold Laser. Pre and post-assessments found significant pain relief and improved function as demonstrated with a near full recovery and markedly improved knee injury and osteoarthritis outcome scores (KOOS). **Conclusion:** A multimodal approach combining chiropractic techniques and soft tissue work with the addition of ancillary therapies such as cold laser can be a therapeutically conservative option, offering cost effective therapy for patients with meniscus tears. (This is a conference presentation abstract and not a full work that has been published.)

Do McTimoney chiropractic graduates perceive that they are adequately prepared to start and run a small business?

Judith Townsend, Adrian Hunnissett, Christina Cunliffe

Objective: To ascertain whether recent graduates from a UK chiropractic college perceive that they are adequately prepared to start and run a small business. **Method:** Following ethical approval, a cross sectional survey was undertaken. The survey was distributed to members of a UK professional chiropractic association. The survey examined perceptions of business training, marketing skills offered

during their degree training and subsequent postgraduate continuing professional development opportunities. **Results:** Graduates appear to feel adequately prepared to plan their finances realistically and manage cash flow. A majority of respondents (80%) considered themselves financially successful with their main income stemming from chiropractic. However, a majority (60%) felt inadequately prepared to write a business plan and conduct market research in their area. Respondents felt post-graduate business training would be useful in the first year of practice. **Conclusion:** It can be argued that the business training provided by this undergraduate college is adequate for long-term business success, although it is speculated that additional business training could decrease the time that it takes for a graduate to succeed in business. Further research may establish a need for change in the chiropractic degree curriculum in relation to business training. (This is a conference presentation abstract and not a full work that has been published.)

Investigating the use of digital imaging to assess the radiology interpretation skills of graduating chiropractors on the NBCE part IV practical examination

Paul Townsend, Margaret Seron, John Hyland, Michele Fisher, Jungnam Kim

Objective: To determine the impact of using digital versus plain films on the psychometric characteristics of the Part IV DIM subtest; to compare the use of 10 station versus 20 station formats. **Methods:** Examinees were randomly allocated to two distinct examination forms. Form 1 consisted of 10 image stations; each had two questions and a 4-minute time limit. Form 2 consisted of 20 image stations; each had 1 question and a 2-minute time limit. The digital images were displayed on individual monitors using a timed PowerPoint® presentation. The 10 station digital exam statistics were compared to a previously administered, identical case and question, 10 station plain film format. **Results:** No statistical difference in score reliability was found between plain film and digital image 10 station formats. No statistical difference was found using a 20 station format. **Conclusions:** Using digital images does not adversely affect score reliability. Additionally, score reliability was not adversely affected by using a 20 station format. Decreased item bias and content underrepresentation are additional benefits of a 20 station exam. (This is a conference presentation abstract and not a full work that has been published.)

A comparison of spinal manipulation versus mobilization for neck pain: a systematic literature review

Peter Tuchin, Daniel Cadona, Sidney Guines, Lucky Tran, James Zheng

Objective: Neck pain (NP) is a common musculoskeletal complaint and treatment for NP often includes spinal manipulation (SMT) and mobilization (MOB) techniques. The objective is to review the evidence comparing effectiveness of SMT versus MOB in the treatment of neck pain. **Data sources:** A systematic literature review of studies published since 2010 was performed, using the key words: neck pain, clinical trials, SMT and MOB. All four authors independently reviewed the abstracts of the articles from the MANTIS, SCIEDIRECT, EMBASE, SCOPUS and PUBMED databases and assessed articles for methodological quality using the PEDro scale. **Results:** Thirty studies were reviewed, with low to high quality of evidence in accordance with the PEDro scale. The results revealed fourteen studies directly related to the cervical spine (n=7 MOB; n=2 SMT; n=5 combined SMT/MOB). Eight of the 30 studies were to the thoracic spine (which revealed statistically significant reduction in NP with SMT). Eight of 30 studies were combined cervical/ thoracic spine treatments (which revealed some reduction in NP with SMT compared with MOB). **Conclusion:** There is a reasonable evidence concluding that SMT is the same or more effective than MOB in managing pain intensity and disability found in NP. (This is a conference presentation abstract and not a full work that has been published.)

