

**William J Owens Jr DC DAAMLPC**

1275 Main Street, Suite 110

Buffalo, NY 14209

P- 716-228-3847

[wowens@nationalspinemanagement.com](mailto:wowens@nationalspinemanagement.com)

**SELECTED OCCUPATIONAL HISTORY**

Adjunct Associate Professor - Family Practice Department, State University at Buffalo, Jacobs School of Medicine, Buffalo, New York, 2012 – Present

Clinical Supervisor, State University of New York at Buffalo, School of Exercise Sciences and Nutrition Science Department, 2007- Present

Adjunct Post Graduate Faculty, Cleveland University – Kansas City, College of Chiropractic, 2017 – present

President and CEO – National Spine Management Group, Lehi, UT, 2020-present

Director, Fellowship in Spinal Biomechanics and Trauma, National Spine Management Group, Cleveland University Kansas City, College of Chiropractic, 2020-present

Clinical Director, Fellowship in Spinal Biomechanics and Trauma, Academy of Chiropractic, Cleveland University Kansas City, Chiropractic and Health Sciences, 2017-2020

Clinical Director, Hospital Qualifying Program, Academy of Chiropractic, Cleveland University Kansas City, Chiropractic and Health Sciences, 2017-2020

Clinical Director, Fellowship in Spinal Biomechanics and Trauma, Texas Chiropractic College, Academy of Chiropractic, Long Island, NY, 2016 – 2017

Educational Director, Primary Spine Care Qualification, Academy of Chiropractic, Cleveland University Kansas City, Chiropractic and Health Sciences, 2017-2020

Coordinator, Hospital Qualifying Program for Chiropractors, Texas Chiropractic College, Academy of Chiropractic, Long Island NY, 2016-2020

Adjunct Clinical Assistant Professor, Texas Chiropractic College, Pasadena, Texas, 2015-2020

Adjunct Clinical Assistant Professor, University of Bridgeport College of Chiropractic, Bridgeport, Connecticut, 2012 - 2017

Clinic Director, Chiropractor, Rochester Spine and Injury Chiropractic, Rochester NY, 2012-2016

Coordinator – Chiropractic Elective – State University of New York at Buffalo School of Medicine and Biomedical Sciences – Family Practice Residency Program, Buffalo NY, 2011-present

Co-President & Consultant, MD Affiliate Program, East Setauket NY, 2011-2020

Clinic Director, Chiropractor, Greater Buffalo Accident and Injury Chiropractic, Buffalo NY, 2010-Present

Director, Medical Continuing Education Program, Academy of Chiropractic, Buffalo NY, 2010-2020

Clinical and Research Co-Director and Chief Executive Officer, US Chiropractic Directory, Setauket, NY, 2009-2020

Clinic Director, Chiropractor, Niagara-Frontier Chiropractic, Buffalo NY, 1998-2010

Assistant Clinical Director Chiropractic Department, Chiropractor, Sheehan Memorial Hospital, Buffalo, NY, 1999-2002

Chiropractor, Erie County Medical Center, Buffalo, NY, 2001-2002

### **EDUCATION and LICENSURE**

Doctor of Chiropractic, Utah, License # 12369149-1202, 2021-Present

Doctor of Chiropractic, New Mexico, License #DC2276 – 2022-Present

Doctor of Chiropractic, New York, License #008853, 1998-Present

Doctor of Chiropractic, National College of Chiropractic, Lombard, IL, 1997

National Board of Chiropractic Examiners, Part I, 1995 National Board of Chiropractic Examiners, Part II, 1999

National Board of Chiropractic Examiners, Part III, 1996

National Board of Chiropractic Examiners, Part IV, 1997

Bachelor of Science in Human Biology National College of Chiropractic, Lombard, IL, 1995

### **SELECTED POST-GRADUATE EDUCATION & CERTIFICATIONS**

**Crash Investigation 1** – *Explanation of the role that the traffic crash investigator plays within the police mission of traffic safety was presented. Five levels of crash investigation were outlined along with the implementation of each distinct phase. Detailed review of planning the different stages of the traffic crash investigation was reviewed. Defining the elements necessary to classify situations beyond a traffic crash, such as suicide, homicide or leaving the scene was presented. Detailed individual projects with instructor grading were required including post-collision questioning, roadway analysis, intersection measurements, vehicle damage analysis on live models, crash scene photographic analysis, influence of drag factor in crash investigation and final project incorporating all learned material in an intersection crash diagram to scale. Northwestern University Center of Public Safety – 2021.*

**Crash Investigation 2** – *Detailed review of Crash Investigation 1 was presented and discussed in group setting. Outline of next phases of crash investigation with detailed instruction of tire mark identification and evaluation with focus on tire inflation status and tire damage with reference to pre and post-crash. Methodology pertaining to crash investigation format was outlined in a scientific process. Instruction in analysis of vehicle lamps was given including pre and post-crash presentations, scientific process*

*and understanding of lamp engineering and manufacturing was detailed. Vehicle crash physics and crush measurements was given and practices in a project scenario using scientific processes to document vehicle damage. Relationship to vehicular behavior, analysis and crash dynamics was presented with analysis using perspective grid photogrammetry. Specific investigation of crash analysis in hit and run events was presented. Final projects included complete technical report writing, discussion of emerging crash investigation technology and crash dynamics related to real world crash analysis. Northwestern University Center of Public Safety – 2021*

**Documentation in Medical Collaborative Cases**, *Concluding an E&M report in cases involving medical primary care providers of medical specialists that have complicated case histories, significant risk factors, and inconclusive findings. Triage and management of complicated cases requiring the clinical evaluation, advanced imaging and electrodiagnostics, Academy of Chiropractic, New York State Department of Education, Board of Chiropractic, Chiropractic and Health Sciences, Long Island New York, 2019*

**MRI Spine Interpretation and Protocols**, *Contemporary acquisition protocols including slice thicknesses and sequences inclusive of the ordering process. Interpretation of axial, sagittal and coronal views in T1, T2 and stir views inclusive of the disc, spinal cord, extra-dural and intra- dural pathology, Academy of Chiropractic, New York State Department of Education, Board of Chiropractic, Long Island New York, 2019*

**Spinal Biomechanical Engineering Analysis**, *understanding spinal motor units as it relates to the Cartesian system and normal vs. pathological movement. Analyzing normal coupling functions of the spine in relations to gait and pelvic biomechanical function and determining stress units and standards of deviation of segmental dysfunction. Interpreting mensuration lines and block analysis beyond standards of deviation in spinal motor dysfunction about connective tissue failure. Cleveland University Kansas City, Chiropractic and Health Sciences, New York State Department of Education, Academy of Chiropractic Post-Doctoral Division, Long Island, NY, 2018*

**Spinal Biomechanical Engineering Pathology and Clinical Application**, *integrating pathological function based upon the Cartesian system and digital mensuration in developing treatment plans with diagnosed connective tissue failures. Diagnosing corrective vs. clinical management scenarios when considering maximum medical improvement in both the chronic and acute, insidious and traumatically induced patient. Cleveland University Kansas City, Chiropractic and Health Sciences, New York State Department of Education, Academy of Chiropractic Post- Doctoral Division, Long Island, NY, 2018*

**Primary Spine Care Qualified**, *this qualification includes graduate chiropractic education in healthy and traumatically altered spinal morphology inclusive of osseous, connective tissue and neurological structure, function and pathology. This certifies you are qualified in assessing predictive models in spinal biomechanics and devising engineering paradigms for treatment plans to maximize spinal homeostasis in an evidenced based conclusion. In addition, this qualification acknowledges your expertise in triaging the injured and coordinating collaborative care from the trauma through conclusion of rehabilitation, Academy of Chiropractic Post- Doctoral Division, Cleveland University-Kansas City, College of Chiropractic, Long Island NY, 2017*

**Primary Spine Care Symposium 3** – *Interprofessional Spine Care, Clinical analysis of anatomic versus biomechanical spine pain and clinical triage protocols. Relating current research trends in the Whole Spine Model of patient including normal versus abnormal sagittal curvature in the adolescent and adult spine, pelvic incidence as a parameter for sagittal balance in the human spine and current methods of assessment. Patient centered approach to Evidenced Based Spine care with a focus on*

diagnosis, prognosis and triage of the spine pain patient, Texas Chiropractic College Post-Doctoral Division, Academy of Chiropractic Post-Doctoral Division, Melville NY 2017

Primary Spine Care Symposium 3 – Epidemiology of Spine Pain, Review of the current Centers for Disease Control [CDC] data on the frequency of musculoskeletal pain in the United States. population with emphasis on pain of spinal origin. CDC guidelines on opioid medication were discussed and correlated to persistent pain syndromes. Research was reviewed showing the importance of managing the spine pain patient properly from the entry point of care with a concentration on maintenance of spinal biomechanics, Texas Chiropractic College Post-Doctoral Division, Academy of Chiropractic Post-Doctoral Division, Melville NY 2017

**Primary Spine Care Symposium 3** - Connective Tissue and Spinal Disc Pathology, The morphology and pathology of connective tissue, inclusive of spinal disc disorders and prognosticating wound repair with permanency implications. Disc bulge, herniation, protrusion and extrusion classifications based upon contemporary literature and how to age-date disc pathology, Texas Chiropractic College Post-Doctoral Division, Academy of Chiropractic Post-Doctoral Division, Melville NY 2017

**Primary Spine Care Symposium 3** – Physiology and Anatomy of Spinal Manual Adjusting, Understanding the role of mechanoreceptors, proprioceptors and nociceptors with facets, ligaments, tendons and muscles in aberrant spinal biomechanics. MRI and imaging studies of decompressing via a chiropractic spinal adjustment of the bio-neuro-mechanical lesion and its effects on the central nervous system both reflexively and supratentorially, Texas Chiropractic College Post-Doctoral Division, Academy of Chiropractic Post-Doctoral Division, Melville NY 2017

**Primary Spine Care Symposium 3** – Medical-Legal Documentation, The contemporary documentation required in a medical-legal environment that is evidenced based and meets the standards of the courts and academia. Utilizing the scientific data to support a diagnosis, prognosis and treatment plan while meeting the admissibility standards based upon a professional's credentials. Texas Chiropractic College Post-Doctoral Division, Academy of Chiropractic Post-Doctoral Division, Melville NY 2017

**Primary Spine Care 2** - Spinal Trauma Pathology, Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequella to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequella to trauma, Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Setauket NY, 2016

**Primary Spine Care 2** - Chiropractic Spinal Adjustment Central Nervous System Processing, Literature reviews of mechanoreceptor, proprioceptor and nociceptor stimulation of later horn gray matter with periaqueductal stimulation affecting the thalamus and cortical regions with efferent distribution in disparate regions of the body in both pain and systemic stimulation, Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Setauket NY, 2016

**Primary Spine Care 2** – Central Nervous System Processing of Pain and Physiology, Central neural pathways of pain and higher cortical responses to pain and the effect of high amplitude- low velocity forces on mechanoreceptors and proprioceptors. The effects of neuropeptides on the hypothalamus, pituitary and adrenal axis when treating patients. Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Melville NY, 2016

**Primary Spine Care 2** – MRI, Bone Edema and Degeneration, The effects of trauma on spinal vertebral segments and the short and long term sequella to morphology. Identifying and diagnosing bone edema, spurring, types of degeneration in assessing biomechanical stability in conjunction with Modic and Pfeiffer changes Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Melville NY, 2016

**Primary Spine Care 2** – Hospital and Emergency Room Care, Identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequella to degenerative disc trauma, Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Melville NY, 2016

**Evidenced Based Interprofessional Collaboration-** Primary Spine Care, Chiropractic as Primary spine care based upon the literature conclusions and the documentation requirements to support those conclusions in an ethical collaborative environment inclusive of hospitals, emergency rooms, primary care medical doctors and medical specialists. Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing boards, Texas Chiropractic College, Las Vegas NV, 2015

**Evaluation and Management of Low Back Conditions,** Diagnosis, prognosis and the creation of treatment plans based upon the contemporary literature inclusive of the neurological pathways of pain from both upper and lower motor neuron pathways. Etiologies of mechanical pain with radicular and myelopathic sequella along with stabilization and modalities as treatment pathways, DC Seminars, Texas Chiropractic College Post Graduate Division, Westbury NY 2015

**Human Subjects Research Basic Course,** Ethics, institutional review boards, informed consent, records, genetic research in human population, vulnerable subjects, FDA requirements, HIPAA, reporting unanticipated problems, Collaborative Institutional Training Initiative, University of Miami, Leonard M. Miller School of Medicine, Miami, FL. 2014

**Biomedical Responsible Conduct of Research,** Using animal subjects in research, research involving human subjects, export controls and national security, plagiarism, mentoring, responsible conduct of research, research misconduct, data management, authorship, peer review, conflict of interest, collaborative research, Collaborative Institutional Training Initiative, University of Miami, Leonard M. Miller School of Medicine, Miami.

**Biomedical Responsible Conduct of Research,** using animal subjects in research, research involving human subjects, export controls and national security, plagiarism, mentoring, responsible conduct of research, research misconduct, data management, authorship, peer review, conflict of interest, collaborative research, Collaborative Institutional Training Initiative, University of Miami, Leonard M. Miller School of Medicine, Miami, FL. 2014

**Spinal Biomechanical Engineering Principles and Application,** Integrating spinal biomechanics and pathobiomechanics through digitized analysis. The comparison of organized versus disorganized compensation with regional and global compensation. Advanced analysis and integration of pathobiomechanics as sequella to trauma in clinical practice and documentation. PACE Recognized

by the Federation of Chiropractic Licensure Boards, Las Vegas NV 2013

**Integrating Clinical Findings in Admissible Documentation**, combining clinical, radiographic, electrodiagnostic and MRI findings to conclude a diagnosis and reporting accurately through admissible documentation. Diagnosis includes head, spine and disc pathology as sequella to trauma, PACE Recognized by the Federation of Chiropractic Licensure Boards, Las Vegas NV2013

**Spinal Biomechanical Engineering:** Cartesian System, The Cartesian Coordinate System from the history to the application in the human body. Explanation of the x, y and z axes in both translation and rotations (thetas) and how they are applicable to human biomechanics. [Insert the state licensure body sent to you], ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post- Doctoral Division, Buffalo, NY, 2013

**Spinal Biomechanical Engineering:** Cervical Pathobiomechanics, Spinal biomechanical engineering of the cervical and upper thoracic spine. This includes the normal and pathobiomechanical movement of both the anterior and posterior motor units and normal function and relationship of the intrinsic musculature to those motor units. Nomenclature in reporting normal and pathobiomechanical findings of the spine. [Insert the state licensure body sent to you], ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post-Doctoral Division, Buffalo, NY, 2013

**Spinal Biomechanical Engineering:** Lumbar Pathobiomechanics, Spinal biomechanical engineering of the lumbar spine. This includes the normal and pathobiomechanical movement of both the anterior and posterior motor units and normal function and relationship of the intrinsic musculature to those motor units. Nomenclature in reporting normal and pathobiomechanical findings of the spine. [Insert the state licensure body sent to you], ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post-Doctoral Division, Buffalo, NY, 2013

**Spinal Biomechanics in Trauma**, to utilize whiplash associated disorders in various vectors of impact and whiplash mechanisms in determining pathobiomechanics. To clinically correlate annular tears, disc herniations, fractures, ligament pathology and spinal segmental instability as. sequella to pathobiomechanics from trauma. The utilization of digital motion x-ray in diagnosing normal versus abnormal facet motion along with case studies to understand the clinical application, ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post-Doctoral Division, Buffalo, NY, 2013

**Spinal Biomechanical Engineering & Organizational Analysis**, Integrating spinal biomechanics and pathobiomechanics through digitized analysis. The comparison of organized versus disorganized compensation with regional and global compensation. Correlation of the vestibular, ocular and proprioceptive neurological integration in the righting reflex as evidenced in imaging. Digital and numerical algorithm in analyzing a spine. ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post-Doctoral Division, Buffalo, NY, 2013

**Spinal Biomechanical Engineering:** Cervical Digital Analysis, Digitizing and analyzing the cervical spine in neutral, flexion and extension views to diagnose pathobiomechanics. This includes alteration of motion segment integrity (AMOSI) in both angular and translational movement. Ligament instability/failure/pathology are identified all using numerical values and models. Review of case studies to analyze pathobiomechanics using a computerized/numerical algorithm. [Insert the state

licensure body sent to you], ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post-Doctoral Division, Buffalo, NY, 2013

**Spinal Biomechanical Engineering:** Lumbar Digital Analysis, Digitalizing and analyzing the lumbar spine images to diagnose pathobiomechanics. This includes anterior and posterior vertebral body elements in rotational analysis with neutral, left and right lateral bending in conjunction with gate analysis. Ligament instability/failure/pathology is identified all using numerical values and models. Review of case studies for analysis of pathobiomechanics using a computerized/numerical algorithm along with corrective guidelines. [Insert the state licensure body sent to you], ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post Doctoral Division, Buffalo, NY, 2013

**Spinal Biomechanical Engineering:** Full Spine Digital Analysis, Digitalizing and analyzing the full spine images to diagnose pathobiomechanics as sequella to trauma in relation to ligamentous failure and disc and vertebral pathology as sequella. This includes anterior and posterior vertebral body elements in rotational analysis with neutral, left and right lateral bending in conjunction with gate analysis. Ligament instability/failure/pathology is identified all using numerical values and models. Review of case studies for analysis of pathobiomechanics using a computerized/numerical algorithm along with corrective guidelines. [Insert the state licensure body sent to you], ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post Doctoral Division, Buffalo, NY, 2013

**MRI Protocols Clinical Necessity,** MRI slices, views, T1, T2, STIR axial, stacking, FFE, FSE and sagittal images. Clinical indication for the utilization of MRI and pathologies of disc in both trauma and non-trauma sequella, including bulge, herniation, protrusion, extrusion and sequestration. New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post-Doctoral Division, Long Island, NY, 2012

**MRI Interpretation of Cervical Herniations,** MRI slices, views, T1, T2, STIR Axial, FFE, FSE and sagittal images in the interpretation of lumbar herniations. With the co-morbidities and complications of stenosis, pseudo-protrusions, cantilevered vertebrae, Schmorl's nodes and herniations. morphology of lumbar disc pathologies of central and lateral herniations, protrusions, extrusions, sequestration, focal and broad based herniations are defined and illustrated. Spinal cord and canal compromise interpretation with management. New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post Doctoral Division, Long Island, NY, 2012

**MRI Interpretation of Lumbar Herniations,** MRI slices, views, T1, T2, STIR axial, stacking, FFE, FSE and sagittal images in the interpretation of lumbar herniations. With the co-morbidities and complications of stenosis, pseudo-protrusions, cantilevered vertebrae, Schmorl's nodes and herniations. Morphology of lumbar disc pathologies of central and lateral herniations, protrusions, extrusions, sequestration, focal and broad based herniations are defined and illustrated. Central canal and cauda equina compromise interpretation with management. New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post Doctoral Division, Long Island, NY, 2012

**MRI Interpretation of Cervical Degeneration/Bulges**, MRI slices, views, T1, T2, STIR axial, stacking, FFE, FSE and sagittal images in the interpretation of lumbar degeneration. With the co-morbidities and complications of stenosis, pseudo-protrusions, cantilevered vertebrate, Schmorl's nodes and herniations. Spinal cord and canal compromise interpretation with management. New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post Doctoral Division, Long Island, NY, 2012

**MRI Interpretation of Degenerative Spine and Disc Disease** with Overlapping Traumatic Insult to Both Spine and Disc, MRI slices, views, T1, T2, STIR Axial, FFE, FSE and sagittal images in the interpretation of degenerative spondylolisthesis, spinal canal stenosis, Modic type 3 changes, central herniations, extrusions, compressions, nerve root compressions, advanced spurring and thecal sac involvement from an orthopaedic, emergency room, chiropractic, neurological, neurosurgical, physical medicine perspective. New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, ACCME Joint Sponsorship with the State. University of New York at Buffalo, School of Medicine and Biomedical Sciences, Academy of Chiropractic Post Doctoral Division, Long Island, NY, 2012

**Electrodiagnostic Interpretation, EMG/NCV**, Somato-sensory evoked potentials, brain stem auditory evoked potential and visual evoked potential utilization, physiology and interpretation, electrodiagnostic testing as a clinical component in part of the neurological work-up of the traumatically injured patient in both the peripheral and central nervous system. Inductions and contraindications to electrodiagnostic procedures. The utilization of electrodiagnostics in concluding radiculopathy, myelopathy and plexopathy and determining recent trauma or chronic pathology, Federation of Chiropractic Licensure Boards, Academy of Chiropractic, American Academy of Medical-Legal Professionals, Hollywood, Florida, 2012

**MRI Spine Interpretation of Disc Bulge and Herniation**, Spinal MRI findings related to degenerative changes vs. traumatic changes of the intervertebral disc by using definitions provided by the American Society of Neuroradiology. Anatomy of the intervertebral disc, spinal cord, nerve roots and spinal ligaments correlated to T1, T2, STIR sagittal, stacking and axial images. Anatomical MRI differentiation of normal, degenerative and traumatic changes, Federation of Chiropractic Licensure Boards, Academy of Chiropractic, American Academy of Medical-Legal Professionals, Hollywood, Florida, 2012

**Biomechanics of Spinal Trauma and its Relationship to Pre-Existing Injuries and Degenerative Changes**. Whiplash Associated Disorders and the biomechanics of side impact vs. rear impact with emphasis on traumatic forces and body position, the mechanism of whiplash injury phases with their relationships to physiologic tolerance to trauma, specific diagnosis of disc pathology and annular tear, disc herniation, fracture, ligamentous injury and instability. Details of spinal nerve root stretching injury and dimensions of the spinal canal during whiplash was outlined particular to significant spinal injury resulting from low level accelerations including pediatric spinal trauma and physiological normals. Spinal surgical intervention techniques including ordering diagnostic studies using MRI, CT and digital motion x-ray. Federation of Chiropractic Licensure Boards, Academy of Chiropractic, American Academy of Medical-Legal Professionals, Hollywood, Florida, 2012

**Certified Professional Coder**, American Academy of Professional Coders, Salt Lake City, UT, 2011-2015

**Neurological Examination and Neuroplasticity in Clinical Practice** – central nervous system neuroplasticity and its relationship to injury, examination and treatment protocols. CNS feedback loops and the neurological examination relating to cranial nerve evaluation, upper and lower extremity peripheral nerve evaluation including gait analysis and motor systems. Emphasis was placed on dermatomal and peripheral nerve pathway mapping. Fetterman Events, Fred Clary DCDICBN, Chiropractic Neurologist, Wauwatosa, WI University of Western States, 2011.

**Clinical Neuroanatomy and Functional Neurology:** Detailed anatomy and embryological development of the head, brain and spinal column. Topography and introductory physiology of the brain and correlation to the clinical neurological examination. Pathophysiologic mechanisms of vascular disease including stroke risk factors and clinical correlation to central nervous system. vascular anatomy. Practical case management of neurologic conditions including integration of rehabilitation and the sensory motor feedback loop with emphasis on neuroplasticity. Emphasis on clinically correlating Central Nervous system anatomy to vascular and anatomical lesions. Fetterman Events, Fred Clary DC DICBN, Chiropractic Neurologist, Wauwatosa, WI University of Western States, 2010.