The efficacy of manual therapy in the treatment of adolescent idiopathic scoliosis: A systematic literature review

Peter Tuchin, Grant Edmonson, Steven Tran, Satya Keo, Dwayne Hubbard

Objective: To analyse the level of evidence for manual therapy in the treatment of patients with adolescent idiopathic scoliosis (AIS) and to evaluate the quality of current research. **Data source:** A systematic literature review was conducted using the databases AMED, Cochrane Library, Index to Chiropractic Literature, PubMed and Mantis. **Results:** A total of only 21 met inclusion criteria for the review. There were 10 case studies, 6 prospective cohort/RCT studies and 5 systematic literature reviews found. Many of these studies had poor methodological quality and there was a large degree of heterogeneity. Most also had poor statistical analyses, compliance protocols, large risks of assessor bias and issues with data collection of outcome measures. Seven case reports showed positive outcome for SMT (some with additional manual therapy) and AIS, however, one cohort study (n=41) was inconclusive. Several meta-analyses demonstrated improvement in AIS with specific exercise protocols. No meta-analysis has been conducted on SMT for AIS, and a past systematic review did not include many studies covered in this review. **Conclusion:** Whilst some case reports showed improvement in AIS after chiropractic, there is currently no strong evidence suggesting that manual therapy is an effective treatment modality for AIS. (This is a conference presentation abstract and not a full work that has been published.)

Sacral-Occipital Technique care alters frontal, temporal, parietal and occipital brain electrical activity: a randomized controlled clinical study

Daniel Tuttle, Jerry Hochman, Stephanie Sullivan, Ronald Hosek

Objective: This study sought to evaluate the effects of chiropractic care on brain function by analyzing scalp electrical activity using quantitative electroencephalography (qEEG). **Methods:** Thirty participants were randomized into 3 groups: SOT[®], sham or control group (10 per group). EEG recordings were obtained from 19 recording sites set up according to the 10/20 system. Readings were taken at baseline, immediately post intervention and one week later. SOT[®] Participants were adjusted using DeJarnette blocks and an Activator[®] II. For sham participants, the Activator[®] II was set to zero and was applied to all subjects identically. ASEBA questionnaires were completed at baseline and one week points. **Results:** The SOT[®] group demonstrated statistically significant changes ($p < .001$) for specific frequencies at baseline, post-adjustment and at one week post-care in frontal, temporal, parietal and occipital brain regions: 2Hz:F7; 4Hz:C4,P4,Pz; 2Hz:T4; 14Hz:T3; 8Hz:Fp1,F3,F7,T6,O1; 9Hz:F3,F4,Fz,F7,T3. Sham participants had no statistically significant changes. The control group experienced significant change in the frontal region: 19Hz:F4; 23Hz:Fz. ASEBA results showed change in externalizing behaviors in the SOT[®] group ($p = .041$). **Conclusion:** Treatment with SOT[®] chiropractic showed significant change in brain function and self-reported behavior, especially when comparing baseline brain activity to 1-week follow-up. (This is a conference presentation abstract and not a full work that has been published.)

OMG I'm going to fail! Using online teaching modalities to decrease students' anxiety and increase learning and preparedness

Michael VanNatta, Thomas Brozovich, Kelly Krell-Mares, Dustin Derby, Michael Tunning

Objective: The purpose of this study was to assess outcomes of migrating traditional paper-pencil student assessments to online modalities for Neuromusculoskeletal I/II. **Methodology:** How does moving student assessments (quizzes, exams, and simulations) from traditional paper-pencil to online modalities impact students' anxiety, preparation, and learning experiences? Data collection occurred at the end of a term, via an in-class survey designed by content experts. Survey data was evaluated using SPSS to calculate descriptive statistics. **Result:** Of the respondents (n=126), 64% indicated decreased anxiety over the term with the implementation of online quizzes. Although just over half reported their anxiety stayed about the same for online exams and simulations, 42% and 32% reported decreased anxiety with those online components. Concerning the impact of online quizzes, respondents said the quizzes assisted with preparing them for both written (78%) and practical exams (57%), while only 32% indicated as such for online simulations. Respondents found all online components beneficial to learning: quizzes (94%),

exams (81%), and simulations (85%). **Conclusion:** The transition from traditional paper-pencil student assessments to online modalities appears to decrease students' self-reported anxiety, assist in exam and practical preparation, and is perceived as beneficial to student learning experiences. (This is a conference presentation abstract and not a full work that has been published.)

Functional neurological symptom disorder in a 19-year-old female with postconcussion syndrome: a case study

Jonathan Vestal, Michael Hall, Michael Longyear

Objective: A 19-year-old female presented with multiple complaints resulting from a concussive injury sustained 17 months prior. Most debilitating of these complaints were: progressive cervical dystonia, right-sided hemi-neglect, dysfluency, and gait impairment. **Clinical Features:** The most profound presentation was that of a leftward cervical dystonic posturing, right knee buckle with weight bearing, right arm neglect, and photosensitivity. Right SCM hypertonus, anterior head carriage, breakdown of cross-crawl coordination and loss of both joint position and discriminative touch on her right side. She would stutter when stressed and demonstrated la belle indifference in her demeanor. **Intervention and Outcome:** A 4 consecutive day course of care with 3 daily appointments was administered. Visits consisted of chiropractic adjustments, functional neurologic procedures with interactive metronome, speech therapy, fine motor movement patterning, and neuromuscular re-education for posture, balance, and gait. At the end of her prescribed course of care, she could ambulate without assistance, was tolerant of light, had appropriate affect and no observable dystonic posturing, had appropriate sensation bilaterally, and no traces of dysfluency. **Conclusion:** The symptoms of post-concussion syndrome are widely variable. Consideration of functional neurological symptom disorder may provide a key for breakthrough in resolving these complaints. (This is a conference presentation abstract and not a full work that has been published.)

Osteochondritis dessicans: A rare location

Federico Villafane, Nathaniel Holloway, Norman Kettner

Objective: The purpose of this case report is to describe a rare location for knee osteochondritis dessicans. The patient recalled locking of the knee during high school. At his presentation he reported the inability to straighten his left knee. **Clinical Features:** A 29-year-old male had left posterior lateral knee pain with joint locking after falling asleep with knees bent. He experienced 8/10 stabbing pain during all knee ranges of motion with radiation to the foot. The patient was suspected of deep venous thrombosis and was sent to urgent care for evaluation. **Intervention and Outcome:** The deep venous thrombosis was ruled out and additional knee imaging was obtained at our clinic. Left knee radiography and ultrasound demonstrated lateral trochlear osteochondral defect with associated osteochondral fragment. Magnetic resonance imaging of the left knee was obtained for further evaluation and confirmed the diagnosis. Patient underwent surgical treatment for loose body removal and trochlear chondroplasty. Full recovery followed. **Conclusion:** This case demonstrated lateral femoral trochlea osteochondral lesion with associated large osteochondral fragment with no history of trauma. Clinical symptoms of posterior knee pain requires careful evaluation by clinicians and radiologists to ensure timely diagnosis and optimal treatment. (This is a conference presentation abstract and not a full work that has been published.)

Use of chiropractic as an integrative health care: A literature review

Sivarama Prasad Vinjamury, Kunsiri Tantithamma, Cheih-Hsin Chen

Background: "Integrative health care" is defined as health care, which combines conventional and complementary health approaches together in a "coordinated way." On the other hand, if a non-mainstream practice such as "chiropractic" is used together with conventional medicine, then it is considered as "complementary." **Objective:** To conduct a review of literature on the use of chiropractic combined with either conventional medicine or acupuncture or diet and exercise both as complementary as an integrative health care. **Data Sources and Selection:** Biomedical databases used: PubMed, Index to Chiropractic Literature (only peer-reviewed), MANTIS. **Search terms:** "chiropractic AND Western medicine," "chiropractic

AND acupuncture,” “chiropractic AND diet and exercise.” Limited to English language and those published between 2006-2016. **Results:** Sixty three articles matched our criteria. A majority were case reports (n=53). Although the majority were neuromusculoskeletal conditions that were reported, they also included post-surgical care, cancer supportive care, hypertension and smoking cessation, etc. Acupuncture is the most common complementary therapy that is integrated with chiropractic after conventional care that includes physical therapy. All trials except four trials reported positive outcomes. **Conclusion:** Chiropractic has been successfully used as an additional intervention in a multidisciplinary approach of managing conditions. (This is a conference presentation abstract and not a full work that has been published.)

The effects of a single session of spinal manipulation on visuomotor adaptation and motor learning

Kinza Waqar, Imran Khan Niazi, Jens Duehr, Kelly Holt, Heidi Haavik, Nabeel Anwar

Objectives: The objective of this study was to investigate the effects of chiropractic care on visuomotor adaptation. **Methods:** 34 healthy subjects were recruited to participate in this parallel group randomized controlled trial. Visuomotor adaptation was assessed 6 times after either a single session of spinal manipulation (n=17) or a passive movement control (n=17) using a computer-based task that required subjects to hit randomly displayed targets by moving a stylus on a digital tablet. The movements displayed on the computer screen were offset by 30° with respect to actual movements performed on the tablet. Outcomes included response time, movement duration, and rate of learning. A repeated measures ANOVA was conducted to assess within and between group differences with significance set at $P \leq 0.05$. **Results:** The spinal manipulation intervention resulted in significantly lower reaction times ($F(1, 32)= 5.52, P=0.025$), faster movements ($F(1,32)=5.77, P=0.02$), and a higher learning index at the early stages of visuomotor adaptation ($F(1,32)=4.8, P=0.03$) compared to the control group. **Conclusion:** Spinal manipulation may result in improvements in visuomotor adaptation and motor learning. Further research is required to investigate the functional significance of these findings. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic management of blast injury related neuropathic pain: a case study