**MRI Normal Anatomy & Protocols,** Spinal anatomy of all MRI views utilizing T1, T2, 3D Gradient, stacking and STIR sequences of imaging. Advanced protocols of MRI examination with multiple sequences to create concurrent diagnostic findings. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, Robert Peyster MD, DABR-NR, Neuroradiologist, Ronkonkoma, NY, 2009

**MRI Disc & Spinal Cord and Spinal Canal Pathology,** MRI interpretation of spinal disc pathologies as a result of trauma and degenerative factors and resultant neurological compromise. Spinal Cord and Spinal canal pathologies and space occupying lesion interpretation. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, Robert Peyster MD, DABR-NR, Neuroradiologist, Ronkonkoma, NY, 2009

**Accident Reconstruction and Ensuing Bodily Injury,** Understanding the forces involved in crashed and the transference of those forces from the bullet car to the target car. Quantifying those forces to determine bodily injury and calculating speed, distance, time and drag factors indetermining causality and direction of forces. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, Ronkonkoma, NY, 2009

**MRI Physics and History,** Magnetic fields, T1 and T2 relaxations, nuclear spins, phase encoding, spin echo, T1 and T2 contrast, magnetic properties of metals and the historical perspective of the creation of NMR and MRI. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, Terry Button, PhD, Medical Physicist, State University of New York at Stony Brook, Long Island, NY, 2009

**MRI Anatomy & History,** Normal anatomy of axial and sagittal views utilizing T1, T2, 3D Gradient and STIR sequences of imaging. Standardized and desired protocols in views and sequencing of MRI examination to create an accurate diagnosis in MRI. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, Robert Peyster MD, Neuroradiologist, State University of New York at Stony Brook, Long Island, NY, 2009

**MRI Disc Pathology & Spinal Stenosis,** MRI interpretation of bulged, herniated, protruded, extruded sequestered and fragmented disc pathologies in etiology and neurological sequella in relationship to the spinal cord and spinal nerve roots. CMCS Post Doctoral Division, New York Chiropractic Council, New

York State Department of Education, Board for Chiropractic, Robert. Peyster MD, Neuroradiologist, State University of New York at Stony Brook, Long Island, NY, 2009

**MRI Spinal Pathology**, MRI interpretation of bone, intradural, extradural, cord and neural sleeve lesions. Tuberculosis, drop lesions, metastasis, ependymoma, schwannoma and numerous other spinal related tumors and lesions. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, Robert Peyster MD, Neuroradiologist, State University of New York at Stony Brook, Long Island, NY, 2009

**MRI Methodology of Analysis**, MRI interpretation sequencing of the cervical, thoracic and lumbar spine inclusive of T1, T2, STIR and 3D gradient studies to ensure the accurate diagnosis of the region visualized. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, Robert Peyster MD, Neuroradiologist, State University of New York at Stony Brook, Long Island, NY, 2009

**MRI Clinical Application**, The clinical application of the results of space occupying lesions. Disc and tumor pathologies and the clinical indications of manual and adjustive therapies in the patient with spinal nerve root and spinal cord insult as sequella. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, Magdy Shady MD, Neurosurgeon, State University of New York at Stony Brook, Long Island, NY, 2009

**MRI Interpretation of Spinal Cord, Spinal Disc and Spinal Canal Disorders**, MRI interpretation of herniated, protruded, extruded, bulged and sequestered discs & spinal stenosis as sequella of ligamentous hypertrophy, congenital malformation, spinal cord pathology. Clinical necessity and contraindications. Robert Peyster MD, DABR, CAQ-NR, Neuroradiologist, CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Long Island, NY, 2009

**AMA Guides to the Evaluation of Permanent Impairment 6th Edition**, Clinically coordinating spinal pathology with neurological and functional sequella including station & gait, migraines, sexual dysfunction, sleep & arousal disorders, paroxysmal disorders, radiculopathic disorders and central nervous system disorders, CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Long Island, NY, 2009

**MRI Interpretation of Herniated Disc and Spinal Cord and Root Encroachment**, MRI interpretation of herniated, protruded, extruded, bulged and sequestered discs and their relationship to the spinal cord and spinal nerve roots and the clinical correlation to spinal adjustments, manual spinal therapy and joint mobilization. Magdy Shady MD, Neurosurgeon, Neuro-Trauma Surgery, CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Long Island, NY, 2009

**Diagnostic Imaging & Testing Interpretation and Protocols**, MRI protocols and interpretation, CAT scan protocols and interpretation, x-ray trauma series protocols and interpretation, bone scan protocols and interpretation, EMG/NCV protocols and utilization and International Classification of Disease trauma coding. CMCS Post Doctoral Education Division, New York Chiropractic Council, New York State Education Department, Long Island, NY, 2008

**Neurodiagnostics, Imaging Protocols and Pathology of the Trauma Patient**, An in-depth understanding of the protocols in triaging and reporting the clinical findings of the trauma patient. Maintaining ethical relationships with the medical-legal community, CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education Board for Chiropractic,

Long Island, NY, 2008

**Risk Factors, Clinical Presentation and Triaging the Trauma Patient,** An extensive understanding of the injured with clinically coordinating the history, physical findings and when to integrate neurodiagnostics. An understanding on how to utilize emergency room records in creating an accurate diagnosis and the significance of “risk factors” in spinal injury. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Education Department Board for Chiropractic Diagnostics, Long Island, NY, 2008

**Crash Dynamics and its Relationship to Causality,** An extensive understanding of the physics involved in the transference of energy from the bullet car to the target car. This includes G's of force, Newton's, gravity, energy, skid marks, crumple zones, spring factors, event data recorder and the graphing of the movement of the vehicle before, during and after the crash. Determining the clinical correlation of forces and bodily injury. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Education Department Board for Chiropractic, Long Island, NY, 2008

**MRI, Bone Scan & X-Ray Protocols, Physiology and Indications for the Trauma Patient,** MRI interpretation, physiology, history and clinical indications, Bone Scan interpretation, physiology and clinical indications, x-ray clinical indications for the trauma patient. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Education Department Board for Chiropractic, Long Island, NY, 2008

**Neurodiagnostic Testing Protocols, Physiology and Indications for the Trauma Patient,** Electromyography (EMG,) Nerve Conduction Velocity (NCV,) Somato Sensory Evoked Potential (SSEP,) Visual Evoked Potential (VEP,) Brain Stem Auditory Evoked Potential (BAER) and Visual-Electronystamography (V-ENG) interpretation, protocols and clinical indications for the trauma patient. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Education Department, Board for Chiropractic, Long Island, NY, 2008

**Documentation and Reporting for the Trauma Victim,** Understanding the necessity for accurate documentation and diagnosis utilizing the ICD-9 and the CPT to accurately describe the injury through diagnosis. Understanding and utilizing state regulations on reimbursement issues pertaining to healthcare. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Education Department, Board for Chiropractic, Long Island, NY, 2008

**Documenting Clinically Correlated Bodily Injury to Causality,** Understanding the necessity for accurate documentation, diagnosis and clinical correlation to the injury when reporting injuries in the medical-legal community. Documenting the kinesiopathology, myopathology, neuropathology, pathophysiology in both a functional and structural paradigm. CMCS Post Doctoral Division, New York Chiropractic Council, New York State Education Department, Board for Chiropractic, Long Island, NY, 2008

**Management of Chronic Pain in the Clinical Setting:** Low Back Pain and Fibromyalgia, Description. American Academy of Pain Management, location, 2007

**Relief of Pain in the Palliative Care Environment,** Description. American Academy of Pain Management, location, 2007

**Certification in Manipulation Under Anesthesia,** National University of Health Sciences, Sheehan Memorial Hospital, Buffalo, NY, 2007

**Solving Clinical Problems Through Ergonomics**, Understanding Entrapment Syndromes, Description. New York College of Chiropractic, Seneca Falls, NY, 2006

**Spinal Rehabilitation**, New York College of Chiropractic, Seneca Falls, NY, 2006

**Documentation, Consent and Patient Interaction**, New York College of Chiropractic, Seneca Falls NY, 2006

**A Matter of Ethics**, New York College of Chiropractic, Seneca Falls NY, 2006

**Healthcare Partnerships and Compliance**, New York College of Chiropractic, Buffalo, 2006

**Orthopedic Board Review**, National College of Chiropractic, Syracuse, NY, 2001

**Evaluation of the Lower Extremity and Foot Part I**, Orthopedic, radiographic protocols and interpretation, MRI protocols and interpretation, EMG/NCV protocols and interpretation. National College of Chiropractic, Syracuse, NY, 2000

**Evaluation of the Lower Extremity and Foot Part II**, Orthopedic, radiographic protocols and interpretation, MRI protocols and interpretation. EMG/NCV protocols and interpretation. National College of Chiropractic, Syracuse, NY, 2000

**Evaluation of the Cervical Spine and Upper Extremity Part II**, Orthopedic, radiographic protocols and interpretation, MRI protocols and interpretation, EMG/NCV protocols and interpretation, National College of Chiropractic, Syracuse, NY, 1999

**Evaluation of the Thoracic Spine and Ribs**, Orthopedic, radiographic protocols and interpretation, MRI protocols and interpretation, National College of Chiropractic, Syracuse, NY, 1999

**Evaluation of the Lumbar Spine and Pelvis Part I**, Orthopedic, radiographic protocols and interpretation, MRI protocols and interpretation, EMG/NCV protocols and interpretation, National College of Chiropractic, Syracuse, NY, 1999

**Evaluation of the Lumbar Spine and Pelvis Part II**, Orthopedic, radiographic protocols and interpretation, MRI protocols and interpretation, EMG/NCV protocols and interpretation. National College of Chiropractic, Syracuse, NY, 1999

**Evaluation of the Cervical Spine and Upper Extremity Part I**, Orthopedic, radiographic protocols and interpretation, MRI protocols and interpretation, EMG/NCV protocols and interpretation. National College of Chiropractic, Syracuse, NY, 1998

### **SELECTED MEMBERSHIPS & ORGANIZATIONAL ACTIVITIES**

American Chiropractic Association, Governor's Advisory Cabinet, 2011

Deans Advisory Committee, University of Bridgeport Chiropractic College, Bridgeport CT, 2011-2012

American Academy of Professional Coders, Member, 2011-Present New York Chiropractic Council,

member, 2011-Present

State University of New York at Buffalo, Exercise Science, Clinical Site Supervisor, 2007-Present

National Academy of Manipulation Under Anesthesia Physicians, Member, 2007-2010

American Academy of Pain Management, Member, 2007-2010

National Association of Disability Evaluating Professionals, Member, 2007  
American

Academy of Expert Medical-Legal Witnesses, Member, 2007

American Academy of Spine Physicians, Member, 2004-2006

New York State Chiropractic Association, District #17, State Delegate, 2002

New York State Chiropractic Association, District #17, Secretary, 2000-2001

New York State Chiropractic Association, District #17, Vice President, 2001-2002

New York State Chiropractic Association, Member, 1997-2002

International Association for the Study of Pain, Member, 1996-1998

American Chiropractic Association, Member, 1995-1999

### **SELECTED TEACHING/INSTRUCTING/LECTURING/CONSULTING**

**Instructor - Medical and Interprofessional Communication** – *detailed overview of medial legal communication in relation to patient subjective and objective clinical findings. Outline of direct and cross-examination techniques were presented. Overview of Voir Dire and Daubert hearings were outlined. Discussion of examination of proof in relation to causality, bodily injury, and persistent functional losses was reviewed. Court testimony flow, professional expectations, and court room etiquette was presented and emphasized. National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, Cleveland University Kansas City, College of Chiropractic – Ft. Lauderdale, Florida 2022.*

**Instructor - Spine Management** – *discussion and outline of case management workflows related to the management of acute and chronic spine pain with a particular focus on pain of traumatic origin. Evidence-Based communication and Electronic Health Record processes were emphasized and presented. Patient management and triage based on patient history, physical examination and imaging findings was outlined. Overview of interprofessional referral options including physical therapy, interventional pain management and spine surgery was discussed in detail. Spine Management as concept was discussed by Dr. John Edwards, neurosurgeon in relation to reducing escalation of non-urgent cases as well as creating space for patients with urgent need. National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, Cleveland University Kansas City, College of Chiropractic – Ft. Lauderdale, Florida 2022.*

**Instructor - Documentation and Communication in Spine Management** – presentation of compliant healthcare documentation including E/M initial and re-evaluations, daily progress notes and medical-legal narrative reports was provided. Workflows detailing interprofessional referral language, advanced imaging requests and patient communication were detailed. Streamlined processes for creating and maintaining compliant, evidence based, patient centered clinical reporting was given. Emphasis was placed on the role of a Spine Management Physician in the processes of interprofessional communication and case management. National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, Cleveland University Kansas City, College of Chiropractic – Ft. Lauderdale, Florida 2022.

**Instructor - Histology and Physical Tolerance of Spinal Ligaments** – presentation of the histological structural organization of spinal ligaments including analysis of tropocollagen as the basis for anatomical structure. Review of the structural hierarchy of the spinal ligament from microscopic to macroscopic was included. Anisotropic properties of spinal ligaments were defined, and examples presented. Detailed review of spinal entheses was presented with emphasis on advanced imaging and chronic enthesopathy. New insights into the pathogenesis, diagnostic modalities, and treatment of spinal enthesitis was outlined and presented. Specific focus was on traumatic injury to the spinal entheses and the difference in formation of spinal osteophytes and enthesophytes. Biomechanics of the degenerative spine was detailed and reviewed in terms of clinical spine management. National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, Cleveland University Kansas City, College of Chiropractic – Ft. Lauderdale, Florida 2022.

**Instructor - Accident Reconstruction and Expert Reporting** – Crash dynamics and basic physics formulas were presented and detailed. Review of biomechanical expert reports and included mathematics was discussed with context given to data collection and accuracy. Spinal injury thresholds were reviewed as well as the Law of Conservation of Energy and its relationship to crash dynamics. Specific mathematical examples were presented including workflows to review the accuracy of biomechanical expert reporting and mathematical formulas. National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, Cleveland University Kansas City, College of Chiropractic – Ft. Lauderdale, Florida 2022.

**Instructor - Degenerative versus Acute Ligament Laxity** – an updated scientifically validated grading system for the identification of degeneration of the intervertebral disc and motion segment was presented. Details such as radiographic signs of disc degeneration including loss of disc height, osteophyte formation and diffuse sclerosis were provided. Grading examples were provided in radiographic and gross specimen form starting with Grade 0 (no degeneration) to Grade 3 (severe degeneration). Outline of the validity and interobserver agreement of this grading system was shown for both the cervical and the lumbar spine. Review and emphasis on the difference between osteophyte formation and enthesophytes was again outlined. National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, Cleveland University Kansas City, College of Chiropractic – Ft. Lauderdale, Florida 2022.

**Instructor - Chiropractic Science Research** – review and presentation of updated peer-reviewed medically indexed research supporting chiropractic management of spine pain was detailed. Timeline of publication was emphasized with three years being the maximum timeframe for up-to-date data. Comprehensive review of evidence supporting chiropractic management of the spine pain patient in the Pain Management, Corrective, and the Health Maintenance Phases of care. Methods to communicate this evidence to the medical and legal communities was presented in the context of compliant patient centered clinical documentation. Efficiency of a Spine Management Physician versus conventional primary care was presented. Emphasis on the hierarchy of published evidence starting with Foundational Evidence up to Level 1 evidence was presented. National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, Cleveland University Kansas City, College of Chiropractic – Ft.

Lauderdale, Florida 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Growth of Interventional Pain Management Techniques and Current Trends in Pharmacological Management of Neuropathic Pain.** *ESI comparison to gabapentin in lumbosacral radicular pain – current trends and future progress of pain management interventions. Mode of action, required dosage, advantages and side effects profiles of currently available pharmacological approaches.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Spinal Injection Therapy - Facet, medial branch blocks, prolotherapy and epidural interventions utilization within the Medicare population, effectiveness on lumbar central canal stenosis with and without steroids and effect on prevention of spinal surgery, herniated disc, fibromyalgia and chronic musculoskeletal pain.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Adverse Events Associated with Injection Therapy – transforaminal and interlaminar epidural steroid injections, anesthesia technical considerations, effects on cervical radiculopathy midline versus paramedian approaches and perineurial injection of autologous conditioned serum. Review of FDA risk assessment.**

National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Correlation of MRI Findings and Injection Outcomes - MODIC Changes on MRI and effectiveness of facet injection, facet joint signal change on MRI with fat suppression comparison with SPECT/CT. Discussion of Modic 1, 2 and 3 with correlation of clinical outcomes and patient selection criteria.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Botulinum Toxin and Dry-Needling in Myofascial Pain Syndrome – cost effectiveness, patient response and triage of therapeutic interventions. Physiological review of trigger point etiology and clinical presentation of acute and chronic pain. Functional response of intervention including relief and recurrence.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Systematic Review Technical Considerations in Cervical Epidural Analgesia - Chemical blockage of cervical nerve roots, review of anatomical structures and correlation with MRI imaging. Blockage effects on the respiratory, circulatory and neurological systems. Review of cervical epidural space (CES) borders and variants in patient population.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Trends in opioid analgesic abuse and mortality in the USA, Evaluation of Opioid Pain Management in Injured Children, assessment of opioid reporting in Veteran Affairs –** *Emergency visitation in pediatric injury, pain management and adoption of best practices. Trends in use of prescription opioid medication using RADARS (Research Abuse, Diversion and Addiction Related Surveillance System), comparison between legitimate pharmacy channels and diversion and abuse. Opioid use prevalence and incidents in Veteran Affairs, new prescriptions or long-term conversion and relationship to persistent growth in opioid use.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Electrodiagnostic Testing, Transforaminal Epidural Steroid Injection, Intra-articular Facet Joint Injection, Spinal Manipulation Post-Epidural Injection–** *Needle EMG, active versus chronic denervation in lumbar, cervical spinal pathologies and differential diagnosis of spinal stenosis and intervertebral disc herniation. Systematic review of facet joint injections, clinical trials and conservative therapy in lower back pain. Results of spinal manipulation post-epidural injection in the cervical spine.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Radiofrequency Ablation and outcome measures - medication, function and pain in relation to pain of spinal origin.** *Medial Branch Block as prognostic tool prior to lumbar facet radiofrequency denervation. Clinical comparison disc herniation, disc bulge, cervical and lumbar radiculopathy. Diagnosis and patient triage correlation to anatomical spine structures. Long, short term risk factors and outcomes in radiofrequency ablation.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Role of Cannabinoids in Pain Management –** *review of pharmacological, botanical or synthetic origins of cannabinoids. Mechanism of action in alleviation of pain including analgesic, anti-inflammatory effects, modular actions on neurotransmitters and interactions with prescribed or endogenous opioids.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in MRI Physics – The Hardware – magnet types including permanent, resistive and superconducting magnets.** *Volume RF, surface, quadrature and phase array coils and other hardware necessary for the generation of MRI imaging.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 1 –** *magnetization, excitation, relaxation, acquisition, computing and display. T1 relaxation and relaxation curves, T2 relaxation, phase and phase coherence, T2 relaxation curves.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 2 – gradient coils, signal coding including slice encoding gradient, phase encoding gradient, Frequency encoding gradient. Gradient specifications and slice thickness. Filling k-space, k-space symmetry and k-space filling technique.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 3 – pulse sequences, spine echo sequences including multi-slicing and multi-echo sequencing. T1, T2, proton density contrast and their applications. Turbo spine echo, fast advanced spine echo (HASTE) sequence and gradient echo sequence. Inversion recovery sequence including STIR and FLAIR sequence. Choosing the right sequence pros and cons, T1, T2 and PD parameters.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation – technical parameters and artifacts – repetition time, echo time, flip angle, inversion time, number of acquisitions, matrix and field of view. Slice thickness, slice gap, phase encoding direction 1 and direction 2 and relation to bandwidth. Motion artifact, para-magnetic artifact, phase wrap artifact, susceptibility artifact, clipping artifact, spine and zebra artifacts. Effects on image quality and acquisition.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – radiographic evolution of a Schmorl's node – acute Schmorl's node and progression to chronic stage comparison to serial MRI. Endplate fracture and acute presentation and correlation to clinical findings and pain patterns. Presentation in plain film radiograph and MRI images were compared and contrasted in both acute and chronic stages.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – syringomyelia, fluid dynamics and spinal cord motion – scoliosis curve patterns and syrinx characteristics versus Chiari I malformation. Normal MRI appearance and motion artifacts related to cerebral spinal fluid motion related phenomena and common appearances on MRI imaging. Syrinx wall and fluid motion and correlation to cardiac cycle with comparison between systolic and diastolic presentations.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Biomechanics, Thoracolumbar Deformity and Surgical Outcomes – full spine analysis, adjacent spinal biomechanics and its impact on surgical outcomes. Sagittal alignment pelvis to cervical spine and association with kyphosis and lordosis mechanical positioning.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI and EMG comparison in denervated muscle diagnosis – lumbar spine pathology and age in relation to paraspinal muscle size and fatty infiltration. Fatty degeneration of paraspinal muscle in degenerative lumbar kyphosis and CT**

*versus MRI digital analysis. Positive correlations with edema on MRI and fibrillations, positive sharp waves, denervation and the level of reduced recruitment pattern.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – association between annular tear and disc degeneration** – *high intensity zone (HIZ) in lumbar disc and association to annular fissure on MRI. Identification of dual HIZ and its relationship to acute inflammation and calcified tissue and its association with discogenic pain patterns. Influence of phenotype, population size and inclusion sequence. T1, T2 and STIR imaging comparison and correlation.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – degenerative cervical myelopathy – paraspinal muscle morphology, clinical symptoms and functional status.** *Review of fatty infiltration, asymmetry findings and correlation with clinical symptoms and functional scores. Review of complex anatomical arrangement of superficial and deep muscle layers in the cervical spine, correlation to MRI findings.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Neurography, Diffuse Tensor Imaging (DTI)** – *diagnostic accuracy and fiber tracking in spinal cord compression. Review of spinal cord structural integrity, peripheral neuropathy and correlation to diffuse tensor imaging findings. Comparison in combining DTI with T2 and T2 alone and its value in magnetic resonance neurography.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – Nomenclature and Classification of Lumbar Disc Pathology** – *modified Pfirrmann grading system and lumbar disc degeneration. Consensus driven description of intervertebral disc nomenclature including intervertebral disc bulge, herniation, protrusion, broad based disc herniation, extrusion and sequestration.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI evaluation of intradural tumor – neuroimaging of spinal tumors and correlation to histological study.** *Determining method of choice for evaluation, review of numerous types of intradural-extramedullary masses including meningioma and schwannoma. Signal intensities, contrast enhancement patterns, presence of cysts and other key differentiation findings of spinal cord tumors.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Cord Compression, Myelomalacia, MRI Imaging and Clinical Correlation** – *positional cervical spinal cord compression and fibromyalgia. T1 and T2 weighted images, comparison of hypo and hyperintense signals and extent of intramedullary changes on MRI. Review of MRI findings associated with myelomalacia and discussion of correlation with clinical findings.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the

State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Characteristics of Lumbar Facet Synovial Cyst** – *formation characteristics of synovial cyst, relation to degenerative changes in spinal facet joints as demonstrated on MRI. Pre and post-surgical procedural MRI were reviewed and compared. Surgical management and subsequent resection were demonstrated.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neuroradiology – Variability in MRI Diagnostic Error Rates** – *in depth review of quality of MRI imaging and comparison to consistent MRI diagnosis between facilities. Errors of interpretation in the study examinations were considered and presented. Impact of radiological diagnosis, location of MRI study and reading radiologist and impact on treatment choice and clinical outcomes.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Wrist Anatomy and Osseous Kinematics** – *normal kinematics using biplanar radiographic model were reviewed. Discussion of extensive database of carpal bone anatomy and kinematics from a large number of healthy subjects. 3-D motion of each bone was calculated for each wrist position and discussed. Database constructed including high-resolution surface models, measures of bone volume and shape, and the 3-D kinematics of each segmented bone.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Normal Motion of the Shoulder and Glenohumeral Instability** – *normal motion of the shoulder joint compared with clinical implications of glenohumeral joint instability including surgical recommendations. Review and overview of the anatomy of the glenohumeral joint, emphasis on instability based on the current literature. Description of detailed anatomy and anatomical variants of the glenohumeral joint associated with anterior and posterior shoulder instability.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Orthopedic Testing and Shoulder Pathology Diagnosis** – *use of orthopedic special tests (OSTs) to diagnose shoulder pathology and clinical examination. Review OST clusters, examination of methodology and illustration of their use in arriving at a pathology-based diagnosis. Discussion of examination of the biceps tendon and clinical relevance. Review of SLAP lesion and shoulder impingement syndrome were reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Electrodiagnostic Testing and Carpal Tunnel Syndrome** – *Review of the most common mononeuropathy in the human body. Relationship between clinical findings, neurological examination and electrodiagnostic testing in the diagnosis of carpal tunnel syndrome. Acute and chronic symptoms including progression of the disorder were reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State

University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Current Concepts in Elbow Disorders** – *Detailed anatomy of osseous, ligamentous and muscular structure of the elbow was reviewed. Common disease of elbow disorders and their treatment was discussed. Lateral epicondylitis and medial collateral ligament injury of the elbow were outlined. Rheumatoid arthritis, posttraumatic osteoarthritis, and elderly patients with comminuted distal humeral fractures. Surgical design and technique were outlined.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Differentiating Cervical Spine from Shoulder Pathology** – *anatomical review of cervical spine and glenohumeral joint focus on similarities and differences. Cervical disorders masking shoulder pain, cervical radiculopathy, cervical spondylotic myelopathy, facet and discogenic pain patterns were outlined. Details of shoulder pathology parsonage-tuner syndrome, subscapular neuropathy and thoracic outlet were presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI of the Shoulder and Shoulder Girdle** – *review of MRI analysis of scapular fracture. Detailed review of scapular function rehabilitation and training on chronic pain syndromes. Reliability of magnetic resonance imaging versus arthroscopy for the diagnosis and classification of superior glenoid labrum anterior to posterior lesions.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Ankle, Hip and Spine** - *Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Shoulder, Elbow, Wrist and Hand** - *Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI and Diagnosis of Shoulder Disorders** – *normal and abnormal shoulder anatomy as viewed on MRI was presented. Review and presentation of MRI in the diagnosis and treatment of brachial plexus injury. Discussion of preganglionic avulsions and muscular denervation. Comparison of CT myelography to MRI myelography were outlined. Enhanced three dimensional T1 high-resolution isotropic volume excitation MR in the evaluation of shoulder pathology. Comparison with two-dimensional enhanced T1 fat saturation MRI were discussed.* National Spine Management Group, Federation of Chiropractic

Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Clinical Evaluation of Upper and Lower Extremity Pathology** – *review of relevant anatomy in shoulder, elbow, wrist, hip, knee and ankle was presented. Physical examination including orthopedic, neurological and range of motion testing was presented and compared with findings on MRI results.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Fusion Surgery and Lumbar Stenosis** – *efficacy of fusion and decompression surgery in patients with lumbar spinal stenosis. Review of degenerative spondylolisthesis and patient selection criteria. Discussion of correlation of MRI, CT findings and clinical evaluation. Review of sedimentation sign on MRI and indications of prognostic factors. Surgery versus nonsurgical treatment outlined and outcomes discussed. Compensation for lumbar spinal stenosis and clinical sagittal plane deformity was presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Posterior Lumbar Interbody Fusion and Adjacent Segment Degeneration (ASD)** – *adjacent segment degeneration as major consequence of spinal fusion. Review of occurrence and location with correlation between surgical outcomes were discussed. Discussion of age, BMI and pre-existing stenosis in cranial adjacent segment as risk factors. ASD prevalence in radiographic evidence between cranial and caudal segments were reviewed. Presentation of risk factors and pre-operative radiological features. Facet sagittalization and tropism were discussed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Morbidity and Mortality Predictions in Spinal Surgery** – *Review of the Charlson Comorbidity Index (CCI) and the American Society of Anesthesiologist (ASA) Physical Status Classification System. Review of index outcomes and relation to costs of care. Discussion of index rating and likelihood of complications. Review of classification system in cerebral spinal fluid (CSF) leaks.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spondylolisthesis, clinical and radiographic classifications** – *classification system that considers disc space height, sagittal alignment and translation, and the absence or presence of unilateral or bilateral leg pain was discussed. Detailed review of spondylolisthesis etiology, clinical presentation and imaging findings was reviewed. Review of inter and interobserver reliabilities of radiographic and clinical criteria. Review of consensus driven treatment options for degenerative spondylolisthesis presented. Transforaminal Lumbar Interbody Fusion (TLIF) in degenerative disc disease with associated spondylolisthesis grade I was reviewed and correlated.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Sagittal Alignment and Spinal Surgery, Clinical Outcomes and Follow up** – *discussion of outcomes and sagittal alignment in single unilateral transforaminal lumbar interbody fusion (TLIF). Detailed review of surgical TLIF procedure and associated mid and long-term clinical outcomes. Discussion and presentation of influence of pelvic incidents and lumbar lordosis mismatch and post-operative residual symptoms. Analysis of adjacent segment disease following fusion.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Complications and Outcomes in Adult Spinal Deformity Surgery** – *review of surgical approaches and complications in correction of adult spinal deformity. Relevance of age, comorbidities, blood loss, osteoporosis and smoking were discussed. Discussion of Cobb Angle, Sagittal Vertical Axis, Pelvic Tilt, Thoracic Kyphosis were reviewed and examined in relation to transposas lateral interbody fusion (LIF), percutaneous pedicle screw (PPS), transforaminal lumbar interbody fusion (TLIF). Comparison between minimally invasive and traditionally open procedures was provided and reviewed. Discussion of minimally invasive surgery options were emphasized and outcomes reviewed with correlation to diagnosis and procedural coding.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Surgical Interventions in Lumbar Disc Herniation** – *review of differences in surgical treatment of recurrent lumbar disc herniation. Clinical correlation between plain film radiography, MRI studies and clinical presentation were reviewed. Data on frequency in management of recurrent lumbar intervertebral disc herniations presented. Duration of symptoms and influence of patient outcomes in sciatica patients undergoing micro-discectomy and decompressions.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Length of Stay in Lumbar Spinal Surgery** – *discussion on epidemiology of lumbar surgery outcomes and hospital stay. Correlation to clinical presentation and comorbidities were reviewed. Outline of decompression and instrumental fusion in the lumbar spine. Review of costs of lumbar surgery, trends in hospital stay and costs both on a cumulative and daily basis. Comparison of the nationwide inpatient sample and national surgical quality improvement program databases for lumbar spine fusion procedures was reviewed and presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Pre-Surgical Planning and Implant Design** – *3-D printing and surgical planning discussion a variety of historical materials in the creation of patient specific implants based on unique individual anatomy. Historical trends in the creation of prosthetics with 3-D modeling software using neuroimaging data. Review of treatment complex spinal pathologies and surgical planning was discussed. Outline of current and future barriers to global implementation and commercialization was reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spine Surgery Procedures in Medical Specialty Training** – *discussion of current spine surgery training including fellowship programming in the United States. Accreditation Council for Graduate Medical Education (ACGME) cases logs were reviewed and discussed. Variability of procedures within programs and between medical specialty programs were outlined. Differential utilization between orthopedic and neurosurgical fellows was reviewed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Cerebral Spinal Fluid Dynamics, Central Nervous System Pathology and Intracranial Hypotension** – *pathophysiology and various craniospinal disorders. Directional phase contrast MRI (4D Flow) was reviewed along with the anatomical and physiological properties of cerebral spinal fluid. Specific disorders such as Alzheimer's disease, hydrocephalus, Chiari Malformation and syringomyelia. Clinical correlation of CSF dynamics to understanding disease process was reviewed including normal and abnormal flow patterns. Recent advancements in fluid flow studies were outlined and presented. Signal intensity changes on MRI study in cervical spondylotic myelopathy was discussed and compared to normal parameters. Fluid dynamics patterns within syringomyelia and Chiari malformation was discussed and correlated to MRI findings and clinical presentations. Spinal microsurgical exploration surgery and resultant CSF leak and spontaneous intractable intracranial hypotension was reviewed and its pathoanatomical presentation outlined. Review of the natural and surgical history of Chiari malformation Type I in pediatric population and clinical correlation with MRI studies. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy and Physiology of the Blood Brain Barrier** – *Review of consequences of alterations in homeostatic control of the neuronal environment. Discussion of blood flow alterations and altered vessel permeability as determinants in the pathophysiology of brain injury. Review present day literature on the anatomy, development and physiological mechanisms of the blood–brain barrier. The blood brain barrier's role in the maintenance of the extracellular environment. Vascular anatomy of the spinal cord was review in relation to the physiology of the neural environment. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Neurosurgery – Spinal Cord Anatomy, Physiology and Vascular Reactivity** – *detailed review of the blood supply of the spinal cord, anatomy of the vascular system and physiology of blood flow. Pathophysiology of various conditions including Thoracic Aortic Occlusion and Spinal Cord Injury were discussed with specific relation to risk of neurological deficit. Severity and duration as an effect was reviewed and correlated clinically. Cerebral circulation and aging, discussion of effects on cognitive functioning and cerebrovascular disease in aging. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Neurosurgery – Upper Cervical Spine Anatomy and Cerebral Spinal Fluid Flow** – *MRI flow imaging and computational fluid dynamics in healthy patients with Chiari Malformations. Review of abnormal cerebral spinal fluid flow oscillations and their effects on healthy patients. Discussion of nonlaminar complex spatial and temporal variations with associated pressure waves and pressure gradients causing syringomyelia, headaches and other clinical manifestations in Chiari I malformation. Microsurgical anatomy and internal architecture of brainstem*

*in 3D images and surgical considerations. CSF hydrodynamic changes, spinal cord injury and development of post traumatic syringomyelia (PTSM). Impact of spinal cord nerve roots and denticulate ligaments on cerebral fluid dynamics in the cervical spine was reviewed and discussed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Neurosurgery – Compression and Degeneration in Chronic Nerve Root Entrapment** – *differentiation between peripheral nerves and spinal nerve roots and effects of electrostimulation. Discussion of various stimulating or recording neurosurgical implants and success vs failure rates. Review of the nerve root compression and its relation to consequences of disc herniation and acute compression during surgery. Maximum pressure level a spinal nerve root can sustain is reviewed. Discussion of microsurgical anatomy of lumbosacral nerve rootlets, Rhizotomy and chronic spinal cord injury. Review of qualitative grading of severity of lumbar spinal stenosis on morphology of dural sac on MRI studies, review of classification systems and the consideration of impingement of neural tissue. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy of Circle of Willis, Cerebral Arteries and Stroke Etiology** – *discussion of stroke by embolism, source and cause in diagnosis and long-term treatment. Review of complex nature of embolus transport and its relation to etiology. Image based hemodynamics with discrete particle dynamics in relation to the distribution of emboli across the various cerebral arteries. Detailed anatomy of Circle of Willis reviewed and discussed with particular focus on size/inertia dependent trends in embolus distribution to the brain, distribution of cardiogenic versus aortogenic emboli among anterior, middle and posterior cerebral arteries, left versus right brain preference in cardio-embolus and aortic emboli transport and source-destination relationship for embolisms affecting the brain. Detailed review of the microsurgical anatomy of the posterior cerebral artery in three dimensional images. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Neurosurgery – Stroke Therapy, Implementation and Cost-Effectiveness** – *review of endovascular therapy in addition to standard care in acute ischemic vessel occlusion stroke. Comparison in National Institutes of Health Stroke Score (NIHSS) score, symptom onset, Alberta Stroke Program Early CT Score (ASPECTS) and occlusion location. Considerations in acute management and revascularization of tandem occlusions in acute ischemic stroke with literature review. Discussion of Transcirculation Pipeline embolization device deployment as a rescue technique. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 1** – *review of historical interventions, multilevel decompression and instrumented fusion in reduction of neural compression and spinal column stabilization. Discussion of morbidity and mortality in relation to surgical procedures. The use of the modified fragility index to predict 30-day morbidity and mortality from spine surgery. Differences in patient selection for minimally invasive versus open surgical procedures, and review of post-surgical outcomes. Morbidity, mortality and health care costs for patients undergoing spine surgery following ACGME resident duty-reform. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs*

School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 2** *Predisposing factors for dural tears in lumbar spine surgery including degenerative conditions, prior surgery and age related indicators were reviewed. Discussion and review of re-admission rates in spine surgery through metanalysis and systematic review. Bibliometric study of the most important minimally invasive (MIS) spine surgery papers including Level III and IV studies with focus on moving toward Level I and Level II.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine and Spine Pain** – *review of lack of guidelines for the management of lower back pain in the ED. Frequency of lower back pain visitation in the emergency department including environmental/sociocultural dimensions and physical/psychospiritual dimensions were reviewed. Discussion of utilization of significant healthcare resources with complete description of lower back pain characteristics, health services use in non-urgent lower back pain patients presenting to the ED. Managing spine pain in the ED using usual and customary medical intervention. Extent of appropriate CT and MRI scans in the hospital setting, accessibility reviewed in conjunction with presented national data.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Emergency Medicine – Medication Usage and Motor Vehicle Accidents** – *review of ADHD medication utilization and motor vehicle accident data and frequency of motor vehicle accident in this specific patient population. Review of the prevalent and preventable cause of morbidity and mortality among patients and concepts of restricting based on prognostic factors.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Department Imaging Perspectives** – *review of imaging protocols among a spectrum of clinical indications, perspective on aging populations and clinical complexity. Review of CT, MRI, plain film imaging and ultrasound and their relationships to internal medicine and musculoskeletal disorders examined on an emergency basis through patient generated national survey data. Details of specific contexts in which imaging has become concentrated and targeted efforts for optimization of utilization. considerations of utilization of CT in the emergency department and evaluation to increasing trends. Review of quality improvements in imaging utilization. Comparison between pediatric and adult imaging protocols and trends. Discussion and analysis of “Choose Wisely” recommendations and creating of guideline/policy/clinical pathways in New England EDs. MRI utilization in pediatric ED reviewed and analyzed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Emergency Medicine – Cauda Equina Syndrome and Other Emergent Conditions** – *traumatic injuries to the thoracolumbar spine and overall impact on emergency services. Discussion of exact definitions of Conus Medullaris Syndrome (CMS) and Cauda Equina Syndrome (CES). Diagnosis in acute phase and radiological findings clinically correlating with physical examination findings. Parameters for spinal regions of traumatic injury were presented and reviewed. Case presentations for neck and spine were included and reviewed with particular focus on*

*differential diagnosis and case uniqueness. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine Residency Curriculum** – *review of Ohio State University Emergency Medicine Residency Program Musculoskeletal Emergencies Curriculum. Outline of the significant nature of musculoskeletal emergency presentations to ED. Details in the training required to master clinical experience, self-directed learning and small group didactics. Case study reviews and discussion was presented with particular focus on infection vs non-infections and traumatic vs non-traumatic presentations in ED. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Opioid vs Non-Opioid Medications in the Emergency Department** – *discussion of limited evidence of long-term outcomes of opioids with non-opioid medication for chronic pain. Literature review on effectiveness for opioid interventions. Discussion of alternative recommendations, evidence demonstrating lack of benefit and poor long term outcomes. Variation in physician opioid prescriptions discussed. Patterns of opioid initiation at first visits for pain in the ED in the United States including frequency and dosage. Emergency Department data concerning the persistent pain after motor vehicle accidents and comparison between opioid and NSAID prescribed in the ED. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Concussion and Repeat ED visits** – *review of patients presenting to ED with concussion with re-visitation within 72 hours. Mechanism of injury including closed head injury, assault, fall and motor vehicle accidents discussed. Epidemiological evidence presented regarding number of visitations, characteristics and care paths reviewed. Discussion of adoption of a more comprehensive discharge plan to further prevent repeat visits was outlined. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Epidemiology of ED Visits in the United States, Adults Over 65 and Motor Vehicle Accidents** – *Evaluation of data from the National Hospital Ambulatory Medical Care Survey and frequency of ED visitation. Percentage of visits requiring hospital admission was reviewed along with patterns of need for critical care. Review of imaging ordering statistics and clinical diagnosis was discussed. Details of primary and secondary ED diagnosis presented in relation to sprain/strain, contusion and spinal pathology including herniated intervertebral disc, fracture and spinal cord compression. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Emergency Medicine – National Hospital Ambulatory Medical Care Survey** – *a review of the current representative data on ambulatory care visits to hospital emergency departments in the United States. Demographics, residence, insurance class, chief complaint with focus on traumatic injury, diseases of the nervous and musculoskeletal systems were outlined. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Lower Back Pain and Emergency Room Visits** – *detailed analysis of impact of lower back pain on ED globally. First systematic review of the trends in the literature including lower back pain as significant complaint and the variables in its definition. Discussion of the proper diagnosis and triage of lower back pain and its current impact on ED management was reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Emergency Medicine – Spinal Cord Injury without Radiographic Abnormality (SCIWORA) in Adults** – *case reports – detailed review of Spinal Cord Injury without Radiographic Abnormality was presented. Syndrome of post traumatic myelopathy demonstrable on MRI with no evidence of osseous injury on plain film or CT scan. Reporting of incidence was included with detailed discussion of case presentations, accurate diagnoses and triage was reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Traumatic Brain Injury Data – Related Emergency Department Visits, Hospitalizations, Deaths – United States, 2007 and 2013** – *traumatic brain injury, short and long term adverse clinical outcomes, death and disability reviewed and compared based on CDC data over a 7 year period. Mechanism of causation including motor vehicle accidents, falls and assault. Public health recommendations and interpretation of data was presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Data, Trends in Emergency Department Visits for Ischemic Stroke and Transient Ischemic Attack** – *relationship between stroke and statistical cause of death, type of stroke and prognosis related to recurrence was discussed. Specific definitions of ischemic stroke, transient ischemic attack with etiology and relationship to emergency visits were outlined and presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Emergency Medicine – US Emergency Department Use by Children** – *pediatric utilization of emergency medicine resources, description of trends on a national basis. Detailed analysis of specific demographics including race and resident status were reported and reviewed. Discussion in allocation of resources including insurance class and coverage were reviewed. Anticipated expansion of Medicaid was considered and reviewed. Estimates of nonurgent ED visits by children were presented and discussed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Supply of Chiropractic Care and Visits to Primary Care Physicians for Neck and Back Pain** – *discussion of primary care visits and lower back pain. Expenditures and contributions to disability data. Discussion of supply of chiropractic care in context of visits for lower back pain and primary care physicians. Estimated national impact of primary care visits and expenditures was outlined with a focus on chiropractic's assistance in managing lower back pain. Defining an "episode" of lower back pain and relationship to collection of epidemiological data.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship

with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Safety of Chiropractic Care in Lower Back Pain and Migraine Headaches** – *review of adverse events associated with chiropractic care in the treatment of migraine. Outline of a prospective 3-armed, single-blinded, placebo RCT. Discussion of transient and mild events following chiropractic intervention. Randomized clinical trials and meta-analysis reviewed and discussed relating to the diagnosis and management of lower back pain including adverse event reporting. Risk of injury to the head, neck or trunk following an office visit for chiropractic spinal manipulation, as compared to office visit for evaluation by primary care physician.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Pain Management in Primary Care** – *evaluation of the analgesic effects of spinal manipulation on both healthy and pain inflicted patients. Discussion of evidence of increased in pressure pain thresholds in musculoskeletal pain at both local and remote sites. Detailed knowledge of patient population regarding demographics and socioeconomic factors as well as disease-specific characteristics. Suggestion that lower back pain should not be seen as benign and self-limiting with focus on management. Describe the communication system surrounding the management of chronic pain from the perspectives of allopathic providers, acupuncture and chiropractor providers, and chronic musculoskeletal pain patients. Chiropractic manipulative treatment (CMT) association with lower healthcare costs among multiply-comorbid Medicare beneficiaries with an episode of chronic low back pain was reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Perceptions of Chiropractic Care** – *demographic review of data on the perceptions of chiropractic care. Review of patient interest, trustworthiness, costs and frequency of visits was discussed. Nationally representative survey to compare characteristics and use of survey respondents with positive and negative perceptions of DCs and chiropractic care. Positive perceptions of DCs were more common than those for chiropractic care. US adults generally perceive DCs in a positive manner. Describe the preferences of older adults for low back pain co-management by MDs and DCs and identify their concerns for receiving care under such a treatment model.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Post-Surgical Care and Care for Veterans** – **discussion of persistent post-surgical lower back and radicular pain response to chiropractic care. Relevant anatomy related to lower back pain and intervertebral disc injury was outlined and presented.** *Discussion and development of an integrated care pathway for doctors of chiropractic, primary care providers, and mental health professionals who manage veterans with low back pain, with or without mental health comorbidity, within Department of Veterans Affairs health care facilities. Support for the inclusion of chiropractic care as a component of multidisciplinary health care for low back pain, as currently recommended in existing guidelines with a focus on US Service Members. Discussion of availability of chiropractic care to military healthcare systems, referral and interprofessional communication models.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Effects of Chiropractic Care Combined with Medical Care, First Contact and Provider Type** – *differences in outcomes, patient satisfaction, and related healthcare costs in spinal, hip, and shoulder pain patients who initiated care with medical doctors (MDs) vs those who initiated care with doctors of chiropractic (DCs). Pain of musculoskeletal origin and epidemiology of reduced productivity. Comparison of data on health outcomes, patient satisfaction, and related healthcare costs in patients consulting differing first-contact care providers for musculoskeletal pain.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Integrating Chiropractic Care into Primary Care and Private Sector Healthcare Facilities** – *suggestion of a diverse role for chiropractors within conventional health care facilities. Discussion of chiropractic's effectiveness for managing musculoskeletal disorders, particularly spine-related pain and disability. Descriptions of doctors of chiropractic who work in nongovernmental, private sector health care settings in the United States. Shared electronic health records, face-to-face informal consultations methods for interprofessional communication.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – American College of Physicians – Guideline Recommendations – Non-Invasive and Non-Pharmacological** - *American College of Physicians (ACP) developed this guideline to present the evidence and provide clinical recommendations on noninvasive treatment of low back pain. Systematically review the current evidence on non-pharmacologic therapies for acute or chronic non-radicular or radicular low back pain. Comparative benefits of non-pharmacological therapies in acute/subacute low back pain including exercise, spinal manipulation, lumbar supports, acupuncture, laser, ultrasound and traction. Discussion of first and second line therapies with reduction in opioid prescription.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2022.

**Clinical Instructor - Clinical Grand Rounds** - *Diagnosis and Management of Lumbar Arachnoiditis – outline of the causes of arachnoiditis in the human spine was presented. Specific focus was on a case of lumbar arachnoiditis involving the cauda equina evidenced on T1, T2 sagittal and axial MRI. Treatment options and lack of curative interventions was presented. Relevant anatomy of the lumbar spine including cauda equina, conus medullaris, filum terminale, dura mater, pia mater and arachnoid mater were reviewed in detail. Review of arachnoiditis and chiropractic adjustment were discussed as well as interprofessional coordination of care with interventional pain management and surgical consultation.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2022.

**Clinical Instructor - Clinical Grand Rounds** - *Diagnosis and Management of Vertebral Osteomyelitis – review of the causes of vertebral osteomyelitis was presented including findings on patient subjective complaint and objective findings on physical examination. Differentiation between plain film radiographs, T1, T2, Flair and STIR weighted imaging was presented and discussed. Associated clinical findings including infections in adjacent areas including intervertebral discitis areas was presented. Causes of osteomyelitis including past surgical procedure, frequent injections, infection in an adjacent tissue, IV drug use and long-term corticosteroid use were presented. Anterior elements of the functional motor unit were outlined as the primary location of osteomyelitis. Correlation clinically to difficulties in identifying this clinical entity in its early stages was reviewed.* National Spine Management Group, LLC,

Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2022.

**Clinical Instructor - Clinical Grand Rounds** - Diagnosis and Management of Schwannoma – *discussion of a case pertaining to traumatically induced pathology to the spine of a 59-year-old female. Outline of pathological reflexes and detailed physical examination best practices. Review of important imaging included CT axial, CT sagittal and CT coronal views as well as T2 FSE sagittal, T2 FSE axial and STIR Sagittal MRI studies were reviewed and clinically correlated. Relevant cervical and lumbar spinal anatomy in the sagittal, axial and coronal planes was detailed on MRI and CT studies. Interprofessional communication with the spine surgeon was presented and review of surgical intervention including ACDF (anterior cervical discectomy and fusion) procedure to the patient's cervical spine.* Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2022.

**Clinical Instructor - Clinical Grand Rounds** - Diagnosis and Management of Synovial Cyst of the Spine – *review and outline of the diagnosis and management of a spinal synovial cyst was presented. Discussion surrounding patient history, physical examination and advanced imaging findings was outlined. Structure and appearance of synovial cyst on T1 and T2 weighted MRI was presented, and the benign nature of these lesions was reviewed. Indications for specialist referral and patient centered management ranging from watchful waiting to surgical intervention due to neurologic compromise was reviewed. Advanced imaging differences between plain film radiographs, CT and MRI was outlined and discussed. MRI signal on T2 weighted image in relation to cerebral spinal fluid was highlighted.* Spine Management Group, LLC, Federation of Chiropractic Licensing Boards – PACE, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2022.

**Clinical Instructor - Clinical Grand Rounds** - Spinal Biomechanical Engineering and Sagittal Balance of the Spine – *discussion of spine care in terms of engineering principles was presented. Biomechanical parameters such as pelvic incidence, sacral slope, pelvic tilt, and sagittal balance were outlined and presented. Spinal curvature and load distribution was presented mathematically and outlined using full spine plain film radiography. Comparative anatomy between primates and humans as well as humans of different ages was presented as examples of spinal compensation. Spinal rehabilitative principles was provided in group discussion.* Spine Management Group, LLC, Federation of Chiropractic Licensing Boards – PACE, State University of New York at Buffalo Jacobs School of Medicine, and Biomedical Sciences – 2022.

**Clinical Instructor - Clinical Grand Rounds** - Diagnosis and Management of Persistent Spine Pain – *overview and discussion of spinal anatomy including intervertebral discs, ligaments, spinal nerves, spinal cord, and facet capsule was presented. Emphasis was placed on differential diagnosis, physical examination and clinical correlation of injury mechanism and patient complaint. Specific outline of facet joint injury and joint effusion was demonstrated and discussed using T1, T2 and STIR weighted MRI scans of the lumbar spine with specific attention paid to the right L3 facet joint. Interprofessional communication in documentation and referral for interventional pain management consulting was presented with emphasis on facet or medial branch block injections.* Spine Management Group, LLC, Federation of Chiropractic Licensing Boards – PACE, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2022.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Growth of Interventional Pain Management Techniques and Current Trends in Pharmacological Management of Neuropathic Pain.** *ESI comparison to gabapentin in lumbosacral radicular pain – current trends and future progress of pain management interventions. Mode of action, required dosage, advantages and side effects profiles of currently available pharmacological approaches.* National Spine

Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Spinal Injection Therapy** - *Facet, medial branch blocks, prolotherapy and epidural interventions utilization within the Medicare population, effectiveness on lumbar central canal stenosis with and without steroids and effect on prevention of spinal surgery, herniated disc, fibromyalgia and chronic musculoskeletal pain.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Adverse Events Associated with Injection Therapy** – *transforaminal and interlaminar epidural steroid injections, anesthesia technical considerations, effects on cervical radiculopathy midline versus paramedian approaches and perineurial injection of autologous conditioned serum. Review of FDA risk assessment.*

National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Correlation of MRI Findings and Injection Outcomes** - *MODIC Changes on MRI and effectiveness of facet injection, facet joint signal change on MRI with fat suppression comparison with SPECT/CT. Discussion of Modic 1, 2 and 3 with correlation of clinical outcomes and patient selection criteria.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Botulinum Toxin and Dry-Needling in Myofascial Pain Syndrome** – *cost effectiveness, patient response and triage of therapeutic interventions. Physiological review of trigger point etiology and clinical presentation of acute and chronic pain. Functional response of intervention including relief and recurrence.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Systematic Review Technical Considerations in Cervical Epidural Analgesia** - *Chemical blockage of cervical nerve roots, review of anatomical structures and correlation with MRI imaging. Blockage effects on the respiratory, circulatory and neurological systems. Review of cervical epidural space (CES) borders and variants in patient population.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Trends in opioid analgesic abuse and mortality in the USA, Evaluation of Opioid Pain Management in Injured Children, assessment of opioid reporting in Veteran Affairs** – *Emergency visitation in pediatric injury, pain management and adoption of best practices. Trends in use of prescription opioid medication using RADARS (Research Abuse, Diversion and Addiction Related Surveillance System), comparison between legitimate pharmacy channels and diversion and abuse. Opioid use prevalence and*

*incidents in Veteran Affairs, new prescriptions or long-term conversion and relationship to persistent growth in opioid use.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Electrodiagnostic Testing, Transforaminal Epidural Steroid Injection, Intra-articular Facet Joint Injection, Spinal Manipulation Post-Epidural Injection–** *Needle EMG, active versus chronic denervation in lumbar, cervical spinal pathologies and differential diagnosis of spinal stenosis and intervertebral disc herniation. Systematic review of facet joint injections, clinical trials and conservative therapy in lower back pain. Results of spinal manipulation post-epidural injection in the cervical spine.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Radiofrequency Ablation and outcome measures - medication, function and pain in relation to pain of spinal origin.** *Medial Branch Block as prognostic tool prior to lumbar facet radiofrequency denervation. Clinical comparison disc herniation, disc bulge, cervical and lumbar radiculopathy. Diagnosis and patient triage correlation to anatomical spine structures. Long, short term risk factors and outcomes in radiofrequency ablation.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Role of Cannabinoids in Pain Management** – *review of pharmacological, botanical or synthetic origins of cannabinoids. Mechanism of action in alleviation of pain including analgesic, anti-inflammatory effects, modular actions on neurotransmitters and interactions with prescribed or endogenous opioids.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in MRI Physics – The Hardware – magnet types including permanent, resistive and superconducting magnets.** *Volume RF, surface, quadrature and phase array coils and other hardware necessary for the generation of MRI imaging.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 1 –** *magnetization, excitation, relaxation, acquisition, computing and display. T1 relaxation and relaxation curves, T2 relaxation, phase and phase coherence, T2 relaxation curves.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 2 –** *gradient coils, signal coding including slice encoding gradient, phase encoding gradient, Frequency encoding gradient. Gradient specifications and slice thickness. Filling k-space, k-space symmetry and k-space filling technique.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of