Robert Walsh, Greg Snow

Objective: To present the case of a patient with moderate neuropathic pain managed conservatively with spinal manipulative therapy (SMT) with positive outcomes. **Clinical features:** A 34-year-old veteran presented with moderate neuropathic thoracic pain from a 2009 service-related blast injury that caused an incomplete spinal cord injury (ISCI). Prior to receiving SMT, pain was managed with Pregabalin, H-wave therapy and self-mobilization. At initiation of SMT, pain was rated 7/10 numeric reporting scale (NRS) without medication and 4/10 medicated, and Oswestry score was 46% disability. Objective findings included decreased and painful thoracic ROM, and Plank hold limited to 60 seconds due to pain. **Intervention and outcome:** Thoracic SMT was delivered on 9 occasions over 4 months. Pain rating reduced to 1/10 NRS (medicated), Oswestry disability score decreased to 30%, and pain medication dosage was reduced 50%. Thoracic ROM was full and pain-free, and Plank hold time increased to 90 seconds. Improvement was maintained at 4-month follow-up. **Conclusion:** Successful management of a patient with neuropathic pain complicated by ISCI is presented. Further research is warranted to determine if SMT may provide a conservative non-pharmaceutical pain management alternative. (This is a conference presentation abstract and not a full work that has been published.)

Chiropractic technique selective courses: a survey of faculty perceptions

Paul Wanless, Paige Morgenthal, Anupama Kizhakkeveetil, David Sikorski, Gene Tobias

Objective: To evaluate the faculty's perception of Chiropractic technique selective courses.

Methods: An IRB-approved survey of faculty who teach the chiropractic technique curriculum (preclinical didactic technique courses, clinical internship program and technique selective courses) was conducted at a chiropractic college. Questions included were the faculty's training in chiropractic technique, their role in the technique curriculum and their perception of the value of the technique selective courses. 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 32 faculty and 27 responded: a response rate of 84%. A majority of the respondents indicated having been trained in diversified (89%) and Cox (52%) techniques. Most agreed that the following selective courses would be valuable for students future practice: diversified (93%), Cox (89%), Thompson (74%), SOT (54%) and Activator (52%). A majority also valued the role of the preclinical technique courses (96%) and clinical internship experience (96%) above that of the selective courses (81%) in preparing students for future practice. **Conclusion:** Chiropractic technique faculty value preclinical technique courses and internship experiences more than technique selectives in students' technique education. (This is a conference presentation abstract and not a full work that has been published.)

Crural index influence on parameters of female running gait

John Ward, Jeff Thompson, Jesse Coats

Purpose: The crural index, the ratio of tibia length to femur length, has been shown to affect running performance. The impact of the crural index has not been well-studied in females. **Methods:** Forty healthy female participants engaged in a jogging gait analysis at 7 mph using an 8-camera passive marker motion analysis system. Silver reflective surface markers were placed bilaterally on participants' greater trochanter, lateral femoral epicondyle, lateral malleolus, and several additional lower limb bony landmarks. Crural index was calculated using stationary standing surface maker data prior to running. Using Matlab, a sub-analysis of the 10 participants with the greatest crural index and the 10 participants with the lowest crural index was then performed. Functional lower limb joint range of motion, step length, and stride length were determined. **Results:** No statistically significant differences in functional hip range of motion, knee range of motion, ankle range of motion, step length, or stride length between the high and low crural index groups occurred. **Conclusion:** In this preliminary study, no impact of crural index was demonstrated to affect lower limb joint functional range of motion, step length, or stride length in female subjects. (This is a conference presentation abstract and not a full work that has been published.)

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Barriers to chiropractic use among African-Americans: a pilot study

Rebecca Wates, Jon Wilson, Julia Bartlett, Mark Pfefer

Objective: To present a case of successful a multimodal therapy for the treatment of a torn medial meniscus of the knee. The meniscal tear

was documented by magnetic resonance imaging (MRI). **Clinical Features:** A 35-year-old male landscaper in excellent health suffered a severe, traumatic onset meniscus tear while practicing Capoeira. He lost all of his athletic capabilities as a result of his injury with his knee "locked" in 20 of flexion. He had seen an orthopedist who recommended partial meniscectomy and warned of eventual knee replacement. However the patient chose to seek a conservative approach and had unsuccessful treatments with a Rolpher, Acupuncturist, and Chiropractor prior to being seen at this office. **Intervention and Outcome:** The patient received 24-treatments combining Sacro-Occipital Technique, Activator Methods Chiropractic Technique, Hendrickson Method, and Cold Laser. Pre and post-assessments found significant pain relief and improved function as demonstrated with a near full recovery and markedly improved knee injury and osteoarthritis outcome scores (KOOS). **Conclusion:** A multimodal approach combining chiropractic techniques and soft tissue work with the addition of ancillary therapies such as cold laser can be a therapeutically conservative option, offering cost effective therapy for patients with meniscus tears. (This is a conference presentation abstract and not a full work that has been published.)

Can a patient's skin be used to display anatomically correct diagnostic images?

Ian Watts, Pierre Boulanger, Michael Feist, Greg Kawchuk

Objective: Clinicians can find it difficult to visualize subcutaneous anatomic structures. Toward this, we developed a new projected augmented reality technique that accurately projects diagnostic imaging directly onto a subject's skin. **Methods:** A human subject was scanned continuously by a 3D camera to create a topographical representation of the skin surface. Diagnostic images obtained previously were rendered by a graphic computer and projected onto the skin giving the illusion of X-ray vision. The system compensates for the shape and scale of the subject's skin topography and allows for image enhancement. The system uses visual markers to align the image and to deal with changes in subject orientation. **Results:** Our projected augmented reality technique was able to display diagnostic images on a subject in a real-time compensating for skin topography while also maintaining location accuracy during subject movement and changes in orientation. **Conclusion:** It is technically feasible to project topographically correct diagnostic images on a subject's skin and adapt them dynamically to subject position and orientation. This approach can be adapted for use in numerous platforms. We envision this technology being a significant development in clinical instruction, patient education, and guidance of diagnostic and therapeutic procedures. (This is a conference presentation abstract and not a full work that has been published.)

Multifidus and abdominal muscle thickness in women immediately following pregnancy: A pilot study

Carol Ann Weis, Jon Barrett, Samantha Bauer, Amanda Huang, Candice Stewart, Claire Wells, Jane Hiller, Crystal Draper

Objective: The purpose of this preliminary study was to evaluate the morphology of multifidus and abdominal muscles in postpartum women compared to healthy nulliparous controls. **Methods:** Ten controls and 16 women between 4-6 weeks postpartum were recruited for this study. Bilateral ultrasound images were employed to determine the thickness of low back and abdominal muscles; specifically, multifidus muscles located in the lumbar region (L3-L5) and 4 abdominal muscles. Participants were stratified by group and primary comparison of muscle thickness (mm) were compared using an unpaired Students t-test. Means and standard deviations are reported. **Results:** The multifidus measurements did not yield any statistically significant results. However, measurements at various abdominal sites were found to be significantly thicker in the left external oblique ($P < 0.03$) and internal oblique ($P < 0.05$), and significantly thinner in the left upper rectus abdominis ($P < 0.02$) and right upper and lower rectus abdominis ($P < 0.01$ and 0.03 , respectively). **Conclusion:** Back pain during pregnancy is very common and often disabling. The results of this preliminary study show significant variation in abdominal muscles but not multifidus in postpartum women compared to controls. It may be prudent to consider these changes when determining the etiology of pregnancy-related back

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

Ontario chiropractor's knowledge of exercise guidelines for pregnant populations

Carol Ann Weis, Emily Baas, Kristen Ciesla, Carissa Kimpniski

Objective: To survey licensed and currently practicing chiropractors in Ontario for knowledge of pregnancy guidelines of exercise and to assess factors (gender, practice location, years in practice and provision of prenatal care) that may contribute to their knowledge. **Methods:** A 17-item survey questionnaire was emailed to 500 randomly selected chiropractors from the Association's 2015-2016 electronic directory. Twelve (12) items related to demographics and 5 items defined the chiropractors' knowledge of exercise guidelines; 1 set of agree/disagree statements, 1 information based question, and 3 case-based questions. Statistical analysis included means and standard deviations of descriptive statistics, Students' t-tests and a one-way analysis (ANOVA) for comparative analysis. **Results:** The overall KO of chiropractors was low, having a mean score of 5.2/10. A chiropractor's gender, years in practice, location of practice and provision of prenatal care did not influence their general knowledge of current exercise and pregnancy guidelines. **Conclusion:** Actively practicing chiropractors in Ontario are lacking in the current knowledge of exercise and pregnancy guidelines. (This is a conference presentation abstract and not a full work that has been published.)

Use of the Medscape "Fast 5" migraine quiz to assess headache knowledge among upper-level chiropractic students

Jon Wilson, Mark Pfefer, William Augello, Taylor Frederick

Objective: Chiropractors commonly see patients with a variety of headaches and should have an understanding of diagnosis and management strategies for headache and facial pain syndromes which are based upon current evidence. The purpose of this study was to assess current evidence-based knowledge of migraine using a quick survey developed by Medscape, known as a "Fast 5 quiz." **Methods:** We have previously investigated headache knowledge among chiropractic students and found gaps in knowledge. This institution added curricular material related to headache diagnosis and management. Two years following curricular changes, students were recently surveyed using an innovative Medscape quiz known as a "Fast 5 Quiz," this one related to knowledge of diagnosis and treatment of migraine. Chiropractic students in their last year of training were surveyed using this Medscape quiz. **Results:** Over the course of a one-month period, 46% ($n = 96$) of upper-level chiropractic students from one institution completed this survey. Approximately 25% of participants were able to answer three out of five questions correctly and a small minority (13%) responded correctly to a question regarding imaging. **Conclusions:** Significant gaps in knowledge were potentially identified in migraine headache knowledge, including diagnosis and management issues. (This is a conference presentation abstract and not a full work that has been published.)