New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 3 – pulse sequences, spine echo sequences including multi-slicing and multi-echo sequencing. T1, T2, proton density contrast and their applications. Turbo spine echo, fast advanced spine echo (HASTE) sequence and gradient echo sequence. Inversion recovery sequence including STIR and FLAIR sequence. Choosing the right sequence pros and cons, T1, T2 and PD parameters.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation – technical parameters and artifacts – repetition time, echo time, flip angle, inversion time, number of acquisitions, matrix and field of view. Slice thickness, slice gap, phase encoding direction 1 and direction 2 and relation to bandwidth. Motion artifact, para-magnetic artifact, phase wrap artifact, susceptibility artifact, clipping artifact, spine and zebra artifacts. Effects on image quality and acquisition.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – radiographic evolution of a Schmorl's node – acute Schmorl's node and progression to chronic stage comparison to serial MRI. Endplate fracture and acute presentation and correlation to clinical findings and pain patterns. Presentation in plain film radiograph and MRI images were compared and contrasted in both acute and chronic stages.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – syringomyelia, fluid dynamics and spinal cord motion – scoliosis curve patterns and syrinx characteristics versus Chiari I malformation. Normal MRI appearance and motion artifacts related to cerebral spinal fluid motion related phenomena and common appearances on MRI imaging. Syrinx wall and fluid motion and correlation to cardiac cycle with comparison between systolic and diastolic presentations.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Biomechanics, Thoracolumbar Deformity and Surgical Outcomes – full spine analysis, adjacent spinal biomechanics and its impact on surgical outcomes. Sagittal alignment pelvis to cervical spine and association with kyphosis and lordosis mechanical positioning.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI and EMG comparison in denervated muscle diagnosis – lumbar spine pathology and age in relation to paraspinal muscle size and fatty infiltration. Fatty degeneration of paraspinal muscle in degenerative lumbar kyphosis and CT versus MRI digital analysis. Positive correlations with edema on MRI and fibrillations, positive sharp waves, denervation and the level of reduced recruitment pattern.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – association between annular tear and disc degeneration** – *high intensity zone (HIZ) in lumbar disc and association to annular fissure on MRI. Identification of dual HIZ and its relationship to acute inflammation and calcified tissue and its association with discogenic pain patterns. Influence of phenotype, population size and inclusion sequence. T1, T2 and STIR imaging comparison and correlation.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – degenerative cervical myelopathy – paraspinal muscle morphology, clinical symptoms and functional status.** *Review of fatty infiltration, asymmetry findings and correlation with clinical symptoms and functional scores. Review of complex anatomical arrangement of superficial and deep muscle layers in the cervical spine, correlation to MRI findings.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Neurography, Diffuse Tensor Imaging (DTI)** – *diagnostic accuracy and fiber tracking in spinal cord compression. Review of spinal cord structural integrity, peripheral neuropathy and correlation to diffuse tensor imaging findings. Comparison in combining DTI with T2 and T2 alone and its value in magnetic resonance neurography.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – Nomenclature and Classification of Lumbar Disc Pathology** – *modified Pfirrmann grading system and lumbar disc degeneration. Consensus driven description of intervertebral disc nomenclature including intervertebral disc bulge, herniation, protrusion, broad based disc herniation, extrusion and sequestration.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI evaluation of intradural tumor – neuroimaging of spinal tumors and correlation to histological study.** *Determining method of choice for evaluation, review of numerous types of intradural-extramedullary masses including meningioma and schwannoma. Signal intensities, contrast enhancement patterns, presence of cysts and other key differentiation findings of spinal cord tumors.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Cord Compression, Myelomalacia, MRI Imaging and Clinical Correlation** – *positional cervical spinal cord compression and fibromyalgia. T1 and T2 weighted images, comparison of hypo and hyperintense signals and extent of intramedullary changes on MRI. Review of MRI findings associated with myelomalacia and discussion of correlation with clinical findings.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Characteristics of Lumbar Facet Synovial Cyst** – *formation characteristics of synovial cyst, relation to degenerative changes in spinal facet joints as demonstrated on MRI. Pre and post-surgical procedural MRI were reviewed and*

*compared. Surgical management and subsequent resection were demonstrated. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Neuroradiology – Variability in MRI Diagnostic Error Rates** – *in depth review of quality of MRI imaging and comparison to consistent MRI diagnosis between facilities. Errors of interpretation in the study examinations were considered and presented. Impact of radiological diagnosis, location of MRI study and reading radiologist and impact on treatment choice and clinical outcomes. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Wrist Anatomy and Osseous Kinematics** – *normal kinematics using biplanar radiographic model were reviewed. Discussion of extensive database of carpal bone anatomy and kinematics from a large number of healthy subjects. 3-D motion of each bone was calculated for each wrist position and discussed. Database constructed including high-resolution surface models, measures of bone volume and shape, and the 3-D kinematics of each segmented bone. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Normal Motion of the Shoulder and Glenohumeral Instability** – *normal motion of the shoulder joint compared with clinical implications of glenohumeral joint instability including surgical recommendations. Review and overview of the anatomy of the glenohumeral joint, emphasis on instability based on the current literature. Description of detailed anatomy and anatomical variants of the glenohumeral joint associated with anterior and posterior shoulder instability. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Orthopedic Testing and Shoulder Pathology Diagnosis** – *use of orthopedic special tests (OSTs) to diagnose shoulder pathology and clinical examination. Review OST clusters, examination of methodology and illustration of their use in arriving at a pathology-based diagnosis. Discussion of examination of the biceps tendon and clinical relevance. Review of SLAP lesion and shoulder impingement syndrome were reviewed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Electrodiagnostic Testing and Carpal Tunnel Syndrome** – *Review of the most common mononeuropathy in the human body. Relationship between clinical findings, neurological examination and electrodiagnostic testing in the diagnosis of carpal tunnel syndrome. Acute and chronic symptoms including progression of the disorder were reviewed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Current Concepts in Elbow Disorders** – *Detailed anatomy of osseous, ligamentous and muscular structure of the elbow was reviewed. Common disease of elbow disorders and their treatment was discussed. Lateral epicondylitis*

*and medial collateral ligament injury of the elbow were outlined. Rheumatoid arthritis, posttraumatic osteoarthritis, and elderly patients with comminuted distal humeral fractures. Surgical design and technique were outlined. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Differentiating Cervical Spine from Shoulder Pathology** – *anatomical review of cervical spine and glenohumeral joint focus on similarities and differences. Cervical disorders masking shoulder pain, cervical radiculopathy, cervical spondylotic myelopathy, facet and discogenic pain patterns were outlined. Details of shoulder pathology parsonage-tuner syndrome, subscapular neuropathy and thoracic outlet were presented. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI of the Shoulder and Shoulder Girdle** – *review of MRI analysis of scapular fracture. Detailed review of scapular function rehabilitation and training on chronic pain syndromes. Reliability of magnetic resonance imaging versus arthroscopy for the diagnosis and classification of superior glenoid labrum anterior to posterior lesions. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Ankle, Hip and Spine** - *Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Shoulder, Elbow, Wrist and Hand** - *Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI and Diagnosis of Shoulder Disorders** – *normal and abnormal shoulder anatomy as viewed on MRI was presented. Review and presentation of MRI in the diagnosis and treatment of brachial plexus injury. Discussion of preganglionic avulsions and muscular denervation. Comparison of CT myelography to MRI myelography were outlined. Enhanced three dimensional T1 high-resolution isotropic volume excitation MR in the evaluation of shoulder pathology. Comparison with two-dimensional enhanced T1 fat saturation MRI were discussed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Clinical Evaluation of Upper and Lower Extremity Pathology** – *review of relevant anatomy in shoulder, elbow, wrist, hip, knee and ankle was presented. Physical examination including orthopedic, neurological and range of motion testing was presented and compared with findings on MRI results.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Fusion Surgery and Lumbar Stenosis** – *efficacy of fusion and decompression surgery in patients with lumbar spinal stenosis. Review of degenerative spondylolisthesis and patient selection criteria. Discussion of correlation of MRI, CT findings and clinical evaluation. Review of sedimentation sign on MRI and indications of prognostic factors. Surgery versus nonsurgical treatment outlined and outcomes discussed. Compensation for lumbar spinal stenosis and clinical sagittal plane deformity was presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Posterior Lumbar Interbody Fusion and Adjacent Segment Degeneration (ASD)** – *adjacent segment degeneration as major consequence of spinal fusion. Review of occurrence and location with correlation between surgical outcomes were discussed. Discussion of age, BMI and pre-existing stenosis in cranial adjacent segment as risk factors. ASD prevalence in radiographic evidence between cranial and caudal segments were reviewed. Presentation of risk factors and pre-operative radiological features. Facet sagittalization and tropism were discussed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Morbidity and Mortality Predictions in Spinal Surgery** – *Review of the Charlson Comorbidity Index (CCI) and the American Society of Anesthesiologist (ASA) Physical Status Classification System. Review of index outcomes and relation to costs of care. Discussion of index rating and likelihood of complications. Review of classification system in cerebral spinal fluid (CSF) leaks.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spondylolisthesis, clinical and radiographic classifications** – *classification system that considers disc space height, sagittal alignment and translation, and the absence or presence of unilateral or bilateral leg pain was discussed. Detailed review of spondylolisthesis etiology, clinical presentation and imaging findings was reviewed. Review of inter and interobserver reliabilities of radiographic and clinical criteria. Review of consensus driven treatment options for degenerative spondylolisthesis presented. Transforaminal Lumbar Interbody Fusion (TLIF) in degenerative disc disease with associated spondylolisthesis grade I was reviewed and correlated.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Sagittal Alignment and Spinal Surgery, Clinical Outcomes and Follow up** – *discussion of outcomes and sagittal alignment in single unilateral transforaminal lumbar interbody fusion (TLIF). Detailed review of surgical TLIF procedure and associated mid and long-term clinical outcomes. Discussion and presentation of influence*

*of pelvic incidents and lumbar lordosis mismatch and post-operative residual symptoms. Analysis of adjacent segment disease following fusion. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Complications and Outcomes in Adult Spinal Deformity Surgery** – *review of surgical approaches and complications in correction of adult spinal deformity. Relevance of age, comorbidities, blood loss, osteoporosis and smoking were discussed. Discussion of Cobb Angle, Sagittal Vertical Axis, Pelvic Tilt, Thoracic Kyphosis were reviewed and examined in relation to transposas lateral interbody fusion (LIF), percutaneous pedicle screw (PPS), transforaminal lumbar interbody fusion (TLIF). Comparison between minimally invasive and traditionally open procedures was provided and reviewed. Discussion of minimally invasive surgery options were emphasized and outcomes reviewed with correlation to diagnosis and procedural coding. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Surgical Interventions in Lumbar Disc Herniation** – *review of differences in surgical treatment of recurrent lumbar disc herniation. Clinical correlation between plain film radiography, MRI studies and clinical presentation were reviewed. Data on frequency in management of recurrent lumbar intervertebral disc herniations presented. Duration of symptoms and influence of patient outcomes in sciatica patients undergoing micro-discectomy and decompressions. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Length of Stay in Lumbar Spinal Surgery** – *discussion on epidemiology of lumbar surgery outcomes and hospital stay. Correlation to clinical presentation and comorbidities were reviewed. Outline of decompression and instrumental fusion in the lumbar spine. Review of costs of lumbar surgery, trends in hospital stay and costs both on a cumulative and daily basis. Comparison of the nationwide inpatient sample and national surgical quality improvement program databases for lumbar spine fusion procedures was reviewed and presented. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Pre-Surgical Planning and Implant Design** – *3-D printing and surgical planning discussion a variety of historical materials in the creation of patient specific implants based on unique individual anatomy. Historical trends in the creation of prosthetics with 3-D modeling software using neuroimaging data. Review of treatment complex spinal pathologies and surgical planning was discussed. Outline of current and future barriers to global implementation and commercialization was reviewed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spine Surgery Procedures in Medical Specialty Training** – *discussion of current spine surgery training including fellowship programming in the United States. Accreditation Council for Graduate Medical Education (ACGME) cases logs were reviewed and discussed. Variability of procedures within programs and between medical specialty programs were outlined. Differential utilization between orthopedic and neurosurgical fellows was reviewed. National Spine Management Group, Federation of Chiropractic Licensing Boards,*

Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Cerebral Spinal Fluid Dynamics, Central Nervous System Pathology and Intracranial Hypotension** – *pathophysiology and various craniospinal disorders. Directional phase contrast MRI (4D Flow) was reviewed along with the anatomical and physiological properties of cerebral spinal fluid. Specific disorders such as Alzheimer's disease, hydrocephalus, Chiari Malformation and syringomyelia. Clinical correlation of CSF dynamics to understanding disease process was reviewed including normal and abnormal flow patterns. Recent advancements in fluid flow studies were outlined and presented. Signal intensity changes on MRI study in cervical spondylotic myelopathy was discussed and compared to normal parameters. Fluid dynamics patterns within syringomyelia and Chiari malformation was discussed and correlated to MRI findings and clinical presentations. Spinal microsurgical exploration surgery and resultant CSF leak and spontaneous intractable intracranial hypotension was reviewed and its pathoanatomical presentation outlined. Review of the natural and surgical history of Chiari malformation Type I in pediatric population and clinical correlation with MRI studies.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy and Physiology of the Blood Brain Barrier** – *Review of consequences of alterations in homeostatic control of the neuronal environment. Discussion of blood flow alterations and altered vessel permeability as determinants in the pathophysiology of brain injury. Review present day literature on the anatomy, development and physiological mechanisms of the blood-brain barrier. The blood brain barrier's role in the maintenance of the extracellular environment. Vascular anatomy of the spinal cord was review in relation to the physiology of the neural environment.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neurosurgery – Spinal Cord Anatomy, Physiology and Vascular Reactivity** – *detailed review of the blood supply of the spinal cord, anatomy of the vascular system and physiology of blood flow. Pathophysiology of various conditions including Thoracic Aortic Occlusion and Spinal Cord Injury were discussed with specific relation to risk of neurological deficit. Severity and duration as an effect was reviewed and correlated clinically. Cerebral circulation and aging, discussion of effects on cognitive functioning and cerebrovascular disease in aging.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neurosurgery – Upper Cervical Spine Anatomy and Cerebral Spinal Fluid Flow** – *MRI flow imaging and computational fluid dynamics in healthy patients with Chiari Malformations. Review of abnormal cerebral spinal fluid flow oscillations and their effects on healthy patients. Discussion of nonlaminar complex spatial and temporal variations with associated pressure waves and pressure gradients causing syringomyelia, headaches and other clinical manifestations in Chiari I malformation. Microsurgical anatomy and internal architecture of brainstem in 3D images and surgical considerations. CSF hydrodynamic changes, spinal cord injury and development of post traumatic syringomyelia (PTSM). Impact of spinal cord nerve roots and denticulate ligaments on cerebral fluid dynamics in the cervical spine was reviewed and discussed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neurosurgery – Compression and Degeneration in Chronic Nerve Root Entrapment** – *differentiation between peripheral nerves and spinal nerve roots and effects of electrostimulation. Discussion of various stimulating or recording neurosurgical implants and success vs failure rates. Review of the nerve root compression and its relation to consequences of disc herniation and acute compression during surgery. Maximum pressure level a spinal nerve root can sustain is reviewed. Discussion of microsurgical anatomy of lumbosacral nerve rootlets, Rhizotomy and chronic spinal cord injury. Review of qualitative grading of severity of lumbar spinal stenosis on morphology of dural sac on MRI studies, review of classification systems and the consideration of impingement of neural tissue.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy of Circle of Willis, Cerebral Arteries and Stroke Etiology** – *discussion of stroke by embolism, source and cause in diagnosis and long-term treatment. Review of complex nature of embolus transport and its relation to etiology. Image based hemodynamics with discrete particle dynamics in relation to the distribution of emboli across the various cerebral arteries. Detailed anatomy of Circle of Willis reviewed and discussed with particular focus on size/inertia dependent trends in embolus distribution to the brain, distribution of cardiogenic versus aortogenic emboli among anterior, middle and posterior cerebral arteries, left versus right brain preference in cardio-embolus and aortic emboli transport and source-destination relationship for embolisms affecting the brain. Detailed review of the microsurgical anatomy of the posterior cerebral artery in three dimensional images.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neurosurgery – Stroke Therapy, Implementation and Cost-Effectiveness** – *review of endovascular therapy in addition to standard care in acute ischemic vessel occlusion stroke. Comparison in National Institutes of Health Stroke Score (NIHSS) score, symptom onset, Alberta Stroke Program Early CT Score (ASPECTS) and occlusion location. Considerations in acute management and revascularization of tandem occlusions in acute ischemic stroke with literature review. Discussion of Transcirculation Pipeline embolization device deployment as a rescue technique.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 1** – *review of historical interventions, multilevel decompression and instrumented fusion in reduction of neural compression and spinal column stabilization. Discussion of morbidity and mortality in relation to surgical procedures. The use of the modified fragility index to predict 30-day morbidity and mortality from spine surgery. Differences in patient selection for minimally invasive versus open surgical procedures, and review of post-surgical outcomes. Morbidity, mortality and health care costs for patients undergoing spine surgery following ACGME resident duty-reform.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 2** *Predisposing factors for dural tears in lumbar spine surgery including degenerative conditions, prior surgery and age related indicators were reviewed. Discussion and review of readmission rates in spine surgery through metanalysis and systematic review. Bibliometric study of the*

*most important minimally invasive (MIS) spine surgery papers including Level III and IV studies with focus on moving toward Level I and Level II. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine and Spine Pain** – *review of lack of guidelines for the management of lower back pain in the ED. Frequency of lower back pain visitation in the emergency department including environmental/sociocultural dimensions and physical/psychospiritual dimensions were reviewed. Discussion of utilization of significant healthcare resources with complete description of lower back pain characteristics, health services use in non-urgent lower back pain patients presenting to the ED. Managing spine pain in the ED using usual and customary medical intervention. Extent of appropriate CT and MRI scans in the hospital setting, accessibility reviewed in conjunction with presented national data. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Medication Usage and Motor Vehicle Accidents** – *review of ADHD medication utilization and motor vehicle accident data and frequency of motor vehicle accident sin this specific patient population. Review of the prevalent and preventable cause of morbidity and mortality among patients and concepts of restricting based on prognostic factors. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Department Imaging Perspectives** – *review of imaging protocols among a spectrum of clinical indications, perspective on aging populations and clinical complexity. Review of CT, MRI, plain film imaging and ultrasound and their relationships to internal medicine and musculoskeletal disorders examined on an emergency basis through patient generated national survey data. Details of specific contexts in which imaging has become concentrated and targeted efforts for optimization of utilization. considerations of utilization of CT in the emergency department and evaluation to increasing trends. Review of quality improvements in imaging utilization. Comparison between pediatric and adult imaging protocols and trends. Discussion and analysis of “Choose Wisely” recommendations and creating of guideline/policy/clinical pathways in New England EDs. MRI utilization in pediatric ED reviewed and analyzed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Cauda Equina Syndrome and Other Emergent Conditions** – *traumatic injuries to the thoracolumbar spine and overall impact on emergency services. Discussion of exact definitions of Conus Medullaris Syndrome (CMS) and Cauda Equina Syndrome (CES). Diagnosis in acute phase and radiological findings clinically correlating with physical examination findings. Parameters for spinal regions of traumatic injury were presented and reviewed. Case presentations for neck and spine were included and reviewed with particular focus on differential diagnosis and case uniqueness. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine Residency Curriculum** – *review of Ohio State University Emergency Medicine Residency Program Musculoskeletal Emergencies Curriculum. Outline of the significant nature of musculoskeletal emergency presentations to ED. Details in the training required to master clinical experience, self-directed learning and small group didactics. Case study reviews and discussion was presented with particular focus on infection vs non-infections and traumatic vs non-traumatic presentations in ED.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Emergency Medicine – Opioid vs Non-Opioid Medications in the Emergency Department** – *discussion of limited evidence of long-term outcomes of opioids with non-opioid medication for chronic pain. Literature review on effectiveness for opioid interventions. Discussion of alternative recommendations, evidence demonstrating lack of benefit and poor long term outcomes. Variation in physician opioid prescriptions discussed. Patterns of opioid initiation at first visits for pain in the ED in the United States including frequency and dosage. Emergency Department data concerning the persistent pain after motor vehicle accidents and comparison between opioid and NSAID prescribed in the ED.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Emergency Medicine – Concussion and Repeat ED visits** – *review of patients presenting to ED with concussion with re-visitation within 72 hours. Mechanism of injury including closed head injury, assault, fall and motor vehicle accidents discussed. Epidemiological evidence presented regarding number of visitations, characteristics and care paths reviewed. Discussion of adoption of a more comprehensive discharge plan to further prevent repeat visits was outlined.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Epidemiology of ED Visits in the United States, Adults Over 65 and Motor Vehicle Accidents** – *Evaluation of data from the National Hospital Ambulatory Medical Care Survey and frequency of ED visitation. Percentage of visits requiring hospital admission was reviewed along with patterns of need for critical care. Review of imaging ordering statistics and clinical diagnosis was discussed. Details of primary and secondary ED diagnosis presented in relation to sprain/strain, contusion and spinal pathology including herniated intervertebral disc, fracture and spinal cord compression.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Emergency Medicine – National Hospital Ambulatory Medical Care Survey** – *a review of the current representative data on ambulatory care visits to hospital emergency departments in the United States. Demographics, residence, insurance class, chief complaint with focus on traumatic injury, diseases of the nervous and musculoskeletal systems were outlined.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Emergency Medicine – Lower Back Pain and Emergency Room Visits** – *detailed analysis of impact of lower back pain on ED globally. First systematic review of the trends in the literature including lower back pain as significant complaint and the variables in its definition. Discussion of the proper diagnosis and triage of lower back pain and its*

*current impact on ED management was reviewed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Spinal Cord Injury without Radiographic Abnormality (SCIWORA) in Adults – case reports – detailed review of Spinal Cord Injury without Radiographic Abnormality was presented. Syndrome of post traumatic myelopathy demonstrable on MRI with no evidence of osseous injury on plain film or CT scan. Reporting of incidence was included with detailed discussion of case presentations, accurate diagnoses and triage was reviewed.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Traumatic Brain Injury Data – Related Emergency Department Visits, Hospitalizations, Deaths – United States, 2007 and 2013 – traumatic brain injury, short and long term adverse clinical outcomes, death and disability reviewed and compared based on CDC data over a 7 year period. Mechanism of causation including motor vehicle accidents, falls and assault. Public health recommendations and interpretation of data was presented.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Data, Trends in Emergency Department Visits for Ischemic Stroke and Transient Ischemic Attack – relationship between stroke and statistical cause of death, type of stroke and prognosis related to recurrence was discussed. Specific definitions of ischemic stroke, transient ischemic attack with etiology and relationship to emergency visits were outlined and presented.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Emergency Medicine – US Emergency Department Use by Children – pediatric utilization of emergency medicine resources, description of trends on a national basis. Detailed analysis of specific demographics including race and resident status were reported and reviewed. Discussion in allocation of resources including insurance class and coverage were reviewed. Anticipated expansion of Medicaid was considered and reviewed. Estimates of nonurgent ED visits by children were presented and discussed.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Supply of Chiropractic Care and Visits to Primary Care Physicians for Neck and Back Pain – discussion of primary care visits and lower back pain. Expenditures and contributions to disability data. Discussion of supply of chiropractic care in context of visits for lower back pain and primary care physicians. Estimated national impact of primary care visits and expenditures was outlined with a focus on chiropractic's assistance in managing lower back pain. Defining an "episode" of lower back pain and relationship to collection of epidemiological data.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Safety of Chiropractic Care in Lower Back Pain and Migraine Headaches** – *review of adverse events associated with chiropractic care in the treatment of migraine. Outline of a prospective 3-armed, single-blinded, placebo RCT. Discussion of transient and mild events following chiropractic intervention. Randomized clinical trials and meta-analysis reviewed and discussed relating to the diagnosis and management of lower back pain including adverse event reporting. Risk of injury to the head, neck or trunk following an office visit for chiropractic spinal manipulation, as compared to office visit for evaluation by primary care physician.*

National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Pain Management in Primary Care** – *evaluation of the analgesic effects of spinal manipulation on both healthy and pain inflicted patients. Discussion of evidence of increased in pressure pain thresholds in musculoskeletal pain at both local and remote sites. Detailed knowledge of patient population regarding demographics and socioeconomic factors as well as disease-specific characteristics. Suggestion that lower back pain should not be seen as benign and self-limiting with focus on management. Describe the communication system surrounding the management of chronic pain from the perspectives of allopathic providers, acupuncture and chiropractor providers, and chronic musculoskeletal pain patients.*

*Chiropractic manipulative treatment (CMT) association with lower healthcare costs among multiply-comorbid Medicare beneficiaries with an episode of chronic low back pain was reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Perceptions of Chiropractic Care** – *demographic review of data on the perceptions of chiropractic care. Review of patient interest, trustworthiness, costs and frequency of visits was discussed. Nationally representative survey to compare characteristics and use of survey respondents with positive and negative perceptions of DCs and chiropractic care. Positive perceptions of DCs were more common than those for chiropractic care. US adults generally perceive DCs in a positive manner. Describe the preferences of older adults for low back pain co-management by MDs and DCs and identify their concerns for receiving care under such a treatment model.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Post-Surgical Care and Care for Veterans** – **discussion of persistent post-surgical lower back and radicular pain response to chiropractic care. Relevant anatomy related to lower back pain and intervertebral disc injury was outlined and presented.** *Discussion and development of an integrated care pathway for doctors of chiropractic, primary care providers, and mental health professionals who manage veterans with low back pain, with or without mental health comorbidity, within Department of Veterans Affairs health care facilities. Support for the inclusion of chiropractic care as a component of multidisciplinary health care for low back pain, as currently recommended in existing guidelines with a focus on US Service Members. Discussion of availability of chiropractic care to military healthcare systems, referral and interprofessional communication models.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Effects of Chiropractic Care Combined with Medical Care, First Contact and Provider Type** – *differences in outcomes, patient satisfaction, and related healthcare costs in spinal, hip, and shoulder pain patients who initiated care with medical doctors (MDs) vs those who initiated care with doctors of chiropractic (DCs). Pain of musculoskeletal origin and epidemiology of reduced productivity. Comparison of data on health outcomes, patient satisfaction, and related healthcare costs in patients consulting differing first-contact care providers for musculoskeletal pain.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Integrating Chiropractic Care into Primary Care and Private Sector Healthcare Facilities** – *suggestion of a diverse role for chiropractors within conventional health care facilities. Discussion of chiropractic's effectiveness for managing musculoskeletal disorders, particularly spine-related pain and disability. Descriptions of doctors of chiropractic who work in nongovernmental, private sector health care settings in the United States. Shared electronic health records, face-to-face informal consultations methods for interprofessional communication.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – American College of Physicians – Guideline Recommendations – Non-Invasive and Non-Pharmacological** - *American College of Physicians (ACP) developed this guideline to present the evidence and provide clinical recommendations on noninvasive treatment of low back pain. Systematically review the current evidence on non-pharmacologic therapies for acute or chronic non-radicular or radicular low back pain. Comparative benefits of non-pharmacological therapies in acute/subacute low back pain including exercise, spinal manipulation, lumbar supports, acupuncture, laser, ultrasound and traction. Discussion of first and second line therapies with reduction in opioid prescription.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2021.

**Clinical Instructor - Clinical Grand Rounds – Diagnosing Mechanical Spine Pain** – *review of specific cervical anatomy in the spine pain patient. Clinical correlation between plain film radiographs and MRI studies was reviewed including radiographic motion studies. Computerized Mensuration Analysis was outlined and discussed with findings correlating with normative translation and angular motion data. Review of the AMA Guides to the Evaluation of Permanent Impairment 5<sup>th</sup> and 6<sup>th</sup> Editions was presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds – Pathophysiology of Osteophyte Formation** – *discussion and presentation of extraspinal and vertebral osteophyte classification. Review of traction osteophyte formation and its relationship to the vertebral body and degenerative changes was discussed. Factors influencing osteophyte formation such as Transforming Growth Factor Beta and the relationship to the initiation of osteochondrosis was outlined. Details of segmental osteophyte formation on regional biomechanics was reviewed. Peer reviewed evidence of the effects of spinal arthrodesis on adjacent segment degeneration, anterior and posterior osteophyte formation was presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Nomenclature and Morphology of Intervertebral Disc Pathology – *updated review and demonstration of intervertebral disc nomenclature related to intervertebral disc degeneration, trauma and other pathology. Specific attention paid to the agreed upon nomenclature between the Combined Task Forces of the North American Spine Society, American Spine Society, American Society of Spine Radiology and American Society of Neuroradiology. Details were provided in comparison to intervertebral disc herniation and intervertebral disc degeneration. Radial fissures were reviewed and outlined including circumferential, transverse and radial pathology and its anatomical relation to the intervertebral disc.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Rating Degenerative Changes in the Cervical Spine – *review of a radiographic rating system for objective assessment of intervertebral disc degeneration in the cervical spine. The degree of degeneration was organized based on loss of disc height, formation of osteophytes and the presence of diffuse sclerosis of adjacent vertebral bodies. Specific details of assessment were outlined and presented. Comparison of plain film radiographs to cadaver specimens was demonstrated and discussed. Review of interobserver validity of the grading system between observers was presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Mechanical Response of Damaged Cervical Spine Ligaments – *discussion of the biomechanical properties of cervical spinal ligaments under sub-failure loads. Ligaments discussed were the Anterior Longitudinal Ligament, Posterior Longitudinal ligament and the Ligamentum Flavum. Deformations exceeding physiological limitations were presented and reviewed. Grade I and Grade II injuries were outlined and discussed. Presentation included observed ligamentous injury significantly compromising ligament ability to give tensile support within physiological spinal motion. Findings were clinically correlated to long term sequelae in Alteration of Motion Segment Integrity and the AMA Guides to the Evaluation of Permanent Impairment 5<sup>th</sup> and 6<sup>th</sup> Editions.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Facet Joint Thresholds and Alteration of Motion Segment Integrity – *discussion of the predominant mode of joint loading of the cervical facet joints during whiplash injury related to retraction tension on the facet joint capsule. Review of shear forces, translation of the inferior and superior facet joint as well as injury risk due to excessive stretching of spinal ligaments was presented. Overview and discussion of mechanical trauma to ligament tissue and subsequent microstructural damage not visibly detected was outlined. Threshold for microstructural changes during retraction, reduced ligament stiffness and unrecovered strain was discussed in detail. Individual response to facet joint capsule response supported in the medical literature was presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Advanced Imaging Upper Cervical Spine and Documentation – *Discussion and review of ligament injury in the upper cervical spine. Focus was on missed diagnosis due to a lack of imaging and interprofessional communication. Discussion of upper cervical anatomy including occipital condyles, C1/C2 articulation in both MRI, plain film and CT scanning was presented using imaging slides. Clinical documentation was reviewed with particular attention paid to clinical documentation errors from other providers. Discussion on case management and interprofessional communication to correct documentation errors was emphasized.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at

Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Biomechanical Analysis in Patient Crash Injuries – Detailed review of the difference between biomechanical and biomedical analysis of injuries was presented. Outline of necessity of the use of properly credentialed biomechanical and crash investigation professionals in the diagnosis, management and reporting of crash injuries. Review of specific research related to forces during Activities of Daily Living and those sustained in a crash were presented. Details of a proper biomechanical analysis were discussed and specific review of a biomedical report omitting the mathematical calculations needed to determine force and injury potential was presented. Additional review of methods needed to determine expertise of the biomechanist or accident investigation was discussed. National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Chiropractic Professional Liability Litigation – *Discussion of thirty years of jury verdict data was reviewed and presented. Focus was on the rationale for claims against Doctor of Chiropractic and overall decisions rendered by jury pools. Outlining the risk factors associated with overly aggressive treatment, failure to diagnose and lack of interprofessional referral when medical necessary was presented with statistics. Comparison between chiropractic management and surgical management were outlined and detailed. Detailed analysis of causality versus correlation was presented and discussed.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Inter-professional Communication with the Personal Injury Attorney – *review of the outlined of the initial and re-evaluation E/M reporting in an injured patient. Discussion targeted compliant reporting and interprofessional communication with the attorney. Specific methods of ensuring compliant reporting were discussed and outlined. Statutory language, permanency determination and impairment were presented and reviewed in context of the final narrative report. Emphasis was placed on the objectification of persistent functional loss and causal relationship in the personal injury patient. Supporting medical evidence of intervertebral disc pathology including disc herniation, disc bulge and annular tear was provided.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Prevalence of Spinal Degeneration – *discussion of the clinical occurrence of spinal degenerative conditions such as Diffuse Skeletal Hyperostosis (DISH), central stenosis, foraminal stenosis, degenerative disc disease and osteoporosis was presented. Advanced imaging and plain film radiological utilization in the diagnosis of spinal degeneration was outlined and reviewed. Acute versus degenerative conditions in the spine were reviewed and detailed in relation to traumatic and non-traumatic events. Consensus driven parameters in the identification and rating of degenerative change severity was discussed.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Diagnosis of Lumbar Facet Syndrome – *overview of the most common pain syndrome in the lumbar spine including societal burdens was presented. Discussion of facet joint arthrosis being the most frequent facet joint pathology in the human spine. Outline of level of correlation between clinical symptoms, physical examination findings and degenerative spinal conditions was discussed. Presentation of diagnostic facet block and the medical necessity of such a referral when indicated was outlined.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and

Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Patient Triage – testing and physical examination workflows – *evidence-based evaluation of the spine pain patient was outlined and presented. Thorough review of criteria for ordering plain film and advanced imaging was discussed and demonstrated. Clinical rationale for ordering electrodiagnostic testing and patient referral criteria overview was demonstrated. EMR and documentation workflows were discussed, and efficiency protocols were outlined and applied to evidence based physical examination procedures with and without a medical scribe. Details of re-evaluations and clinical outcomes were reviewed and discussed.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Types of Annular Fissures on Advanced and Plain Film Imaging – *detailed review of the structure and function of the human intervertebral disc was presented including annulus fibrosis, nucleus pulposus, cartilaginous endplate and Sharpey's fibers. Diagrams as well as MRI images were outlined and reviewed in both the cervical and the lumbar spines with particular focus on the difference between degenerative and traumatically induced changes. High intensity zone (HIZ) as a characteristic of injury to the posterior aspect of the annulus fibrosis best visualized on T1 sagittal MRI images. Detailed comparison of axial and sagittal T1, T2 and STIR images was outlined, discussed, and reviewed.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Pelvic Incidence, Chiropractic and the Spine Surgeon – *detailed analysis of the historical publication of Pelvic Incidence as an integral part of sagittal spinal balance. Inter-professional communication with the surgeon using peer reviewed medically indexed biomechanical parameters was outlined and presented. Functional interaction between the spine and pelvis was demonstrated and discussed. Components of Pelvic Incidence, sacral slope, pelvic tilt, and femoral heads were reviewed and demonstrated on plain film radiographs. Specific updated research regarding spinal pelvic balance and pelvic incidence measurements was provided.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Aberrant Spinal Motion and Degenerative Disc Disease – *research analysis of mechanical factors as etiology of intervertebral disc degeneration. Review of spinal tissue mechanics and their relation to mechanical stress was discussed and correlated to abnormal changes in the structure and composition of the intervertebral disc. Detailed discussion of ingrowth of pain transmitting nerve fibers into degenerative intervertebral discs and their relationship to acute and chronic pain was presented. Clinical correlation between congenital malformations of the spine, including scoliosis, kyphosis, spina bifida, spondylolysis and Klippel Feil syndrome), accidental back injury or ligament injury, occupational exposure and causing aberrant mechanical loading of lumbar spine, and intervertebral disc degeneration visible on T1, T2 and STIR MRI, sagittal and axial sequences was presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Diagnosis of Ossification of Anterior Longitudinal Ligament – *discussion of the different types of Ossification of Anterior Longitudinal Ligament (OALL) including Segmental, Continuous and Mixed in the sagittal plane. Review of axial classification including Flat, Nodular and Globular was presented. Anatomy of spinal ligaments including the anterior and posterior longitudinal ligament and their attachments was outlined. Context of dysphagia, its progression, symptoms and need for referral was reviewed and outlined.* National Spine Management

Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Chiropractic Management of Chronic Spine Pain – *Discussion of chronic spine pain as a Public Health issue and Chiropractic's role in its diagnosis and management. Epidemiological statistics of chronic pain sufferers consulting Doctors of Chiropractic in the United States was presented. Outline of a spinal function and preventative model as opposed to a curative process was presented and reviewed.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Cervical Spinal Alignment and Knee Replacement Revision Rates – *Review of the most common cervical spinal sagittal alignment parameters and their relationship to interprofessional communication was presented. Discussion of rationale for knee replacement revision surgery including aseptic loosening, fracture and prosthetic joint infection was reviewed. Specific statistical review on revision surgery and effective treatment of end-stage knee osteoarthritis was presented. Details of evidence-based research outlining patients with cervical degenerative disorders having a higher rate of total knee replacement revisions than those without degenerative changes. Analysis of the benefit of radiographic studies looking at the mechanical relationship between the cervical spine and knee composition was outlined and reviewed.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Importance of Interprofessional Healthcare Communication and Teamwork – *Discussion of the history of interprofessional healthcare and the acknowledgement by the World Health Organization was presented. Specific detail on chiropractic academia and student perception of its importance was outlined. The growth and importance of both interprofessional education and communication was stressed and reviewed. Need for a clear professional identity to facilitate interprofessional education and communication was presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Chiropractic Management of Cervical Disc Herniation – *clinical differences between etiology and morphology were reviewed and presented. Outline of patient history, physical examination including neurological and orthopedic evaluation as well as criteria for ordering and reading advanced imaging such as MRI and CT were presented. Plain film static and dynamic radiographic studies were reviewed. Patient centered; consensus driven clinical diagnosis including interprofessional communication was presented. Specific anatomical location of cervical intervertebral disc herniation was presented and correlated to neurological findings on physical examination.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Chiropractic Management of Cervical Radiculopathy – *characterization of cervical radiculopathy in terms of neurological dysfunction including compression and inflammation of the spinal nerves was reviewed. Cervical spondylosis and intervertebral disc herniation as causative factors were presented and discussed. Conservative care as well as surgical intervention were presented and correlated to response to care and clinical findings. Outline of patient history, physical examination including neurological and orthopedic evaluation as well as criteria for ordering and reading advanced imaging such as MRI and CT were presented. Plain film static and dynamic radiographic studies were reviewed. Patient centered; consensus driven clinical diagnosis including interprofessional communication was presented.* National Spine Management Group, LLC,

Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Chiropractic Management of Lumbar Disc Herniation – *review of the pathogenesis and morphological presentation of lumbar intervertebral disc herniation. Outline of patient history, physical examination including neurological and orthopedic evaluation as well as criteria for ordering and reading advanced imaging such as MRI and CT were presented. Plain film static and dynamic radiographic studies were reviewed. Patient centered; consensus driven clinical diagnosis including interprofessional communication was presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards, State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Chiropractic Management of Lumbar Radiculopathy – *review of the pathogenesis and morphological presentation of lumbar radiculopathy and radiculitis. Outline of patient history, physical examination including neurological and orthopedic evaluation as well as criteria for ordering and reading advanced imaging such as MRI and CT were presented. Plain film static and dynamic radiographic studies were reviewed. Patient centered; consensus driven clinical diagnosis including interprofessional communication was presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Chiropractic Management of Cervical Facet Syndrome – *review of the pathogenesis and morphological presentation of cervical facet syndrome. Outline of patient history, physical examination including neurological and orthopedic evaluation as well as criteria for ordering and reading advanced imaging such as MRI and CT were presented. Discussion involving ligamentous structures such as interspinous ligament, supraspinous ligament and facet capsules was presented. Plain film static and dynamic radiographic studies were reviewed as well as specific sclerotogenous referrals patterns of facet mediated pain. Patient centered; consensus driven clinical diagnosis including interprofessional communication was presented, specific presentation relating to diagnostic medial branch blocks and pain management referral was emphasized.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Chiropractic Management of Lumbar Facet Syndrome - *discussion of the clinical presentation of lumbar facet syndrome with specific attention paid to the pathogenesis and differential diagnosis of lumbar disc herniation, disc bulge and radiculopathy. Review of patient history, mechanism of injury, physical examination including neurological and orthopedic evaluation as well as criteria for ordering and reading advanced imaging such as MRI and CT were presented. Discussion involving ligamentous structures such as interspinous ligament, supraspinous ligament and facet capsules was presented. Plain film static and dynamic radiographic studies were reviewed as well as specific sclerotogenous referrals patterns of facet mediated pain. Patient centered; consensus driven clinical diagnosis including interprofessional communication was presented, specific presentation relating to diagnostic medial branch blocks and pain management referral was emphasized.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** – Chiropractic Management of Cervical Myelopathy – *review of all relevant spinal anatomy in the cervical and lumbar spine including vertebral bodies, central canal, neuroforamen, ligamentum flavum, anterior and posterior longitudinal ligaments, facet capsule, interspinous ligament, supraspinous ligament, and spinal cord anatomy. Review of spinal cord anatomy included white and gray matter, ventral and dorsal nerve roots, spinal nerve including the dura mater,*

arachnoid mater, and pia mater. Specific review of *patient history, mechanism of injury, physical examination including neurological and orthopedic evaluation as well as criteria for ordering and reading advanced imaging such as MRI and CT* were presented in relation to cervical myelopathy, spinal cord compression and myelomalacia. Patient centered; consensus driven clinical diagnosis including interprofessional communication was presented, specific presentation relating to diagnostic outcomes and management. Attention was given to MRI and CT myelogram in both the uncomplicated and complicated patient. National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** - Chiropractic Diagnosis and Management of Cervical Ligament Laxity – *detailed outline of injury thresholds of the anterior longitudinal, posterior longitudinal and ligamentum flavum was presented. Review of structural and physiological properties relating to stress/strain curve of the above ligaments. Outline of the toe region, linear region and failure region was demonstrated. Transversely isotropic material properties of spinal ligaments was included and correlated to chiropractic care and impairment rating using the AMA Guides to the Evaluation and Management 5<sup>th</sup> and 6<sup>th</sup> editions.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** - Chiropractic Diagnosis and Management of Lumbar Ligament Laxity – *detailed outline of injury thresholds of the anterior longitudinal, posterior longitudinal and ligamentum flavum was presented in the lumbar spine. Review of structural and physiological properties relating to stress/strain curve of the above ligaments. Outline of the toe region, linear region and failure region was demonstrated. Transversely isotropic material properties of spinal ligaments was included and correlated to chiropractic care and impairment rating using the AMA Guides to the Evaluation and Management 5<sup>th</sup> and 6<sup>th</sup> editions.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** - Chiropractic Diagnosis and Management of the Pre-Surgical Patient – *outline and analysis of spinal biomechanical parameters in a whole spine model of care. Review of the details of measuring Pelvic Incidence and discussion of history of its analysis. Outline of movement from a regional model of spine care to a full spine model was presented. Analysis of the components of the pre-surgical patient including muscle movement patterns, segmental mobility, spinal curvature and rotation in the coronal, sagittal and axial planes was presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** - Chiropractic Diagnosis and Management of the Post-Surgical Patient - *outline and analysis of spinal biomechanical parameters in a whole spine model of care in the post-surgical analysis of the spine pain patient. Review of the details of measuring Pelvic Incidence and discussion of history of its analysis in relation to sagittal balance and vertebral body rotation was discussed. Outline of movement from a regional model of spine care to a full spine model was presented particularly in the context of pain management strategies post-surgery. Analysis of the components of the post-surgical patient including muscle movement patterns, segmental mobility, spinal curvature and rotation in the coronal, sagittal and axial planes was presented. Interprofessional communication and co-management was emphasized.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** - Chiropractic Diagnosis and Management of Vertebral Compression Fracture – *review of the influence of osteoporosis on development of vertebral compression fracture was reviewed and detailed in comparison to neoplasm. Utilization of MRI as the gold standard for evaluating the age of and pathophysiology was discussed and presented. Absorptiometry was outlined and presented in relation to monitoring bone density. Interprofessional communication of absolute versus relative contraindications to conservative care and spinal manipulation was outlined and reviewed. Review of the three columns of vertebral architecture was detailed.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** - Chiropractic Diagnosis and Management of Whiplash Disorder – *outline and discussion of Whiplash as a mechanism of injury with particular focus on damage to underlying tissue structures. Review of anatomy, with specific focus on surrounding muscular, supraspinous ligament, interspinous ligament, spinal nerve, spinal cord, facet capsule and dorsal/ventral nerve roots was presented. Clinical correlation to imaging studies and its influence on management of the Whiplash patient was reviewed. Focused attention was paid to Whiplash as a mechanism of injury and not a complete diagnosis.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** - Chiropractic Diagnosis and Management of Non-Specific Spine Pain – *outline and discussion of the mechanical origins of spine pain emphasizing common biomechanical parameters was presented. Review of chiropractic-based maintenance care in the management of patient centered spine pain was introduced. Introduction of a Spine Management Physician was presented outlining the natural history of spine pain in the human population. Interprofessional communication and case management was emphasized with focus on societal burden of mismanagement was presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** - Diagnosis and Management of Anterior Sacral Contusion – *overview and discussion of contusion of the anterior sacral ala in an elite college cross-country runner. Physical examination outlining range of motion, neurological and orthopedic examination was reviewed and correlated to the subjective complaint of right sided lower back pain. Misdiagnosis was presented and long-standing symptoms resulting in possible cessation of play for this athlete. Discussion of interprofessional communication with the neuroradiologist and subsequent MRI order with slices through the anterior sacrum was reviewed and presented.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** - Diagnosis and Management of Post-Surgical Cervical Facet Syndrome – *a case of persistent and worsening neck and left shoulder pain post-surgical fusion was presented. Pre and post plain film and advanced imaging slides were reviewed and correlated clinically to left sided mid-scapular pain. Physical examination including orthopedic and neurological testing was discussed in correlation to presenting symptoms. Differential diagnosis of radiculopathy, radiculitis, discogenic pain, scapular myofascial syndrome and thoracic intersegmental dysfunction was presented. Cervical facet joint referral patterns were reviewed and outline of referral for diagnostic facet joint block was discussed.* National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Clinical Instructor - Clinical Grand Rounds** - Diagnosis and Management of Lumbar Disc Herniation – case review of traumatically induced 10mm L5-S1 intervertebral disc extrusion was presented. Correlation of neurological examination including testing of myotomes, dermatomes and deep tendon reflexes was presented. Detailed review of sagittal T1, sagittal T2, axial T1, axial T2 as well as STIR images were presented. Clinical referral for surgical consultation was outlined and clinical rationale was presented. Review of the different between anatomical and functional sources of pain were outlined with a focus on biomechanical parameters such as pelvic incidence. National Spine Management Group, LLC, Federation of Chiropractic Licensing Boards - PACE. State University of New York at Buffalo Jacobs School of Medicine and Biomedical Sciences – 2021.

**Instructor - Spine Management Clinical Workflows** – in-depth review and discussion of the Doctor of Chiropractic as a Spine Management Physician with specific focus on the diagnosis and management of spine pain of mechanical origin. Details were outlined in relation to triage of anatomical causes of spine pain such as fracture, tumor, infection. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.

**Instructor - Pain Management and the Chiropractic Adjustment** – Current peer reviewed indexed research demonstrating the chiropractic adjustment's effect on the central nervous system and pain threshold was outlined and reviewed. Anatomical review and contemporary supportive research were discussed. Details of central nervous system response to the chiropractic adjustment was reviewed and demonstrated. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.

**Instructor - Corrective Spinal Care and Chiropractic Case Management** - Current peer reviewed indexed research demonstrating the chiropractic adjustment's effect on the biomechanical structure of the human spine during the corrective/rehabilitative phase of care. Basic outline of biomechanical parameters in symptomatic and asymptomatic patients was reviewed with particular focus on pathobiomechanics in chiropractic practice. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.

**Instructor - Health Maintenance Care and Chiropractic Case Management** - Current peer reviewed indexed research demonstrating the chiropractic adjustment's effect on the maintenance of the human spine. Details of indexed research reviewing Chiropractic's role in the reduction of narcotic utilization and decreased absenteeism from work due to disability. Communicating Health Maintenance Care to the medical profession and the public was emphasized. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.

**Instructor - Evidence Based Clinical Reporting** – overview of current CPT and ICD-10 coding guidelines pertaining to the evaluation and management of spine pain patients was presented. Timed codes, relevant diagnosis related to injured tissue was presented. Specific discussion of proper format of the Assessment portion of clinical documentation was presented. Review of the difference between daily progress notes and Evaluation and Management [E/M] reporting was provided. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.

**Instructor - Cervical Spine Clinical Workflows** – detailed review of workflows of a thorough patient history and identification of clinical red flags related to relative and absolute contraindications to

*chiropractic care was presented. Outline of neurological examination including pathological reflexes present during spinal cord compression, cervical stenosis and cervical myelomalacia was discussed. Normal vs abnormal measurement of range of motion objectifying spinal dysfunction was presented. Specific orthopedic testing related to specific muscle, nerve or intervertebral disc injury was discussed. Review of interprofessional triage and imaging decision tree was outlined with specific focus on the pain management physician and spinal surgeon. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.*

**Instructor - Lumbar Spine Clinical Workflows** - *detailed review of workflows of a thorough patient history and identification of clinical red flags related to relative and absolute contraindications to chiropractic care was presented. Outline of neurological examination including pathological reflexes present during cervical and lumbar stenosis was discussed. Normal vs abnormal measurement of range of motion objectifying spinal dysfunction was presented. Specific orthopedic testing related to muscle, nerve or intervertebral disc injury was discussed. Review of interprofessional triage and imaging decision tree was outlined with specific focus on the pain management physician and spinal surgeon. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.*

**Instructor - Interprofessional Clinical Documentation for the Primary Care Physician** – *contemporary techniques to best communicate chiropractic care to the Primary Care Physician was discussed and presented. Analysis of the depth and scope of communication was emphasized with direct focus on the proper documentation management system including demographic sheet, imaging reports, most recent evaluation, and management reports. Discussion of appropriate timing for phone consultation was presented. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.*

**Instructor - Clinical Documentation for the Spine Surgeon** - *contemporary techniques to best communicate chiropractic care to the spine surgeon was discussed and presented. Analysis of the depth and scope of communication was emphasized with direct focus on the proper documentation management system including demographic sheet, imaging reports, most recent evaluation, and management reports. Discussion of appropriate timing for phone consultation was presented. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.*

**Instructor - Clinical Documentation for the Pain Management Physician** - *contemporary techniques to best communicate chiropractic care to the pain management physician was discussed and presented. Analysis of the depth and scope of communication was emphasized with direct focus on the proper documentation management system including demographic sheet, imaging reports, most recent evaluation, and management reports. Discussion of appropriate timing for phone consultation was presented. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.*

**Instructor -Clinical Documentation for Attorney** - *contemporary techniques to best communicate chiropractic care and permanent injury to the personal injury attorney was discussed and presented. Analysis of the depth and scope of communication was emphasized with direct focus on the proper documentation management system including diagnosis, response to treatment, causality and persistent functional loss was outlined. Discussion of appropriate timing for phone consultation was presented. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences,*

Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.

**Instructor -Spinal Biomechanical Engineering** – *detailed presentation of the progression of laboratory-based biomechanics into the clinical realm was outlined. Evidence based review of Pelvic Incidence and other sagittal balance parameters was presented. Regional sagittal balance and communication with the spine surgeon in the spine management practice was reviewed. Specific discussions were related to spinal sagittal balance and the non-surgical spine pain patient and correlated to the Corrective Care Phase of Chiropractic Care. Outline of the future of full spine biomechanical modeling was presented in relation to symptomatic and asymptomatic patients.* National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.