Responders/non-responders to spinal manipulation: a relation to spinal degeneration and post-treatment changes in disc diffusion

Arnold Wong, Eric Parent, Sukhvinder Dhillon, Narashima Prasad, Dino Samrtzis, Greg Kawchuk

Objective: To determine if persons with non-specific low back pain (nLBP) who respond to spinal manipulative therapy (SMT) have unique magnetic resonance imaging (MRI) findings compared to SMT non-responders. **Methods:** Thirty-two participants with nLBP received SMT on Day 1 and Day 4 with pre-post SMT MRI on Day 1. SMT responders were classified as those having $> 30\%$ reduction in their modified Oswestry Disability score on Day 7. Images from responders/non-responders were assessed for facet degeneration, disc degeneration and apparent diffusion coefficient. **Results:** Responders tended to have a lower prevalence of severely degenerated facets ($P = 0.05$) and higher baseline ADC values at the L4-5 disc ($P = 0.09$) when compared to non-responders. Responders also displayed significant increases in post-SMT ADC values at discs associated with segments painful to palpation ($P < 0.01$). **Conclusion:** SMT responders have a lower prevalence of severely degenerated facets, heightened baseline ADC values at L4-5 disc, and post-SMT increases in ADC values in discs associated with painful

segments. Our results suggest that short-term SMT response may be moderated by spinal degeneration. Our findings provide a new insight into SMT mechanisms while suggesting the existence of discrete forms of treatment-specific LBP. (This is a conference presentation abstract and not a full work that has been published.)

A systematic review on the predictive factors for developing low back pain in healthcare students

Arnold Wong, Kevin Lam, Jean-Maxime Caron

Objective: To summarize the evidence regarding the predictive factors for low back pain (LBP) in healthcare students. **Data Sources and Selection:** Nine databases were searched using keywords related to the predictive factors for LBP in healthcare students. Two reviewers independently selected citations based on predetermined criteria, and extracted relevant data and determine risk of bias of the included studies. **Results and Conclusion:** Eight out of 2,067 potential citations were included. Specifically, seven prospective studies involved nursing (n=4), nursing assistant (n=1), dental (n=1), and dental hygienist students (n=1) while one retrospective study involved medical students. The sample size of the included studies ranged from 33 to 694. While 17 physical and psychological predictive factors were found to be significant, only three of them (a history of LBP, stress/mental pressure, and moderate physical activity) were consistently reported to be significant by at least three studies. The major risks of bias included no description of "participants' selection criteria" and "the characteristics of dropout participants". Given that early development of LBP in healthcare students may predispose them to frequent LBP recurrence, future prospective studies should identify predictive factors for LBP in students across all healthcare disciplines. (This is a conference presentation abstract and not a full work that has been published.)

MRI acquired data analyses before and after a chiropractic intervention in migraine subjects

H. Charles Woodfield, D. Gordon Hasick, Sean Sethi, Karthikeya Subramanian, David Utriainen, E. Mark Haacke

Objectives: Extensive analyses of MRI acquired data associated with a recent migraine case series, explored intracranial hemodynamic and hydrodynamic change after a National Upper Cervical Chiropractic Association (NUCCA) atlas intervention. **Methods:** Following an institutional-review-board approved study protocol eleven migraine subjects were scanned at baseline, four and eight-weeks after the intervention. Data acquisition utilized a 1.5-Tesla GE Optima scanner (GE Medical Systems, Waukesha, WI). Two blinded examiners analyzed data using Signal Processing in nMRI (SPIN) software (MR Innovations, Detroit, MI). **Results:** Total arterial flows were the same at baseline and after intervention. Four subjects exhibited increased secondary paraspinal venous flow (Type II) with decreased venous outflow via the internal jugular veins (Type I). This Type II cohort demonstrated an increase in hydrodynamic intracranial compliance index (7.9 to 9.8) at week-8. At week-4, only the seven subjects exhibiting Type I flow showed a decrease in venous flow (t-test, $p=0.029$). Following intervention, estimated perfusion (mL/100mg Brain) decreased in the Type II cohort and increased in Type I. **Conclusion:** Apparent physiologic flow changes observed after the NUCCA intervention indicates need for further investigation with a larger subject pool with healthy controls. (This is a conference presentation abstract and not a full work that has been published.)

Resolution of adult gastroesophageal reflux disease: a retrospective case series

Pamela Woodward Terranova

Objective: This case series attempts to investigate whether a relationship may exist between vertebral subluxation, particularly in the mid-thoracic spine, and the presence of gastroesophageal reflux disease (GERD) symptoms. More importantly, it presents a retrospective review of patients presenting with GERD who had a temporal relationship between a resolution of their symptomatology which coincided with the correction of the spinal misalignment. **Clinical Features:** Eight-women, six of whom were pregnant, presented with GERD symptoms amongst other musculoskeletal concerns. Increased erector spinae tone was present in all patients, typically on the right side in the mid-thoracic spine.

Intervention and Outcomes: Each patient was analyzed according to a combination of Activator and SOT trapezius fiber analysis and adjusted using instrument-assisted adjusting. Patients were seen between 10-30 visits, and six of eight-reported improvement in GERD symptoms following 1-2 adjustments of the T5 vertebra. This corresponded with decreased indicators of T5 subluxation. **Conclusion:** While it is difficult to generalize from a small case series such as this, documentation of clinical relationships between symptom resolution and improved spinal alignment is important in order to options for patients suffering from non-musculoskeletal symptomatology since this may offer patients low-risk conservative options for care. (This is a conference presentation abstract and not a full work that has been published.)

The use of activity trackers in the management of lifestyle modification: a pilot study

Shari Wynd, Amber Horsely, Aladin Boriek

Objective: To determine how an activity tracker can be used when managing lifestyle modification. **Methods:** Garmin vivofit™ activity trackers were provided to seventeen women and three men. Each participant submitted weekly reports regarding the number of steps they had taken, and the number of calories they consumed. Their body mass index (BMI) and waist-to-hip ratio were measured at the beginning of the study, at the end of the 3-month study, and at 1 year follow-up. **Results:** Fifteen subjects completed the study. Only 9 completed the 1 year follow-up survey. The average age was 44.9 ± 14.7 years old. Initially, the average BMI and waist-to-hip ratio were 26.3 ± 3.1 and 0.9 ± 0.1 , respectively. At 3 months, the BMI and waist-to-hip ratio significantly decreased to 25.1 ± 1.2 and 0.82 ± 0.02 ($p < 0.04$). The BMI and waist-to-hip ratio did not change in the 9 subjects that completed the follow-up survey. Subjects increased their average steps per day from 9499 in the first week to 10354 at the end of 3 months. These subjects continued to use the activity tracker after 1 year. **Conclusion:** Subjects using activity trackers demonstrated decreased BMIs and waist-to-hip ratios that persisted after 1 year with continued use of the activity tracker. (This is a conference presentation abstract and not a full work that has been published.)

Attitude changes towards the basic science courses between 1st, 5th, and 8th trimesters

Shari Wynd, Martha Friesen

Objective: To examine the changes in attitude towards the basic sciences in students as they progress from trimester 1 to trimester 5, and from trimester 5 to trimester 8. **Methods:** Chiropractic students entering 1st, 5th, and 8th trimester were given a survey that consisted questions regarding the importance each of the courses in basic science. Descriptive statistics were used to identify the most change in attitude (mode) for each question in each course. Survey responses and attitude scores were matched by student and paired Mann Whitney U tests were conducted on each of the matched cohorts. **Results:** Trimester 1 students demonstrated an overall agreement (86% and 93%) that courses in the basic sciences were important to their education and to practicing chiropractors, and this agreement did not change significantly when they were in trimester 5. The cohort of trimester 5 students were generally neutral to the basic sciences (81%); however, their level of agreement significantly increased ($p < 0.05$) in trimester 8 (87%). **Conclusions:** Overall, students recognize the importance of the basic science courses; however the trimester 8 students changed their attitude from trimester 5 and strongly agreed that the basic science courses were important. (This is a conference presentation abstract and not a full work that has been published.)

Association of lumbar spine stiffness and flexion-relaxation with patient-reported outcomes in adults with chronic low back pain receiving spinal manipulation therapy

Ting Xia, Cynthia Long, Robert Vining, Maruti Gudavalli, James DeVocht, Qian Li, Gregory Kawchuk, David Wilder, Christine Goertz