**Instructor - Objectifying the Biomechanical Spine Lesion** – review of ligament laxity and alternation of motion segment integrity was presented with specific correlation to the AMA Guides to the Evaluation of Permanent Impairment 5<sup>th</sup> and 6<sup>th</sup> Edition. Correlation to bodily injury, causality and persistent functional losses in the personal injury patient and communication with the attorney was outlined. Attention was paid to the differences between vertebral body translation and angular motion deficits between adjacent motor units was presented. Specific details on measurement tools and analysis of the injured cervical and lumbar spines were discussed. National Spine Management Group, Cleveland University Kansas City, Chiropractic and Health Sciences, Federation of Chiropractic Licensing Boards, Buffalo, NY, Lehi, UT 2021.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Growth of Interventional Pain Management Techniques and Current Trends in Pharmacological Management of Neuropathic Pain.** *ESI comparison to gabapentin in lumbosacral radicular pain – current trends and future progress of pain management interventions. Mode of action, required dosage, advantages and side effects profiles of currently available pharmacological approaches.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Spinal Injection Therapy - Facet, medial branch blocks, prolotherapy and epidural interventions utilization within the Medicare population, effectiveness on lumbar central canal stenosis with and without steroids and effect on prevention of spinal surgery, herniated disc, fibromyalgia and chronic musculoskeletal pain.** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Adverse Events Associated with Injection Therapy** – *transforaminal and interlaminar epidural steroid injections, anesthesia technical considerations, effects on cervical radiculopathy midline versus paramedian approaches and perineural injection of autologous conditioned serum. Review of FDA risk assessment.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Correlation of MRI Findings and Injection Outcomes - *MODIC Changes on MRI and effectiveness of facet injection, facet joint signal change on MRI with fat suppression comparison with SPECT/CT. Discussion of Modic 1, 2 and 3 with correlation of clinical outcomes and patient selection criteria.*** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Botulinum Toxin and Dry-Needling in Myofascial Pain Syndrome – *cost effectiveness, patient response and triage of therapeutic interventions. Physiological review of trigger point etiology and clinical presentation of acute and chronic pain. Functional response of intervention including relief and recurrence.*** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Systematic Review Technical Considerations in Cervical Epidural Analgesia - *Chemical blockage of cervical nerve roots, review of anatomical structures and correlation with MRI imaging. Blockage effects on the respiratory, circulatory and neurological systems. Review of cervical epidural space (CES) borders and variants in patient population.*** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Trends in opioid analgesic abuse and mortality in the USA, Evaluation of Opioid Pain Management in Injured Children, assessment of opioid reporting in Veteran Affairs – *Emergency visitation in pediatric injury, pain management and adoption of best practices. Trends in use of prescription opioid medication using RADARS (Research Abuse, Diversion and Addiction Related Surveillance System), comparison between legitimate pharmacy channels and diversion and abuse. Opioid use prevalence and incidents in Veteran Affairs, new prescriptions or long-term conversion and relationship to persistent growth in opioid use.*** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Electrodiagnostic Testing, Transforaminal Epidural Steroid Injection, Intra-articular Facet Joint Injection, Spinal Manipulation Post-Epidural Injection– *Needle EMG, active versus chronic denervation in lumbar, cervical spinal pathologies and differential diagnosis of spinal stenosis and intervertebral disc herniation. Systematic review of facet joint injections, clinical trials and conservative therapy in lower back pain. Results of spinal manipulation post-epidural injection in the cervical spine.*** National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Radiofrequency Ablation and outcome measures - medication, function and pain in relation to pain of spinal origin. *Medial Branch Block as prognostic tool prior to lumbar facet radiofrequency denervation. Clinical comparison disc herniation, disc bulge, cervical and lumbar radiculopathy. Diagnosis and patient triage correlation to anatomical spine structures. Long, short term risk factors and outcomes in radiofrequency ablation.*** National Spine Management Group, Federation of Chiropractic

Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Role of Cannabinoids in Pain Management** – *review of pharmacological, botanical or synthetic origins of cannabinoids. Mechanism of action in alleviation of pain including analgesic, anti-inflammatory effects, modular actions on neurotransmitters and interactions with prescribed or endogenous opioids.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in MRI Physics – The Hardware – magnet types including permanent, resistive and superconducting magnets.** *Volume RF, surface, quadrature and phase array coils and other hardware necessary for the generation of MRI imaging.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 1 – magnetization, excitation, relaxation, acquisition, computing and display.** *T1 relaxation and relaxation curves, T2 relaxation, phase and phase coherence, T2 relaxation curves.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 2 – gradient coils, signal coding including slice encoding gradient, phase encoding gradient, Frequency encoding gradient.** *Gradient specifications and slice thickness. Filling k-space, k-space symmetry and k-space filling technique.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 3 – pulse sequences, spine echo sequences including multi-slicing and multi-echo sequencing.** *T1, T2, proton density contrast and their applications. Turbo spine echo, fast advanced spine echo (HASTE) sequence and gradient echo sequence. Inversion recovery sequence including STIR and FLAIR sequence. Choosing the right sequence pros and cons, T1, T2 and PD parameters.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation – technical parameters and artifacts** – *repetition time, echo time, flip angle, inversion time, number of acquisitions, matrix and field of view. Slice thickness, slice gap, phase encoding direction 1 and direction 2 and relation to bandwidth. Motion artifact, para-magnetic artifact, phase wrap artifact, susceptibility artifact, clipping artifact, spine and zebra artifacts. Effects on image quality and acquisition.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – radiographic evolution of a Schmorl's node** – *acute Schmorl's node and progression to chronic stage comparison to serial MRI. Endplate fracture and acute presentation and correlation to clinical findings and pain patterns. Presentation in plain film radiograph and MRI images were compared and contrasted in both acute and chronic stages.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – syringomyelia, fluid dynamics and spinal cord motion** – *scoliosis curve patterns and syrinx characteristics versus Chiari I malformation. Normal MRI appearance and motion artifacts related to cerebral spinal fluid motion related phenomena and common appearances on MRI imaging. Syrinx wall and fluid motion and correlation to cardiac cycle with comparison between systolic and diastolic presentations.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Biomechanics, Thoracolumbar Deformity and Surgical Outcomes** – *full spine analysis, adjacent spinal biomechanics and its impact on surgical outcomes. Sagittal alignment pelvis to cervical spine and association with kyphosis and lordosis mechanical positioning.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI and EMG comparison in denervated muscle diagnosis** – *lumbar spine pathology and age in relation to paraspinal muscle size and fatty infiltration. Fatty degeneration of paraspinal muscle in degenerative lumbar kyphosis and CT versus MRI digital analysis. Positive correlations with edema on MRI and fibrillations, positive sharp waves, denervation and the level of reduced recruitment pattern.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – association between annular tear and disc degeneration** – *high intensity zone (HIZ) in lumbar disc and association to annular fissure on MRI. Identification of dual HIZ and its relationship to acute inflammation and calcified tissue and its association with discogenic pain patterns. Influence of phenotype, population size and inclusion sequence. T1, T2 and STIR imaging comparison and correlation.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – degenerative cervical myelopathy – paraspinal muscle morphology, clinical symptoms and functional status.** *Review of fatty infiltration, asymmetry findings and correlation with clinical symptoms and functional scores. Review of complex anatomical arrangement of superficial and deep muscle layers in the cervical spine, correlation to MRI findings.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Neurography, Diffuse Tensor Imaging (DTI)** – *diagnostic accuracy and fiber tracking in spinal cord compression. Review of spinal cord structural integrity, peripheral neuropathy and correlation to diffuse tensor imaging findings. Comparison in combining DTI with T2 and T2 alone and its value in magnetic resonance neurography.*

National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – Nomenclature and Classification of Lumbar Disc Pathology** – *modified Pfirrmann grading system and lumbar disc degeneration. Consensus driven description of intervertebral disc nomenclature including intervertebral disc bulge, herniation, protrusion, broad based disc herniation, extrusion and sequestration.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI evaluation of intradural tumor – neuroimaging of spinal tumors and correlation to histological study.** *Determining method of choice for evaluation, review of numerous types of intradural-extramedullary masses including meningioma and schwannoma. Signal intensities, contrast enhancement patterns, presence of cysts and other key differentiation findings of spinal cord tumors.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Cord Compression, Myelomalacia, MRI Imaging and Clinical Correlation** – *positional cervical spinal cord compression and fibromyalgia. T1 and T2 weighted images, comparison of hypo and hyperintense signals and extent of intramedullary changes on MRI. Review of MRI findings associated with myelomalacia and discussion of correlation with clinical findings.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Characteristics of Lumbar Facet Synovial Cyst** – *formation characteristics of synovial cyst, relation to degenerative changes in spinal facet joints as demonstrated on MRI. Pre and post-surgical procedural MRI were reviewed and compared. Surgical management and subsequent resection were demonstrated.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neuroradiology – Variability in MRI Diagnostic Error Rates** – *in depth review of quality of MRI imaging and comparison to consistent MRI diagnosis between facilities. Errors of interpretation in the study examinations were considered and presented. Impact of radiological diagnosis, location of MRI study and reading radiologist and impact on treatment choice and clinical outcomes.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Wrist Anatomy and Osseous Kinematics** – *normal kinematics using biplanar radiographic model were reviewed. Discussion of extensive database of carpal bone anatomy and kinematics from a large number of healthy subjects. 3-D motion of each bone was calculated for each wrist position and discussed. Database constructed including high-resolution surface models, measures of bone volume and shape, and the 3-D kinematics of each segmented bone.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of

New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Normal Motion of the Shoulder and Glenohumeral Instability** – *normal motion of the shoulder joint compared with clinical implications of glenohumeral joint instability including surgical recommendations. Review and overview of the anatomy of the glenohumeral joint, emphasis on instability based on the current literature. Description of detailed anatomy and anatomical variants of the glenohumeral joint associated with anterior and posterior shoulder instability.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Orthopedic Testing and Shoulder Pathology Diagnosis** - *use of orthopedic special tests (OSTs) to diagnose shoulder pathology and clinical examination. Review OST clusters, examination of methodology and illustration of their use in arriving at a pathology-based diagnosis. Discussion of examination of the biceps tendon and clinical relevance. Review of SLAP lesion and shoulder impingement syndrome were reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Electrodiagnostic Testing and Carpal Tunnel Syndrome** – *Review of the most common mononeuropathy in the human body. Relationship between clinical findings, neurological examination and electrodiagnostic testing in the diagnosis of carpal tunnel syndrome. Acute and chronic symptoms including progression of the disorder were reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Current Concepts in Elbow Disorders** – *Detailed anatomy of osseous, ligamentous and muscular structure of the elbow was reviewed. Common disease of elbow disorders and their treatment was discussed. Lateral epicondylitis and medial collateral ligament injury of the elbow were outlined. Rheumatoid arthritis, posttraumatic osteoarthritis, and elderly patients with comminuted distal humeral fractures. Surgical design and technique were outlined.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Differentiating Cervical Spine from Shoulder Pathology** – *anatomical review of cervical spine and glenohumeral joint focus on similarities and differences. Cervical disorders masking shoulder pain, cervical radiculopathy, cervical spondylotic myelopathy, facet and discogenic pain patterns were outlined. Details of shoulder pathology parsonage-tuner syndrome, subscapular neuropathy and thoracic outlet were presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI of the Shoulder and Shoulder Girdle** – *review of MRI analysis of scapular fracture. Detailed review of scapular function rehabilitation and training on chronic pain syndromes. Reliability of magnetic resonance imaging versus arthroscopy for the diagnosis and classification of superior glenoid labrum anterior to posterior lesions.* National Spine Management Group, Federation of Chiropractic Licensing Boards,

Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Ankle, Hip and Spine** - *Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Shoulder, Elbow, Wrist and Hand** - *Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI and Diagnosis of Shoulder Disorders** – *normal and abnormal shoulder anatomy as viewed on MRI was presented. Review and presentation of MRI in the diagnosis and treatment of brachial plexus injury. Discussion of preganglionic avulsions and muscular denervation. Comparison of CT myelography to MRI myelography were outlined. Enhanced three dimensional T1 high-resolution isotropic volume excitation MR in the evaluation of shoulder pathology. Comparison with two-dimensional enhanced T1 fat saturation MRI were discussed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Clinical Evaluation of Upper and Lower Extremity Pathology** – *review of relevant anatomy in shoulder, elbow, wrist, hip, knee and ankle was presented. Physical examination including orthopedic, neurological and range of motion testing was presented and compared with findings on MRI results.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Fusion Surgery and Lumbar Stenosis** – *efficacy of fusion and decompression surgery in patients with lumbar spinal stenosis. Review of degenerative spondylolisthesis and patient selection criteria. Discussion of correlation of MRI, CT findings and clinical evaluation. Review of sedimentation sign on MRI and indications of prognostic factors. Surgery versus nonsurgical treatment outlined and outcomes discussed. Compensation for lumbar spinal stenosis and clinical sagittal plane deformity was presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Posterior Lumbar Interbody Fusion and Adjacent Segment Degeneration (ASD)** – *adjacent segment degeneration as major consequence of spinal fusion. Review of occurrence and location with correlation between surgical outcomes were discussed. Discussion of age, BMI and pre-existing stenosis in cranial adjacent*

*segment as risk factors. ASD prevalence in radiographic evidence between cranial and caudal segments were reviewed. Presentation of risk factors and pre-operative radiological features. Facet sagittalization and tropism were discussed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Morbidity and Mortality Predictions in Spinal Surgery** – *Review of the Charlson Comorbidity Index (CCI) and the American Society of Anesthesiologist (ASA) Physical Status Classification System. Review of index outcomes and relation to costs of care. Discussion of index rating and likelihood of complications. Review of classification system in cerebral spinal fluid (CSF) leaks. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spondylolisthesis, clinical and radiographic classifications** – *classification system that considers disc space height, sagittal alignment and translation, and the absence or presence of unilateral or bilateral leg pain was discussed. Detailed review of spondylolisthesis etiology, clinical presentation and imaging findings was reviewed. Review of inter and interobserver reliabilities of radiographic and clinical criteria. Review of consensus driven treatment options for degenerative spondylolisthesis presented. Transforaminal Lumbar Interbody Fusion (TLIF) in degenerative disc disease with associated spondylolisthesis grade I was reviewed and correlated. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Sagittal Alignment and Spinal Surgery, Clinical Outcomes and Follow up** – *discussion of outcomes and sagittal alignment in single unilateral transforaminal lumbar interbody fusion (TLIF). Detailed review of surgical TLIF procedure and associated mid and long-term clinical outcomes. Discussion and presentation of influence of pelvic incidents and lumbar lordosis mismatch and post-operative residual symptoms. Analysis of adjacent segment disease following fusion. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Complications and Outcomes in Adult Spinal Deformity Surgery** – *review of surgical approaches and complications in correction of adult spinal deformity. Relevance of age, comorbidities, blood loss, osteoporosis and smoking were discussed. Discussion of Cobb Angle, Sagittal Vertical Axis, Pelvic Tilt, Thoracic Kyphosis were reviewed and examined in relation to transposas lateral interbody fusion (LIF), percutaneous pedicle screw (PPS), transforaminal lumbar interbody fusion (TLIF). Comparison between minimally invasive and traditionally open procedures was provided and reviewed. Discussion of minimally invasive surgery options were emphasized and outcomes reviewed with correlation to diagnosis and procedural coding. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Surgical Interventions in Lumbar Disc Herniation** – *review of differences in surgical treatment of recurrent lumbar disc herniation. Clinical correlation between plain film radiography, MRI studies and clinical presentation were reviewed. Data on frequency in management of recurrent lumbar intervertebral disc herniations presented. Duration of symptoms and influence of patient outcomes in sciatica patients undergoing*

*micro-discectomy and decompressions.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Length of Stay in Lumbar Spinal Surgery** – *discussion on epidemiology of lumbar surgery outcomes and hospital stay. Correlation to clinical presentation and comorbidities were reviewed. Outline of decompression and instrumental fusion in the lumbar spine. Review of costs of lumbar surgery, trends in hospital stay and costs both on a cumulative and daily basis. Comparison of the nationwide inpatient sample and national surgical quality improvement program databases for lumbar spine fusion procedures was reviewed and presented.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Pre-Surgical Planning and Implant Design** – *3-D printing and surgical planning discussion a variety of historical materials in the creation of patient specific implants based on unique individual anatomy. Historical trends in the creation of prosthetics with 3-D modeling software using neuroimaging data. Review of treatment complex spinal pathologies and surgical planning was discussed. Outline of current and future barriers to global implementation and commercialization was reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spine Surgery Procedures in Medical Specialty Training** – *discussion of current spine surgery training including fellowship programming in the United States. Accreditation Council for Graduate Medical Education (ACGME) cases logs were reviewed and discussed. Variability of procedures within programs and between medical specialty programs were outlined. Differential utilization between orthopedic and neurosurgical fellows was reviewed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Cerebral Spinal Fluid Dynamics, Central Nervous System Pathology and Intracranial Hypotension** – *pathophysiology and various craniospinal disorders. Directional phase contrast MRI (4D Flow) was reviewed along with the anatomical and physiological properties of cerebral spinal fluid. Specific disorders such as Alzheimer's disease, hydrocephalus, Chiari Malformation and syringomyelia. Clinical correlation of CSF dynamics to understanding disease process was reviewed including normal and abnormal flow patterns. Recent advancements in fluid flow studies were outlined and presented. Signal intensity changes on MRI study in cervical spondylotic myelopathy was discussed and compared to normal parameters. Fluid dynamics patterns within syringomyelia and Chiari malformation was discussed and correlated to MRI findings and clinical presentations. Spinal microsurgical exploration surgery and resultant CSF leak and spontaneous intractable intracranial hypotension was reviewed and its pathoanatomical presentation outlined. Review of the natural and surgical history of Chiari malformation Type I in pediatric population and clinical correlation with MRI studies.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy and Physiology of the Blood Brain Barrier** – *Review of consequences of alterations in homeostatic control of the neuronal environment. Discussion of blood flow alterations and altered vessel permeability as determinants in the*

*pathophysiology of brain injury. Review present day literature on the anatomy, development and physiological mechanisms of the blood–brain barrier. The blood brain barrier’s role in the maintenance of the extracellular environment. Vascular anatomy of the spinal cord was review in relation to the physiology of the neural environment. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Neurosurgery – Spinal Cord Anatomy, Physiology and Vascular Reactivity** – *detailed review of the blood supply of the spinal cord, anatomy of the vascular system and physiology of blood flow. Pathophysiology of various conditions including Thoracic Aortic Occlusion and Spinal Cord Injury were discussed with specific relation to risk of neurological deficit. Severity and duration as an effect was reviewed and correlated clinically. Cerebral circulation and aging, discussion of effects on cognitive functioning and cerebrovascular disease in aging. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Neurosurgery – Upper Cervical Spine Anatomy and Cerebral Spinal Fluid Flow** – *MRI flow imaging and computational fluid dynamics in healthy patients with Chiari Malformations. Review of abnormal cerebral spinal fluid flow oscillations and their effects on healthy patients. Discussion of nonlaminar complex spatial and temporal variations with associated pressure waves and pressure gradients causing syringomyelia, headaches and other clinical manifestations in Chiari I malformation. Microsurgical anatomy and internal architecture of brainstem in 3D images and surgical considerations. CSF hydrodynamic changes, spinal cord injury and development of post traumatic syringomyelia (PTSM). Impact of spinal cord nerve roots and denticulate ligaments on cerebral fluid dynamics in the cervical spine was reviewed and discussed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Neurosurgery – Compression and Degeneration in Chronic Nerve Root Entrapment** – *differentiation between peripheral nerves and spinal nerve roots and effects of electrostimulation. Discussion of various stimulating or recording neurosurgical implants and success vs failure rates. Review of the nerve root compression and its relation to consequences of disc herniation and acute compression during surgery. Maximum pressure level a spinal nerve root can sustain is reviewed. Discussion of microsurgical anatomy of lumbosacral nerve rootlets, Rhizotomy and chronic spinal cord injury. Review of qualitative grading of severity of lumbar spinal stenosis on morphology of dural sac on MRI studies, review of classification systems and the consideration of impingement of neural tissue. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy of Circle of Willis, Cerebral Arteries and Stroke Etiology** – *discussion of stroke by embolism, source and cause in diagnosis and long-term treatment. Review of complex nature of embolus transport and its relation to etiology. Image based hemodynamics with discrete particle dynamics in relation to the distribution of emboli across the various cerebral arteries. Detailed anatomy of Circle of Willis reviewed and discussed with particular focus on size/inertia dependent trends in embolus distribution to the brain, distribution of cardiogenic versus aortogenic emboli among anterior, middle and posterior cerebral arteries, left versus right brain preference in cardio-embolus and aortic emboli transport and source-destination relationship for embolisms affecting the brain. Detailed review of the microsurgical anatomy of the posterior cerebral*

*artery in three dimensional images. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Neurosurgery – Stroke Therapy, Implementation and Cost-Effectiveness** – *review of endovascular therapy in addition to standard care in acute ischemic vessel occlusion stroke. Comparison in National Institutes of Health Stroke Score (NIHSS) score, symptom onset, Alberta Stroke Program Early CT Score (ASPECTS) and occlusion location. Considerations in acute management and revascularization of tandem occlusions in acute ischemic stroke with literature review. Discussion of Transcirculation Pipeline embolization device deployment as a rescue technique. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 1** – *review of historical interventions, multilevel decompression and instrumented fusion in reduction of neural compression and spinal column stabilization. Discussion of morbidity and mortality in relation to surgical procedures. The use of the modified fragility index to predict 30-day morbidity and mortality from spine surgery. Differences in patient selection for minimally invasive versus open surgical procedures, and review of post-surgical outcomes. Morbidity, mortality and health care costs for patients undergoing spine surgery following ACGME resident duty-reform. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 2** *Predisposing factors for dural tears in lumbar spine surgery including degenerative conditions, prior surgery and age related indicators were reviewed. Discussion and review of re-admission rates in spine surgery through metanalysis and systematic review. Bibliometric study of the most important minimally invasive (MIS) spine surgery papers including Level III and IV studies with focus on moving toward Level I and Level II. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine and Spine Pain** – *review of lack of guidelines for the management of lower back pain in the ED. Frequency of lower back pain visitation in the emergency department including environmental/sociocultural dimensions and physical/psychospiritual dimensions were reviewed. Discussion of utilization of significant healthcare resources with complete description of lower back pain characteristics, health services use in non-urgent lower back pain patients presenting to the ED. Managing spine pain in the ED using usual and customary medical intervention. Extent of appropriate CT and MRI scans in the hospital setting, accessibility reviewed in conjunction with presented national data. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Medication Usage and Motor Vehicle Accidents** – *review of ADHD medication utilization and motor vehicle accident data and frequency of motor vehicle accident in this specific patient population. Review of the prevalent and preventable cause of morbidity and mortality among patients and concepts of restricting based on prognostic factors. National Spine Management Group, Federation of Chiropractic Licensing Boards,*

Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Department Imaging Perspectives** – *review of imaging protocols among a spectrum of clinical indications, perspective on aging populations and clinical complexity. Review of CT, MRI, plain film imaging and ultrasound and their relationships to internal medicine and musculoskeletal disorders examined on an emergency basis through patient generated national survey data. Details of specific contexts in which imaging has become concentrated and targeted efforts for optimization of utilization. considerations of utilization of CT in the emergency department and evaluation to increasing trends. Review of quality improvements in imaging utilization. Comparison between pediatric and adult imaging protocols and trends. Discussion and analysis of “Choose Wisely” recommendations and creating of guideline/policy/clinical pathways in New England EDs. MRI utilization in pediatric ED reviewed and analyzed.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Emergency Medicine – Cauda Equina Syndrome and Other Emergent Conditions** – *traumatic injuries to the thoracolumbar spine and overall impact on emergency services. Discussion of exact definitions of Conus Medullaris Syndrome (CMS) and Cauda Equina Syndrome (CES). Diagnosis in acute phase and radiological findings clinically correlating with physical examination findings. Parameters for spinal regions of traumatic injury were presented and reviewed. Case presentations for neck and spine were included and reviewed with particular focus on differential diagnosis and case uniqueness.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine Residency Curriculum** – *review of Ohio State University Emergency Medicine Residency Program Musculoskeletal Emergencies Curriculum. Outline of the significant nature of musculoskeletal emergency presentations to ED. Details in the training required to master clinical experience, self-directed learning and small group didactics. Case study reviews and discussion was presented with particular focus on infection vs non-infections and traumatic vs non-traumatic presentations in ED.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Emergency Medicine – Opioid vs Non-Opioid Medications in the Emergency Department** – *discussion of limited evidence of long-term outcomes of opioids with non-opioid medication for chronic pain. Literature review on effectiveness for opioid interventions. Discussion of alternative recommendations, evidence demonstrating lack of benefit and poor long term outcomes. Variation in physician opioid prescriptions discussed. Patterns of opioid initiation at first visits for pain in the ED in the United States including frequency and dosage. Emergency Department data concerning the persistent pain after motor vehicle accidents and comparison between opioid and NSAID prescribed in the ED.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Emergency Medicine – Concussion and Repeat ED visits** – *review of patients presenting to ED with concussion with re-visitation within 72 hours. Mechanism of injury including closed head injury, assault, fall and motor vehicle accidents discussed. Epidemiological evidence presented regarding number of visitations, characteristics and care paths reviewed. Discussion*

*of adoption of a more comprehensive discharge plan to further prevent repeat visits was outlined. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Epidemiology of ED Visits in the United States, Adults Over 65 and Motor Vehicle Accidents** – *Evaluation of data from the National Hospital Ambulatory Medical Care Survey and frequency of ED visitation. Percentage of visits requiring hospital admission was reviewed along with patterns of need for critical care. Review of imaging ordering statistics and clinical diagnosis was discussed. Details of primary and secondary ED diagnosis presented in relation to sprain/strain, contusion and spinal pathology including herniated intervertebral disc, fracture and spinal cord compression. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Emergency Medicine – National Hospital Ambulatory Medical Care Survey** – *a review of the current representative data on ambulatory care visits to hospital emergency departments in the United States. Demographics, residence, insurance class, chief complaint with focus on traumatic injury, diseases of the nervous and musculoskeletal systems were outlined. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Lower Back Pain and Emergency Room Visits** – *detailed analysis of impact of lower back pain on ED globally. First systematic review of the trends in the literature including lower back pain as significant complaint and the variables in its definition. Discussion of the proper diagnosis and triage of lower back pain and its current impact on ED management was reviewed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Spinal Cord Injury without Radiographic Abnormality (SCIWORA) in Adults** – *case reports – detailed review of Spinal Cord Injury without Radiographic Abnormality was presented. Syndrome of post traumatic myelopathy demonstrable on MRI with no evidence of osseous injury on plain film or CT scan. Reporting of incidence was included with detailed discussion of case presentations, accurate diagnoses and triage was reviewed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Traumatic Brain Injury Data – Related Emergency Department Visits, Hospitalizations, Deaths – United States, 2007 and 2013** – *traumatic brain injury, short and long term adverse clinical outcomes, death and disability reviewed and compared based on CDC data over a 7 year period. Mechanism of causation including motor vehicle accidents, falls and assault. Public health recommendations and interpretation of data was presented. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Emergency Medicine** – *CDC Data, Trends in Emergency Department Visits for Ischemic Stroke and Transient Ischemic Attack – relationship between stroke and statistical cause of death, type of stroke and prognosis related to recurrence was discussed. Specific definitions of ischemic stroke, transient ischemic attack with etiology and relationship to emergency visits were outlined and presented. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Emergency Medicine – US Emergency Department Use by Children** – *pediatric utilization of emergency medicine resources, description of trends on a national basis. Detailed analysis of specific demographics including race and resident status were reported and reviewed. Discussion in allocation of resources including insurance class and coverage were reviewed. Anticipated expansion of Medicaid was considered and reviewed. Estimates of nonurgent ED visits by children were presented and discussed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Supply of Chiropractic Care and Visits to Primary Care Physicians for Neck and Back Pain** – *discussion of primary care visits and lower back pain. Expenditures and contributions to disability data. Discussion of supply of chiropractic care in context of visits for lower back pain and primary care physicians. Estimated national impact of primary care visits and expenditures was outlined with a focus on chiropractic's assistance in managing lower back pain. Defining an "episode" of lower back pain and relationship to collection of epidemiological data. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Safety of Chiropractic Care in Lower Back Pain and Migraine Headaches** – *review of adverse events associated with chiropractic care in the treatment of migraine. Outline of a prospective 3-armed, single-blinded, placebo RCT. Discussion of transient and mild events following chiropractic intervention. Randomized clinical trials and meta-analysis reviewed and discussed relating to the diagnosis and management of lower back pain including adverse event reporting. Risk of injury to the head, neck or trunk following an office visit for chiropractic spinal manipulation, as compared to office visit for evaluation by primary care physician. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Pain Management in Primary Care** – *evaluation of the analgesic effects of spinal manipulation on both healthy and pain inflicted patients. Discussion of evidence of increased in pressure pain thresholds in musculoskeletal pain at both local and remote sites. Detailed knowledge of patient population regarding demographics and socioeconomic factors as well as disease-specific characteristics. Suggestion that lower back pain should not be seen as benign and self-limiting with focus on management. Describe the communication system surrounding the management of chronic pain from the perspectives of allopathic providers, acupuncture and chiropractor providers, and chronic musculoskeletal pain patients. Chiropractic manipulative treatment (CMT) association with lower healthcare costs among multiply-comorbid Medicare beneficiaries with an episode of chronic low back pain was reviewed. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs*