Objective: To examine the association of lumbar spinal stiffness (SS) and flexion-relaxation (FR) with pain intensity and disability in adults with chronic low back pain (CLBP) receiving spinal manipulation therapy (SMT). **Methods:** Participants with CLBP (n=82) of age 21-65, Roland-Morris Disability Questionnaire (RMDQ) score ≥ 6 , and numerical pain rating score ≥ 2 were enrolled in this single-arm trial that provided 6

weeks, 12 sessions of side lying, thrust SMT in the lumbosacral region. Lumbar SS was calculated from pre-SMT force-displacement curves obtained using instrument-assisted methods. Lumbar FR was assessed during pre-SMT trunk flexion-extension. Pain intensity and disability were reported using visual analog scale (VAS) and RMDQ, respectively. **Results:** The mean (95% confidence interval) reduction in VAS and RMDQ were 20.1 mm (14.1 to 26.1) 4.8 (3.7 to 5.8) at week 6, respectively. Overall, no change in SS or FR was observed over time. None of SS or FR measures were statistically significantly related to VAS, though higher SS and lower FR measures were significantly associated with higher levels of RMDQ. **Conclusions:** We did not observe any association between pain and disability improvement and the effects of SMT on SS or FR in this study. (This is a conference presentation abstract and not a full work that has been published.)

Neck pain and cognitive function in the US older adults: Data from NHANES

Haiou Yang, Scott Haldeman, Margareta Nordin

Objectives: Recent research in fields of neuroimaging, fibromyalgia and pain management has linked chronic pain with impaired cognitive function. The objective of this study was to explore the association between neck pain specifically and cognitive function in the older adult population in the US. **Methods:** The variance estimation method was used to conduct multivariable logistic regression analysis to explore the associations in the older adult population (65+). The data came from 2 modules (Miscellaneous Pains and Cognitive Functioning) in the 1999-2000 and 2001-2002 Health and Nutrition Examination Survey (NHANES). Neck pain in this study was measured by a question on neck pain over last three months. Cognitive function was assessed using the Digit Symbol Substitution Test (DSST) which assesses cognitive function. A corrected score smaller than 40 was coded as impaired cognitive function. Demographic variables were controlled as confounders. **Results:** A main finding was the significant association between neck pain and impaired cognitive function (OR 1.60, 95%CI: 1.02, 2.51), controlling for demographic variables. **Conclusions:** The linkage between neck pain and impaired cognitive functions found in this study supports the recent research on chronic pain. However, the mechanism of this association is unclear. (This is a conference presentation abstract and not a full work that has been published.)

Diagnosis of an ACL tear utilizing ultrasound, MRI and arthrographic correlation

Alicia Yochum, Norman Kettner

Objective: Injury to the anterior cruciate ligament (ACL) is a common sports injury in athletes. The objective of this case report is to describe the diagnostic workup of a patient with an ACL tear utilizing both diagnostic ultrasound, magnetic resonance imaging (MRI) with arthroscopic correlation. **Clinical Features:** A 24 year-old female presented to our clinic with right knee pain following an injury while participating in a soccer game. She reported feeling a pop in her knee and falling to the ground. **Intervention and Outcome:** A diagnostic ultrasound was performed which demonstrated abnormal appearance of the anterior cruciate ligament (ACL) with anterior translation of the tibia visualized with the anterior drawer test. A magnetic resonance imaging examination of the right knee was performed which confirmed a complete tear. Arthroscopic surgical reconstruction was performed which confirmed full thickness ACL tearing and the location of the remnants of the ACL seen on ultrasound. **Conclusion:** ACL injuries are common and identification utilizing diagnostic ultrasound may be an expedient and cost effective tool to utilize in the work up of a patient. To our knowledge, this is the first case report of an ACL tear visualized with diagnostic ultrasound. (This is a conference presentation abstract and not a full work that has been published.)

Predicting stress and test anxiety among first year chiropractic students

Niu Zhang, Charles Henderson

Objective: We evaluated perceived stress in chiropractic students and the relationship between stress and test anxiety. Moreover, we sought factors that might identify at-risk students in chiropractic education. **Method:** Hypotheses tested: 1) Student stress would be greater 6 months after beginning chiropractic training. 2) Depression at

beginning of training and poor pre-matriculation academic performance would predict stress. 3) Stress would be positively correlated with test anxiety. **Results:** Four hundred and seven chiropractic students participated during the 2014 and 2015 academic years. We observed increased stress after 6 months ($p = .000$, $r = .507$). Surprisingly, pre-matriculation GPA, a widely applied predictor of student performance, was a poor predictor of stress ($R^2 = 0.8\%$, $p = .056$), while depression at matriculation was a moderately strong predictor ($R^2 = 10.4\%$, $p = .000$). We found correlation between student perceived stress and the two subscales of test anxiety, emotionality and worry ($p = .000$, $r = .337$ and $p = .000$, $r = .336$, respectively). **Conclusion:** We identified four student services that college policy makers and administrators could adopt to reduce the student's stress load, help them develop better coping skills, and improve their academic performance. (This is a conference presentation abstract and not a full work that has been published.)