School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Perceptions of Chiropractic Care** – *demographic review of data on the perceptions of chiropractic care. Review of patient interest, trustworthiness, costs and frequency of visits was discussed. Nationally representative survey to compare characteristics and use of survey respondents with positive and negative perceptions of DCs and chiropractic care. Positive perceptions of DCs were more common than those for chiropractic care. US adults generally perceive DCs in a positive manner. Describe the preferences of older adults for low back pain co-management by MDs and DCs and identify their concerns for receiving care under such a treatment model.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Post-Surgical Care and Care for Veterans** – *discussion of persistent post-surgical lower back and radicular pain response to chiropractic care. Relevant anatomy related to lower back pain and intervertebral disc injury was outlined and presented. Discussion and development of an integrated care pathway for doctors of chiropractic, primary care providers, and mental health professionals who manage veterans with low back pain, with or without mental health comorbidity, within Department of Veterans Affairs health care facilities. Support for the inclusion of chiropractic care as a component of multidisciplinary health care for low back pain, as currently recommended in existing guidelines with a focus on US Service Members. Discussion of availability of chiropractic care to military healthcare systems, referral and interprofessional communication models.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Effects of Chiropractic Care Combined with Medical Care, First Contact and Provider Type** – *differences in outcomes, patient satisfaction, and related healthcare costs in spinal, hip, and shoulder pain patients who initiated care with medical doctors (MDs) vs those who initiated care with doctors of chiropractic (DCs). Pain of musculoskeletal origin and epidemiology of reduced productivity. Comparison of data on health outcomes, patient satisfaction, and related healthcare costs in patients consulting differing first-contact care providers for musculoskeletal pain.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Integrating Chiropractic Care into Primary Care and Private Sector Healthcare Facilities** – *suggestion of a diverse role for chiropractors within conventional health care facilities. Discussion of chiropractic's effectiveness for managing musculoskeletal disorders, particularly spine-related pain and disability. Descriptions of doctors of chiropractic who work in nongovernmental, private sector health care settings in the United States. Shared electronic health records, face-to-face informal consultations methods for interprofessional communication.* National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – American College of Physicians – Guideline Recommendations – Non-Invasive and Non-Pharmacological** – *American College of Physicians (ACP) developed this guideline to present the evidence and provide clinical recommendations on noninvasive treatment of low back pain. Systematically review the current evidence on non-pharmacologic therapies for acute or chronic non-radicular or radicular low back pain.*

*Comparative benefits of non-pharmacological therapies in acute/subacute low back pain including exercise, spinal manipulation, lumbar supports, acupuncture, laser, ultrasound and traction. Discussion of first and second line therapies with reduction in opioid prescription. National Spine Management Group, Federation of Chiropractic Licensing Boards, Cleveland University College of Chiropractic, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2020.*

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Growth of Interventional Pain Management Techniques and Current Trends in Pharmacological Management of Neuropathic Pain.** *ESI comparison to gabapentin in lumbosacral radicular pain – current trends and future progress of pain management interventions. Mode of action, required dosage, advantages and side effects profiles of currently available pharmacological approaches.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Spinal Injection Therapy - Facet, medial branch blocks, prolotherapy and epidural interventions** *utilization within the Medicare population, effectiveness on lumbar central canal stenosis with and without steroids and effect on prevention of spinal surgery, herniated disc, fibromyalgia, and chronic musculoskeletal pain.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Adverse Events Associated with Injection Therapy – transforaminal and interlaminar epidural steroid injections, anesthesia technical considerations, effects on cervical radiculopathy midline versus paramedian approaches and perineurial injection of autologous conditioned serum.** *Review of FDA risk assessment.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Correlation of MRI Findings and Injection Outcomes - MODIC Changes on MRI and effectiveness of facet injection, facet joint signal change on MRI with fat suppression comparison with SPECT/CT.** *Discussion of Modic 1, 2 and 3 with correlation of clinical outcomes and patient selection criteria.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Botulinum Toxin and Dry-Needling in Myofascial Pain Syndrome – cost effectiveness, patient response and triage of therapeutic interventions.** *Physiological review of trigger point etiology and clinical presentation of acute and chronic pain. Functional response of intervention including relief and recurrence.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Systematic Review Technical Considerations in Cervical Epidural Analgesia - Chemical blockage of cervical nerve roots, review of anatomical structures and correlation with MRI imaging.** *Blockage*

*effects on the respiratory, circulatory, and neurological systems. Review of cervical epidural space (CES) borders and variants in patient population. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Trends in opioid analgesic abuse and mortality in the USA, Evaluation of Opioid Pain Management in Injured Children, assessment of opioid reporting in Veteran Affairs – Emergency visitation in pediatric injury, pain management and adoption of best practices. Trends in use of prescription opioid medication using RADARS (Research Abuse, Diversion and Addiction Related Surveillance System), comparison between legitimate pharmacy channels and diversion and abuse. Opioid use prevalence and incidents in Veteran Affairs, new prescriptions or long-term conversion and relationship to persistent growth in opioid use.** Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Electrodiagnostic Testing, Transforaminal Epidural Steroid Injection, Intra-articular Facet Joint Injection, Spinal Manipulation Post-Epidural Injection– Needle EMG, active versus chronic denervation in lumbar, cervical spinal pathologies and differential diagnosis of spinal stenosis and intervertebral disc herniation. Systematic review of facet joint injections, clinical trials and conservative therapy in lower back pain. Results of spinal manipulation post-epidural injection in the cervical spine.** Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Radiofrequency Ablation and outcome measures - medication, function, and pain in relation to pain of spinal origin. Medial Branch Block as prognostic tool prior to lumbar facet radiofrequency denervation. Clinical comparison disc herniation, disc bulge, cervical and lumbar radiculopathy. Diagnosis and patient triage correlation to anatomical spine structures. Long, short term risk factors and outcomes in radiofrequency ablation.** Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Role of Cannabinoids in Pain Management – review of pharmacological, botanical, or synthetic origins of cannabinoids. Mechanism of action in alleviation of pain including analgesic, anti-inflammatory effects, modular actions on neurotransmitters and interactions with prescribed or endogenous opioids.** Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in MRI Physics – The Hardware – magnet types including permanent, resistive, and superconducting magnets. Volume RF, surface, quadrature and phase array coils and other hardware necessary for the generation of MRI imaging.** Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 1 –** *magnetization, excitation, relaxation, acquisition, computing, and display. T1 relaxation and relaxation curves, T2 relaxation, phase, and phase coherence, T2 relaxation curves.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 2 –** *gradient coils, signal coding including slice encoding gradient, phase encoding gradient, Frequency encoding gradient. Gradient specifications and slice thickness. Filling k-space, k-space symmetry and k-space filling technique.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 3 –** *pulse sequences, spine echo sequences including multi-slicing and multi-echo sequencing. T1, T2, proton density contrast and their applications. Turbo spine echo, fast advanced spine echo (HASTE) sequence and gradient echo sequence. Inversion recovery sequence including STIR and FLAIR sequence. Choosing the right sequence pros and cons, T1, T2 and PD parameters.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation –** **technical parameters and artifacts** – *repetition time, echo time, flip angle, inversion time, number of acquisitions, matrix and field of view. Slice thickness, slice gap, phase encoding direction 1 and direction 2 and relation to bandwidth. Motion artifact, para-magnetic artifact, phase wrap artifact, susceptibility artifact, clipping artifact, spine and zebra artifacts. Effects on image quality and acquisition.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019

**Clinical Instructor - Specialty Research in Neuroradiology – radiographic evolution of a Schmorl's node** – *acute Schmorl's node and progression to chronic stage comparison to serial MRI. Endplate fracture and acute presentation and correlation to clinical findings and pain patterns. Presentation in plain film radiograph and MRI images were compared in both acute and chronic stages.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – syringomyelia, fluid dynamics and spinal cord motion** – *scoliosis curve patterns and syrinx characteristics versus Chiari I malformation. Normal MRI appearance and motion artifacts related to cerebral spinal fluid motion related phenomena and common appearances on MRI imaging. Syrinx wall and fluid motion and correlation to cardiac cycle with comparison between systolic and diastolic presentations.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Biomechanics, Thoracolumbar Deformity and Surgical Outcomes** – *full spine analysis, adjacent spinal biomechanics, and its impact on surgical outcomes. Sagittal alignment pelvis to cervical spine and association with kyphosis and lordosis mechanical positioning.* Academy of Chiropractic, Recognized

by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI and EMG comparison in denervated muscle diagnosis** – *lumbar spine pathology and age in relation to paraspinal muscle size and fatty infiltration. Fatty degeneration of paraspinal muscle in degenerative lumbar kyphosis and CT versus MRI digital analysis. Positive correlations with edema on MRI and fibrillations, positive sharp waves, denervation and the level of reduced recruitment pattern.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – association between annular tear and disc degeneration** – *high intensity zone (HIZ) in lumbar disc and association to annular fissure on MRI. Identification of dual HIZ and its relationship to acute inflammation and calcified tissue and its association with discogenic pain patterns. Influence of phenotype, population size and inclusion sequence. T1, T2 and STIR imaging comparison and correlation.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – degenerative cervical myelopathy** – *paraspinal muscle morphology, clinical symptoms, and functional status. Review of fatty infiltration, asymmetry findings and correlation with clinical symptoms and functional scores. Review of complex anatomical arrangement of superficial and deep muscle layers in the cervical spine, correlation to MRI findings.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Neurography, Diffuse Tensor Imaging (DTI)** – *diagnostic accuracy and fiber tracking in spinal cord compression. Review of spinal cord structural integrity, peripheral neuropathy, and correlation to diffuse tensor imaging findings. Comparison in combining DTI with T2 and T2 alone and its value in magnetic resonance neurography.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – Nomenclature and Classification of Lumbar Disc Pathology** – *modified Pfirrmann grading system and lumbar disc degeneration. Consensus driven description of intervertebral disc nomenclature including intervertebral disc bulge, herniation, protrusion, broad based disc herniation, extrusion, and sequestration.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI evaluation of intradural tumor** – *neuroimaging of spinal tumors and correlation to histological study. Determining method of choice for evaluation, review of numerous types of intradural-extramedullary masses including meningioma and schwannoma. Signal intensities, contrast enhancement patterns, presence of cysts and other key differentiation findings of spinal cord tumors.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Cord Compression, Myelomalacia, MRI Imaging and Clinical Correlation** – *positional cervical spinal cord compression and fibromyalgia. T1 and T2 weighted images, comparison of hypo and hyperintense signals and extent of intramedullary changes on MRI. Review of MRI findings associated with myelomalacia and discussion of correlation with clinical findings.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Characteristics of Lumbar Facet Synovial Cyst** – *formation characteristics of synovial cyst, relation to degenerative changes in spinal facet joints as demonstrated on MRI. Pre and post-surgical procedural MRI were reviewed and compared. Surgical management and subsequent resection were demonstrated.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neuroradiology – Variability in MRI Diagnostic Error Rates** – *in depth review of quality of MRI imaging and comparison to consistent MRI diagnosis between facilities. Errors of interpretation in the study examinations were considered and presented. Impact of radiological diagnosis, location of MRI study and reading radiologist and impact on treatment choice and clinical outcomes.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Wrist Anatomy and Osseous Kinematics** – *normal kinematics using biplanar radiographic model were reviewed. Discussion of extensive database of carpal bone anatomy and kinematics from many healthy subjects. 3-D motion of each bone was calculated for each wrist position and discussed. Database constructed including high-resolution surface models, measures of bone volume and shape, and the 3-D kinematics of each segmented bone.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Normal Motion of the Shoulder and Glenohumeral Instability** – *normal motion of the shoulder joint compared with clinical implications of glenohumeral joint instability including surgical recommendations. Review and overview of the anatomy of the glenohumeral joint, emphasis on instability based on the current literature. Description of detailed anatomy and anatomical variants of the glenohumeral joint associated with anterior and posterior shoulder instability.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Orthopedic Testing and Shoulder Pathology Diagnosis** – *use of orthopedic special tests (OSTs) to diagnose shoulder pathology and clinical examination. Review OST clusters, examination of methodology and illustration of their use in arriving at a pathology-based diagnosis. Discussion of examination of the biceps tendon and clinical relevance. Review of SLAP lesion and shoulder impingement syndrome were reviewed.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic

Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Electrodiagnostic Testing and Carpal Tunnel Syndrome** – *Review of the most common mononeuropathy in the human body. Relationship between clinical findings, neurological examination and electrodiagnostic testing in the diagnosis of carpal tunnel syndrome. Acute and chronic symptoms including progression of the disorder were reviewed.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Current Concepts in Elbow Disorders** – *Detailed anatomy of osseous, ligamentous and muscular structure of the elbow was reviewed. Common disease of elbow disorders and their treatment was discussed. Lateral epicondylitis and medial collateral ligament injury of the elbow were outlined. Rheumatoid arthritis, posttraumatic osteoarthritis, and elderly patients with comminuted distal humeral fractures. Surgical design and technique were outlined.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Differentiating Cervical Spine from Shoulder Pathology** – *anatomical review of cervical spine and glenohumeral joint focus on similarities and differences. Cervical disorders masking shoulder pain, cervical radiculopathy, cervical spondylotic myelopathy, facet and discogenic pain patterns were outlined. Details of shoulder pathology parsonage-tuner syndrome, subscapular neuropathy and thoracic outlet were presented.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI of the Shoulder and Shoulder Girdle** – *review of MRI analysis of scapular fracture. Detailed review of scapular function rehabilitation and training on chronic pain syndromes. Reliability of magnetic resonance imaging versus arthroscopy for the diagnosis and classification of superior glenoid labrum anterior to posterior lesions.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Ankle, Hip and Spine** - *Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Shoulder, Elbow, Wrist and Hand** - *Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint

Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI and Diagnosis of Shoulder Disorders** – *normal and abnormal shoulder anatomy as viewed on MRI was presented. Review and presentation of MRI in the diagnosis and treatment of brachial plexus injury. Discussion of preganglionic avulsions and muscular denervation. Comparison of CT myelography to MRI myelography were outlined. Enhanced three dimensional T1 high- resolution isotropic volume excitation MR in the evaluation of shoulder pathology. Comparison with two-dimensional enhanced T1 fat saturation MRI were discussed.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Clinical Evaluation of Upper and Lower Extremity Pathology** – *review of relevant anatomy in shoulder, elbow, wrist, hip, knee and ankle were presented. Physical examination including orthopedic, neurological and range of motion testing was presented and compared with findings on MRI results.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Fusion Surgery and Lumbar Stenosis** – *efficacy of fusion and decompression surgery in patients with lumbar spinal stenosis. Review of degenerative spondylolisthesis and patient selection criteria. Discussion of correlation of MRI, CT findings and clinical evaluation. Review of sedimentation sign on MRI and indications of prognostic factors. Surgery versus nonsurgical treatment outlined and outcomes discussed. Compensation for lumbar spinal stenosis and clinical sagittal plane deformity was presented.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Posterior Lumbar Interbody Fusion and Adjacent Segment Degeneration (ASD)** – *adjacent segment degeneration as major consequence of spinal fusion. Review of occurrence and location with correlation between surgical outcomes were discussed. Discussion of age, BMI and pre-existing stenosis in cranial adjacent segment as risk factors. ASD prevalence in radiographic evidence between cranial and caudal segments were reviewed. Presentation of risk factors and pre-operative radiological features. Facet sagittalization and tropism were discussed.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Morbidity and Mortality Predictions in Spinal Surgery** – *Review of the Charlson Comorbidity Index (CCI) and the American Society of Anesthesiologist (ASA) Physical Status Classification System. Review of index outcomes and relation to costs of care. Discussion of index rating and likelihood of complications. Review of classification system in cerebral spinal fluid (CSF) leaks.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spondylolisthesis, clinical and radiographic classifications** - *classification system that considers disc space height, sagittal alignment and translation, and the absence or presence of unilateral or bilateral leg pain was discussed. Detailed review of spondylolisthesis etiology, clinical presentation and imaging findings was reviewed. Review of inter and interobserver reliabilities of radiographic and clinical criteria. Review of consensus driven treatment options for degenerative spondylolisthesis presented. Transforaminal Lumbar Interbody Fusion (TLIF) in degenerative disc disease with associated spondylolisthesis grade I was reviewed and correlated.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Sagittal Alignment and Spinal Surgery, Clinical Outcomes and Follow up** – *discussion of outcomes and sagittal alignment in single unilateral transforaminal lumbar interbody fusion (TLIF). Detailed review of surgical TLIF procedure and associated mid and long-term clinical outcomes. Discussion and presentation of influence of pelvic incidents and lumbar lordosis mismatch and post-operative residual symptoms. Analysis of adjacent segment disease following fusion.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Complications and Outcomes in Adult Spinal Deformity Surgery** – *review of surgical approaches and complications in correction of adult spinal deformity. Relevance of age, comorbidities, blood loss, osteoporosis and smoking were discussed. Discussion of Cobb Angle, Sagittal Vertical Axis, Pelvic Tilt, Thoracic Kyphosis were reviewed and examined in relation to transposas lateral interbody fusion (LIF), percutaneous pedicle screw (PPS), transforaminal lumbar interbody fusion (TLIF). Comparison between minimally invasive and traditionally open procedures was provided and reviewed. Discussion of minimally invasive surgery options were emphasized, and outcomes reviewed with correlation to diagnosis and procedural coding.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Surgical Interventions in Lumbar Disc Herniation** – *review of differences in surgical treatment of recurrent lumbar disc herniation. Clinical correlation between plain film radiography, MRI studies and clinical presentation were reviewed. Data on frequency in management of recurrent lumbar intervertebral disc herniations presented. Duration of symptoms and influence of patient outcomes in sciatica patients undergoing micro-discectomy and decompressions.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Length of Stay in Lumbar Spinal Surgery** – *discussion on epidemiology of lumbar surgery outcomes and hospital stay. Correlation to clinical presentation and comorbidities were reviewed. Outline of decompression and instrumental fusion in the lumbar spine. Review of costs of lumbar surgery, trends in hospital stay and costs both on a cumulative and daily basis. Comparison of the nationwide inpatient sample and national surgical quality improvement program databases for lumbar spine fusion procedures was reviewed and presented.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Pre-Surgical Planning and Implant Design** – *3-D printing and surgical planning discussion a variety of historical materials in the creation of patient specific implants based on unique individual anatomy. Historical trends in the creation of prosthetics with 3-D modeling software using neuroimaging data. Review of treatment complex spinal pathologies and surgical planning was discussed. Outline of current and future barriers to global implementation and commercialization was reviewed. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spine Surgery Procedures in Medical Specialty Training** – *discussion of current spine surgery training including fellowship programming in the United States. Accreditation Council for Graduate Medical Education (ACGME) cases logs were reviewed and discussed. Variability of procedures within programs and between medical specialty programs were outlined. Differential utilization between orthopedic and neurosurgical fellows was reviewed. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Cerebral Spinal Fluid Dynamics, Central Nervous System Pathology and Intracranial Hypotension** – *pathophysiology and various craniospinal disorders. Directional phase contrast MRI (4D Flow) was reviewed along with the anatomical and physiological properties of cerebral spinal fluid. Specific disorders such as Alzheimer's disease, hydrocephalus, Chiari Malformation and syringomyelia. Clinical correlation of CSF dynamics to understanding disease process was reviewed including normal and abnormal flow patterns. Recent advancements in fluid flow studies were outlined and presented. Signal intensity changes on MRI study in cervical spondylotic myelopathy was discussed and compared to normal parameters. Fluid dynamics patterns within syringomyelia and Chiari malformation was discussed and correlated to MRI findings and clinical presentations. Spinal microsurgical exploration surgery and resultant CSF leak and spontaneous intractable intracranial hypotension was reviewed and its pathoanatomical presentation outlined. Review of the natural and surgical history of Chiari malformation Type I in pediatric population and clinical correlation with MRI studies. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy and Physiology of the Blood Brain Barrier** – *Review of consequences of alterations in homeostatic control of the neuronal environment. Discussion of blood flow alterations and altered vessel permeability as determinants in the pathophysiology of brain injury. Review present day literature on the anatomy, development and physiological mechanisms of the blood-brain barrier. The blood brain barrier's role in the maintenance of the extracellular environment. Vascular anatomy of the spinal cord was reviewed in relation to the physiology of the neural environment. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Neurosurgery – Spinal Cord Anatomy, Physiology and Vascular Reactivity** – *detailed review of the blood supply of the spinal cord, anatomy of the vascular system and physiology of blood flow. Pathophysiology of various conditions including Thoracic Aortic Occlusion and Spinal Cord Injury were discussed with specific relation to risk of neurological deficit. Severity and duration as an effect was reviewed and correlated clinically.*

*Cerebral circulation and aging, discussion of effects on cognitive functioning and cerebrovascular disease in aging. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Neurosurgery – Upper Cervical Spine Anatomy and Cerebral Spinal Fluid Flow** – *MRI flow imaging and computational fluid dynamics in healthy patients with Chiari Malformations. Review of abnormal cerebral spinal fluid flow oscillations and their effects on healthy patients. Discussion of nonlaminar complex spatial and temporal variations with associated pressure waves and pressure gradients causing syringomyelia, headaches and other clinical manifestations in Chiari I malformation. Microsurgical anatomy and internal architecture of brainstem in 3D images and surgical considerations. CSF hydrodynamic changes, spinal cord injury and development of post traumatic syringomyelia (PTSM). Impact of spinal cord nerve roots and denticulate ligaments on cerebral fluid dynamics in the cervical spine was reviewed and discussed. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Neurosurgery – Compression and Degeneration in Chronic Nerve Root Entrapment** – *differentiation between peripheral nerves and spinal nerve roots and effects of electrostimulation. Discussion of various stimulating or recording neurosurgical implants and success vs failure rates. Review of the nerve root compression and its relation to consequences of disc herniation and acute compression during surgery. Maximum pressure level a spinal nerve root can sustain is reviewed. Discussion of microsurgical anatomy of lumbosacral nerve rootlets, Rhizotomy and chronic spinal cord injury. Review of qualitative grading of severity of lumbar spinal stenosis on morphology of dural sac on MRI studies, review of classification systems and the consideration of impingement of neural tissue. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy of Circle of Willis, Cerebral Arteries and Stroke Etiology** – *discussion of stroke by embolism, source and cause in diagnosis and long-term treatment. Review of complex nature of embolus transport and its relation to etiology. Image based hemodynamics with discrete particle dynamics in relation to the distribution of emboli across the various cerebral arteries. Detailed anatomy of Circle of Willis reviewed and discussed with particular focus on size/inertia dependent trends in embolus distribution to the brain, distribution of cardiogenic versus aortogenic emboli among anterior, middle and posterior cerebral arteries, left versus right brain preference in cardio-embolus and aortic emboli transport and source-destination relationship for embolisms affecting the brain. Detailed review of the microsurgical anatomy of the posterior cerebral artery in three dimensional images. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Neurosurgery – Stroke Therapy, Implementation and Cost-Effectiveness** – *review of endovascular therapy in addition to standard care in acute ischemic vessel occlusion stroke. Comparison in National Institutes of Health Stroke Score (NIHSS) score, symptom onset, Alberta Stroke Program Early CT Score (ASPECTS) and occlusion location. Considerations in acute management and revascularization of tandem occlusions in acute ischemic stroke with literature review. Discussion of Transcirculation Pipeline embolization device deployment as a rescue technique. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at*

Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 1** – *review of historical interventions, multilevel decompression and instrumented fusion in reduction of neural compression and spinal column stabilization. Discussion of morbidity and mortality in relation to surgical procedures. The use of the modified fragility index to predict 30-day morbidity and mortality from spine surgery. Differences in patient selection for minimally invasive versus open surgical procedures, and review of post-surgical outcomes. Morbidity, mortality and health care costs for patients undergoing spine surgery following ACGME resident duty-reform.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 2** – *Predisposing factors for dural tears in lumbar spine surgery including degenerative conditions, prior surgery and age-related indicators were reviewed. Discussion and review of readmission rates in spine surgery through metanalysis and systematic review. Bibliometric study of the most important minimally invasive (MIS) spine surgery papers including Level III and IV studies with focus on moving toward Level I and Level II.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine and Spine Pain** – *review of lack of guidelines for the management of lower back pain in the ED. Frequency of lower back pain visitation in the emergency department including environmental/sociocultural dimensions and physical/psychospiritual dimensions were reviewed. Discussion of utilization of significant healthcare resources with complete description of lower back pain characteristics, health services use in non-urgent lower back pain patients presenting to the ED. Managing spine pain in the ED using usual and customary medical intervention. Extent of appropriate CT and MRI scans in the hospital setting, accessibility reviewed in conjunction with presented national data.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Emergency Medicine – Medication Usage and Motor Vehicle Accidents** – *review of ADHD medication utilization and motor vehicle accident data and frequency of motor vehicle accident in this specific patient population. Review of the prevalent and preventable cause of morbidity and mortality among patients and concepts of restricting based on prognostic factors.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Department Imaging Perspectives** – *review of imaging protocols among a spectrum of clinical indications, perspective on aging populations and clinical complexity. Review of CT, MRI, plain film imaging and ultrasound and their relationships to internal medicine and musculoskeletal disorders examined on an emergency basis through patient generated national survey data. Details of specific contexts in which imaging has become concentrated and targeted efforts for optimization of utilization. Considerations of utilization of CT in the emergency department and evaluation to increasing trends. Review of quality improvements in imaging utilization. Comparison between pediatric and adult imaging protocols and trends. Discussion and analysis of*

*“Choose Wisely” recommendations and creating of guideline/policy/clinical pathways in New England EDs. MRI utilization in pediatric ED reviewed and analyzed. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Cauda Equina Syndrome and Other Emergent Conditions** – *traumatic injuries to the thoracolumbar spine and overall impact on emergency services. Discussion of exact definitions of Conus Medullaris Syndrome (CMS) and Cauda Equina Syndrome (CES). Diagnosis in acute phase and radiological findings clinically correlating with physical examination findings. Parameters for spinal regions of traumatic injury were presented and reviewed. Case presentations for neck and spine were included and reviewed with particular focus on differential diagnosis and case uniqueness. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine Residency Curriculum** – *review of Ohio State University Emergency Medicine Residency Program Musculoskeletal Emergencies Curriculum. Outline of the significant nature of musculoskeletal emergency presentations to ED. Details in the training required to master clinical experience, self-directed learning and small group didactics. Case study reviews and discussion was presented with particular focus on infection vs non-infections and traumatic vs non-traumatic presentations in ED. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Opioid vs Non-Opioid Medications in the Emergency Department** – *discussion of limited evidence of long-term outcomes of opioids with non-opioid medication for chronic pain. Literature review on effectiveness for opioid interventions. Discussion of alternative recommendations, evidence demonstrating lack of benefit and poor long-term outcomes. Variation in physician opioid prescriptions discussed. Patterns of opioid initiation at first visits for pain in the ED in the United States including frequency and dosage. Emergency Department data concerning the persistent pain after motor vehicle accidents and comparison between opioid and NSAID prescribed in the ED. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Concussion and Repeat ED visits** – *review of patients presenting to ED with concussion with re-visitation within 72 hours. Mechanism of injury including closed head injury, assault, fall and motor vehicle accidents discussed. Epidemiological evidence presented regarding number of visitations, characteristics and care paths reviewed. Discussion of adoption of a more comprehensive discharge plan to further prevent repeat visits was outlined. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Epidemiology of ED Visits in the United States, Adults Over 65 and Motor Vehicle Accidents** – *Evaluation of data from the National Hospital Ambulatory Medical Care Survey and frequency of ED visitation. Percentage of visits requiring hospital admission was reviewed along with patterns of need for critical care. Review*

*of imaging ordering statistics and clinical diagnosis was discussed. Detailsof primary and secondary ED diagnosis presented in relation to sprain/strain, contusion and spinal pathology including herniated intervertebral disc, fracture and spinal cord compression. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – National Hospital Ambulatory Medical Care Survey** – *a review of the current representative data on ambulatory care visits to hospital emergency departments in the United States. Demographics, residence, insurance class, chief complaint with focus on traumatic injury, diseases of the nervous and musculoskeletal systems were outlined. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Lower Back Pain and Emergency Room Visits** – *detailed analysis of impact of lower back pain on ED globally. First systematic review of the trends in the literature including lower back pain as significant complaint and the variables in its definition. Discussion of the proper diagnosis and triage of lower back pain and its current impact on ED management was reviewed. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Spinal Cord Injury without Radiographic Abnormality (SCIWORA) in Adults** – *case reports – detailed review of Spinal Cord Injury without Radiographic Abnormality was presented. Syndrome of post traumatic myelopathy demonstrable on MRI with no evidence of osseous injury on plain film or CT scan. Reporting of incidence was included with detailed discussion of case presentations, accurate diagnoses and triage was reviewed. Academy of Chiropractic, Recognized by the PACE. Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship withthe State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Traumatic Brain Injury Data** – *Related Emergency Department Visits, Hospitalizations, Deaths – United States, 2007 and 2013 – traumatic brain injury, short and long term adverse clinical outcomes, death and disability reviewed and compared based on CDC data over a 7-year period. Mechanism of causation including motor vehicle accidents, falls and assault. Public health recommendations and interpretation of data was presented. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Data, Trends in Emergency Department Visits for Ischemic Stroke and Transient Ischemic Attack** – *relationship between stroke and statistical cause of death, type of stroke and prognosis related to recurrence was discussed. Specific definitions of ischemic stroke, transient ischemic attack with etiology and relationship to emergency visits were outlined and presented. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Emergency Medicine – US Emergency Department Use by Children** – *pediatric utilization of emergency medicine resources, description of trendson a national basis. Detailed analysis of specific demographics including race and resident status were*

*reported and reviewed. Discussion in allocation of resources including insurance class and coverage were reviewed. Anticipated expansion of Medicaid was considered and reviewed. Estimates of nonurgent ED visits by children were presented and discussed. Academy of Chiropractic, State University of New York at Buffalo, Jacobs School of Medicine, 2019*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Supply of Chiropractic Care and Visits to Primary Care Physicians for Neck and Back Pain** – *discussion of primary care visits and lower back pain. Expenditures and contributions to disability data. Discussion of supply of chiropractic care in context of visits for lower back pain and primary care physicians. Estimated national impact of primary care visits and expenditures was outlined with a focus on chiropractic's assistance in managing lower back pain. Defining an "episode" of lower back pain and relationship to collection of epidemiological data. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Safety of Chiropractic Care in Lower Back Pain and Migraine Headaches** – *review of adverse events associated with chiropractic care in the treatment of migraine. Outline of a prospective 3-armed, single-blinded, placebo RCT. Discussion of transient and mild events following chiropractic intervention. Randomized clinical trials and meta-analysis reviewed and discussed relating to the diagnosis and management of lower back pain including adverse event reporting. Risk of injury to the head, neck or trunk following an office visit for chiropractic spinal manipulation, as compared to office visit for evaluation by primary care physician. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Pain Management in Primary Care** – *evaluation of the analgesic effects of spinal manipulation on both healthy and pain inflicted patients. Discussion of evidence of increased inpressure pain thresholds in musculoskeletal pain at both local and remote sites. Detailed knowledge of patient population regarding demographics and socioeconomic factors as well as disease-specific characteristics. Suggestion that lower back pain should not be seen as benign and self-limiting with focus on management. Describe the communication system surrounding the management of chronic pain from the perspectives of allopathic providers, acupuncture and chiropractor providers, and chronic musculoskeletal pain patients. Chiropractic manipulative treatment (CMT) association with lower healthcare costs among multiply-comorbid Medicare beneficiaries with an episode of chronic low back pain was reviewed. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Perceptions of Chiropractic Care** – *demographic review of data on the perceptions of chiropractic care. Review of patient interest, trustworthiness, costs and frequency of visits was discussed. Nationally representative survey to compare characteristics and use of survey respondents with positive and negative perceptions of DCs and chiropractic care. Positive perceptions of DCs were more common than those for chiropractic care. US adults generally perceive DCs in a positive manner. Describe the preferences of older adults for low back pain co-management by MDs and DCs and identify their concerns for receiving care under such a treatment model. Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Post-Surgical Care and Care for Veterans** – discussion of persistent post-surgical lower back and radicular pain response to chiropractic care. Relevant anatomy related to lower back pain and intervertebral disc injury was outlined and presented. *Discussion and development of an integrated care pathway for doctors of chiropractic, primary care providers, and mental health professionals who manage veterans with low back pain, with or without mental health comorbidity, within Department of Veterans Affairs health care facilities. Support for the inclusion of chiropractic care as a component of multidisciplinary health care for low back pain, as currently recommended in existing guidelines with a focus on US Service Members. Discussion of availability of chiropractic care to military healthcare systems, referral and interprofessional communication models.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Effects of Chiropractic Care Combined with Medical Care, First Contact and Provider Type** – *differences in outcomes, patient satisfaction, and related healthcare costs in spinal, hip, and shoulder pain patients who initiated care with medical doctors (MDs) vs those who initiated care with doctors of chiropractic (DCs). Pain of musculoskeletal origin and epidemiology of reduced productivity. Comparison of data on health outcomes, patient satisfaction, and related healthcare costs in patients consulting differing first-contact care providers for musculoskeletal pain.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Integrating Chiropractic Care into Primary Care and Private Sector Healthcare Facilities** – *suggestion of a diverse role for chiropractors within conventional health care facilities. Discussion of chiropractic's effectiveness for managing musculoskeletal disorders, particularly spine-related pain and disability. Descriptions of doctors of chiropractic who work in nongovernmental, private sector health care settings in the United States. Shared electronic health records, face-to-face informal consultations methods for interprofessional communication.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – American College of Physicians – Guideline Recommendations** – *Non-Invasive and Non-Pharmacological - American College of Physicians (ACP) developed this guideline to present the evidence and provide clinical recommendations on noninvasive treatment of low back pain. Systematically review the current evidence on non-pharmacologic therapies for acute or chronic non-radicular or radicular low back pain. Comparative benefits of non-pharmacological therapies in acute/subacute low back pain including exercise, spinal manipulation, lumbar supports, acupuncture, laser, ultrasound and traction. Discussion of first and second line therapies with reduction in opioid prescription.* Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, ACCME Joint Sponsorship with the State University of New York at Buffalo, Jacobs School of Medicine, 2019.

**Clinical Instructor, Interprofessional Hospital Based Spinal Care**, *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative*

*disc trauma*, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Texas Board of Chiropractic, ID #O07-10130, Pasadena TX, 2019

**Clinical Instructor, Interprofessional Hospital Based Spinal Care**, *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative disc trauma*, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of Arizona Board of Chiropractic Examiners, ID#AZCE16083, Phoenix AZ, 2019

**Clinical Instructor, MRI Spine Credentialing, Differential or Physical Diagnosis or both**, *Spinal MRI findings related to degenerative changes vs. traumatic changes of the intervertebral disc by using definitions provided by the American Society of Neuroradiology. Anatomy of the intervertebral disc, spinal cord, nerve roots and spinal ligaments correlated to T1, T2, STIR sagittal, stacking and axial images. Anatomical MRI differentiation of normal, degenerative and traumatic changes*, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas Board of Chiropractic Examiners, Little Rock AR, #AR7526, 2020

**Clinical Instructor, Primary Spine Care and Vertebral Subluxation Research**, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Board of Chiropractic Examiners, State of California CA-A-19-11-10039, Sacramento, CA, 2019

**Clinical Instructor, Primary Spine Care 2: Spinal Trauma Pathology**, *Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequela to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequela to trauma*. Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, New York Board of Chiropractic, NYSCB - 2590, Albany NY, 2019-2021

**Clinical Instructor, Primary Spine Care 2: Spinal Trauma Pathology**, *Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequela to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequela to trauma*. Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards State of Georgia, Board of Chiropractic Examiners, Index #2018-108, 2020

**Clinical Instructor, Interprofessional Hospital Based Spinal Care**, *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative disc trauma*, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards State of Georgia, Board of Chiropractic Examiners, Index #2018-99, 2020

**Clinical Instructor, MRI Spine Credentialing, Differential or Physical Diagnosis or both, *Spinal MRI findings related to degenerative changes vs. traumatic changes of the intervertebral disc by using definitions provided by the American Society of Neuroradiology. Anatomy of the intervertebral disc, spinal cord, nerve roots and spinal ligaments correlated to T1, T2, STIR sagittal, stacking and axial images. Anatomical MRI differentiation of normal, degenerative and traumatic changes,*** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards State of Georgia, Board of Chiropractic Examiners, Index #2018-86, 2020

**Clinical Instructor, Primary Spine Care 2: Spinal Trauma Pathology, *Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequela to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequela to trauma.*** Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Hampshire Board of Chiropractic Examiners, ID# 1041 Concord, NH 2019-2020

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar,** Cleveland University, Kansas City, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Jersey Office of the Attorney General, Division of Consumer Affairs, State Board of Chiropractic Examiners ID #1902-06, Newark NJ, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar,** Cleveland University, Kansas City, Academy of Chiropractic, , State of Hawaii, Professional & Vocational Licensing Division, Board of Chiropractic Examiners, Department of Consumer Affairs, Index #HI 19-081, Honolulu HI, 2019

**Clinical Instructor, Primary Spine Care 1, *based upon the literature conclusions and the documentation requirements to support those conclusions in an ethical collaborative environment inclusive of hospitals, emergency rooms, primary care medical doctors and medical specialists,*** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Board of Chiropractic Examiners, State of California CA-A-19-06-05041, Sacramento, CA, 2019

**Clinical Instructor, Interprofessional Hospital Based Spinal Care, *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative disc trauma,*** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Board of Chiropractic Examiners, State of California CA-A-19-06-05040, Sacramento, CA, 2019

**Clinical Instructor, MRI Spine Credentialing, Differential or Physical Diagnosis or both, *Spinal MRI findings related to degenerative changes vs. traumatic changes of the intervertebral disc by using definitions provided by the American Society of Neuroradiology. Anatomy of the intervertebral disc, spinal cord, nerve roots and spinal ligaments correlated to T1, T2, STIR sagittal, stacking and axial images. Anatomical MRI differentiation of normal, degenerative and traumatic changes,*** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of West Virginia Board of Chiropractic, South Charleston WV, 2019

**Clinical Instructor, Interprofessional Hospital Based Spinal Care**, *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative disc trauma*, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of West Virginia Board of Chiropractic, South Charleston WV, 2019

**Clinical Instructor, Primary Spine Care: Utilizing Research in Trauma**, *The ability of your electronic health records to convey tissue pathology while documenting case studies, field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care.* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of West Virginia Board of Chiropractic, South Charleston WV, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar**, Cleveland University, Kansas City, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Jersey Office of the Attorney General, Division of Consumer Affairs, State Board of Chiropractic Examiners ID #1902-06, Newark NJ, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar**, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Kansas Chiropractic Association, Topeka KS, 2019

**Clinical Instructor, Online MRI Spine Credentialing: Diagnostic Imaging**, Cleveland University, Kansas City, Academy of Chiropractic, State of Missouri Board of Chiropractic Examiners ID# 2019002306, Jefferson City MO, 2019

**Clinical Instructor, Online MRI Spine Credentialing: Aggravated Spine Conditions and/or Injuries**, Cleveland University, Kansas City, Academy of Chiropractic, State of Missouri Board of Chiropractic Examiners ID# 2019002307, Jefferson City MO, 2019

**Clinical Instructor, Online MRI Spine Credentialing: Differential or Physical Diagnosis or Both**, Cleveland University, Kansas City, Academy of Chiropractic, State of Missouri Board of Chiropractic Examiners ID# 2019002308, Jefferson City MO, 2019

**Clinical Instructor, Primary Spine Care Modules 1-5**, Cleveland University, Kansas City, Academy of Chiropractic, State of Missouri Board of Chiropractic Examiners ID# 2019002325, Jefferson City MO, 2019

**Clinical Instructor, Online Interprofessional Hospital Based Spinal Care**, *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative*

*disc trauma*, Cleveland University, Kansas City, Academy of Chiropractic, State of Missouri Board of Chiropractic Examiners ID# 2019002324, Jefferson City MO, 2019

**Clinical Instructor, Ethics and Medical Collaboration,** *Having referral relationships with emergency rooms, neurosurgeons, orthopedic surgeons, pain management specialists, neurologists, neuroradiologist and medical primary care providers based upon clinical dilemmas that processed after a thorough history, examination and imaging if clinically indicated to conclude diagnostic dilemmas. Utilizing evidence-based protocols and acquisition. of images and treatment pathways, collaborating with medical specialists and primaries to conclude, and accurate treatment plan,* Academy of Chiropractic, Pace Approved for The Federation of Chiropractic Licensing Boards, Cleveland University Kansas City, Chiropractic and Health Sciences, Long Island New York, 2019

**Clinical Instructor, Documentation in a Medical – Legal and Insurances,** *Constructing and concluding an E&M (99202-99205) report that accurately reflects the history, clinical findings and management of trauma cases that concurrently meets the needs of both the carriers in the courts and ethical relationship that concurrently matches the standards of both contemporary academia requirements and a contemporary literature-based standard,* Academy of Chiropractic, Pace Approved for The Federation of Chiropractic Licensing Boards, Cleveland University Kansas City, Chiropractic and Health Sciences, Long Island New York, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management ONLINE,** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas Board of Chiropractic Examiners, Little Rock AR, #AR7350, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management ONLINE,** Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Hampshire Board of Chiropractic Examiners, ID# 1041 Concord, NH 2019-2020

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar,** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Texas Board of Chiropractic, ID #007-9607, Pasadena TX, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar,** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of West Virginia Board of Chiropractic, South Charleston WV, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Online,** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of West Virginia Board of Chiropractic, South Charleston WV, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar,** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards District of Columbia Board of Chiropractic, Department of Health, Washington, D.C., 2019

**Clinical Instructor, Primary Spine Care 2: Utilizing Research in Trauma,** *The ability of your electronic health records to convey tissue pathology while documenting case studies, field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care.* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of Arizona Board of Chiropractic Examiners, ID#AZCE19106, Phoenix AZ, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar,** Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Hampshire Board of Chiropractic Examiners, ID# 1040 Concord, NH 2019-2020

**Clinical Instructor, MRI Spine Interpretation Basics,** *MRI Physics in determining T1, T2, STIR images along with proper ordering sequencing. Diagnosis of variations of bulges and herniations and other pathology both intra and extra-dural in etiology. Viewing methodology and requirements in determining an accurate diagnosis,* Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Hampshire Board of Chiropractic Examiners, ID# 1042 Concord, NH 2019-2020

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management ONLINE,** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards State of Georgia, Board of Chiropractic Examiners, Index #2019-271, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar,** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards State of Georgia, Board of Chiropractic Examiners, Index #2019-239, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar,** Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, North Carolina Board of Chiropractic Examiners, 2019

**Clinical Instructor, Interprofessional Hospital Based Spinal Care,** *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative disc trauma,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards State of Georgia, Board of Chiropractic Examiners, Index #2018-99, 2019

**Clinical Instructor, Chiropractic as a Primary Spine Care,** *based upon the literature conclusions and the documentation requirements to support those conclusions in an ethical collaborative environment inclusive of hospitals, emergency rooms, primary care medical doctors and medical specialists,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards State of Georgia, Board of Chiropractic Examiners, Index #2018-105, 2019

**Clinical Instructor, Primary Spine Care 2:** Spinal Trauma Pathology, *Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequela to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequela to trauma.* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards State of Georgia, Board of Chiropractic Examiners, Index #2018-108, 2019

**Clinical Instructor, MRI Spine Interpretation Basics,** *MRI Physics in determining T1, T2, STIR images along with proper ordering sequencing. Diagnosis of variations of bulges and herniations and other pathology both intra and extra-dural in etiology. Viewing methodology and requirements in determining an accurate diagnosis,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of Arizona Board of Chiropractic Examiners, ID#AZCE16084, Phoenix AZ, 2019

**Clinical Instructor, Primary Spine Care 7:** Spinal Biomechanical Pathology and Collaborative Management Webinar, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, South Dakota Board of Chiropractic Examiners, Yankton SD, 2019

**Clinical Instructor, Primary Spine Care 2:** Utilizing Research in Trauma, *The ability of your electronic health records to convey tissue pathology while documenting case studies, field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care.* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Texas Board of Chiropractic, ID #O07-9557, Pasadena TX, 2019

**Clinical Instructor, Primary Spine Care 7:** Spinal Biomechanical Pathology and Collaborative Management Webinar, Cleveland University, Kansas City, Academy of Chiropractic, State of Missouri Board of Chiropractic Examiners ID# 2019001696, Jefferson City MO, 2019-2020

**Clinical Instructor, MRI Spine Credentialing, Differential or Physical Diagnosis or both,** *Spinal MRI findings related to degenerative changes vs. traumatic changes of the intervertebral disc by using definitions provided by the American Society of Neuroradiology. Anatomy of the intervertebral disc, spinal cord, nerve roots and spinal ligaments correlated to T1, T2, STIR sagittal, stacking and axial images. Anatomical MRI differentiation of normal, degenerative and traumatic changes,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards State of Georgia, Board of Chiropractic Examiners, Index #2018-86, 2019

**Clinical Instructor, MRI Spine Interpretation Basics,** *MRI Physics in determining T1, T2, STIR images along with proper ordering sequencing. Diagnosis of variations of bulges and herniations and other pathology both intra and extra-dural in etiology. Viewing methodology and requirements in determining an accurate diagnosis,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards State of Georgia, Board of Chiropractic Examiners, Index #2018-87, 2019

**Clinical Instructor, Chiropractic as a Primary Spine Care,** based upon the literature conclusions and the documentation requirements to support those conclusions in an ethical collaborative environment inclusive of hospitals, emergency rooms, primary care medical doctors and medical specialists, Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE

Program of the Federation of Chiropractic Licensing Board, Minnesota Board of Chiropractic Examiners, ID #68802, Minneapolis MN, 2019-2020

**Clinical Instructor, Primary Spine Care 7:** Spinal Biomechanical Pathology and Collaborative Management Webinar, Cleveland University, Kansas City, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Jersey Office of the Attorney General, Division of Consumer Affairs, State Board of Chiropractic Examiners ID #1812-07, Newark NJ, 2019

**Clinical Instructor, Primary Spine Care 7:** Spinal Biomechanical Pathology and Collaborative Management Webinar, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas Board of Chiropractic Examiners, Little Rock AR, #AR7331, 2019

**Clinical Instructor, Primary Spine Care 7:** Spinal Biomechanical Pathology and Collaborative Management Webinar, Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, Minnesota Board of Chiropractic Examiners, ID #68794, Minneapolis MN, 2019-2020

**Clinical Instructor, Primary Spine Care 2:** Utilizing Research in Trauma, *The ability of your electronic health records to convey tissue pathology while documenting case studies, field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care.* Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, Minnesota Board of Chiropractic Examiners, ID #68800, Minneapolis MN, 2019-2020

**Clinical Instructor, Primary Spine Care 7:** Spinal Biomechanical Pathology and Collaborative Management Webinar, Cleveland University, Kansas City, Academy of Chiropractic, State of Missouri Board of Chiropractic Examiners ID# 2019001351, Jefferson City MO, 2019

**Clinical Instructor, Clinical Grand Rounds** – Traumatically Induced Cervical Central Canal Stenosis – *a case review of traumatically induced acute cervical intervertebral disc extrusion with superior migration resulting in severe central canal stenosis and spinal cord impingement. A detailed review of physical examination findings, neurological evaluation, MRI images and surgical triage. Interprofessional communication both verbally and through proper evidence-based documentation.* Cleveland University-Kansas City, Chiropractic and Health Sciences, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Buffalo, NY 2019.

**Clinical Instructor, Primary Spine Care 1,** *based upon the literature conclusions and the documentation requirements to support those conclusions in an ethical collaborative environment inclusive of hospitals, emergency rooms, primary care medical doctors and medical specialists,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, New York Board of Chiropractic, NYSCB - 2062, Albany NY, 2019-2022

**Clinical Instructor, Interprofessional Hospital Based Spinal Care,** *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative disc trauma,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the

Federation of Chiropractic Licensing Boards, Minnesota Board of Chiropractic Examiners, ID #66922, Minneapolis MN, 2019-2020

**Clinical Instructor, MRI Spine Interpretation Basics,** MRI Physics in determining T1, T2, STIR images along with proper ordering sequencing. Diagnosis of variations of bulges and herniations and other pathology both intra and extra-dural in etiology. Viewing methodology and requirements in determining an accurate diagnosis.

**Clinical Instructor, Interprofessional Hospital Based Spinal Care,** *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative disc trauma,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, South Dakota Board of Chiropractic Examiners, Yankton SD, 2019

**Clinical Instructor, Primary Spine Care 2:** Spinal Trauma Pathology, *Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequela to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequela to trauma.* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, South Dakota Board of Chiropractic Examiners, Yankton SD, 2019

**Clinical Instructor, Primary Spine Care 2:** Spinal Trauma Pathology, *Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequela to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequela to trauma.* Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, Minnesota Board of Chiropractic Examiners, ID #66927, Minneapolis MN, 2019

**Clinical Instructor, Primary Spine Care 2:** Spinal Trauma Pathology, *Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequela to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequela to trauma.* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas Board of Chiropractic Examiners, Little Rock AR, #AR7303, 2019

**Clinical Instructor, Primary Spine Care 1,** *based upon the literature conclusions and the documentation requirements to support those conclusions in an ethical collaborative environment inclusive of hospitals, emergency rooms, primary care medical doctors and medical specialists,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas Board of Chiropractic Examiners, Little Rock AR, #AR7308, 2019

**Clinical Instructor, Primary Spine Care 2:** Spinal Trauma Pathology, *Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequela to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequela to trauma.* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, New York Board of Chiropractic, NYSCB - 2071, Albany NY, 2019-2022

**Clinical Instructor, Primary Spine Care 2:** Spinal Trauma Pathology, *Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequela to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequela to trauma.* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of West Virginia Board of Chiropractic, South Charleston WV, 2019

**Clinical Instructor, MRI Spine Interpretation Basics,** *MRI Physics in determining T1, T2, STIR images along with proper ordering sequencing. Diagnosis of variations of bulges and herniations and other pathology both intra and extra-dural in etiology. Viewing methodology and requirements in determining an accurate diagnosis,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Texas Board of Chiropractic, ID #O07-9477, Pasadena TX, 2019

**Clinical Instructor, MRI Spine Credentialing -** Diagnostic Testing Differential or Physical Diagnosis or both, *Spinal MRI findings related to degenerative changes vs. traumatic changes of the intervertebral disc by using definitions provided by the American Society of Neuroradiology. Anatomy of the intervertebral disc, spinal cord, nerve roots and spinal ligaments correlated to T1, T2, STIR sagittal, stacking and axial images. Anatomical MRI differentiation of normal, degenerative and traumatic changes,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Texas Board of Chiropractic, ID #O07-9478, Pasadena TX, 2019

**Clinical Instructor, Primary Spine Care Symposium 3-** Connective Tissue and Spinal Disc Pathology, *The morphology and pathology of connective tissue, inclusive of spinal disc disorders and prognosticating wound repair with permanency implications. Disc bulge, herniation, protrusion and extrusion classifications based upon contemporary literature and how to age-date disc pathology.* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, South Dakota Board of Chiropractic Examiners, Yankton SD, 2019

**Clinical Instructor, Interprofessional Hospital Based Spinal Care,** *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative disc trauma,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, New York Board of Chiropractic, NYSCB - 2059, Albany NY, 2019-2021

**Clinical Instructor, Interprofessional Hospital Based Spinal Care**, *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative disc trauma*, Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Hampshire Board of Chiropractic Examiners, ID# 1031 Concord, NH 2019-2020

**Clinical Instructor, Chiropractic as a Primary Spine Care**, *based upon the literature conclusions and the documentation requirements to support those conclusions in an ethical collaborative environment inclusive of hospitals, emergency rooms, primary care medical doctors and medical specialists*, Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Hampshire Board of Chiropractic Examiners, ID# 1032 Concord, NH 2019-2020

**Clinical Instructor, MRI Spine Credentialing** - Diagnostic Testing Differential or Physical Diagnosis or both, *Spinal MRI findings related to degenerative changes vs. traumatic changes of the intervertebral disc by using definitions provided by the American Society of Neuroradiology. Anatomy of the intervertebral disc, spinal cord, nerve roots and spinal ligaments correlated to T1, T2, STIR sagittal, stacking and axial images. Anatomical MRI differentiation of normal, degenerative and traumatic changes*, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Board of Chiropractic Examiners, State of California CA-A-19-02-12002, Sacramento, CA, 2019

**Clinical Instructor, MRI Spine Credentialing** - Spinal Anatomy Differential or Physical Diagnosis or both, *Spinal MRI findings related to degenerative changes vs. traumatic changes of the intervertebral disc by using definitions provided by the American Society of Neuroradiology. Anatomy of the intervertebral disc, spinal cord, nerve roots and spinal ligaments correlated to T1, T2, STIR sagittal, stacking and axial images. Anatomical MRI differentiation of normal, degenerative and traumatic changes*, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Board of Chiropractic Examiners, State of California CA-A-19-02-12004, Sacramento, CA, 2019

**Clinical Instructor, Interprofessional Hospital Based Spinal Care**, *identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis, and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequela to degenerative disc trauma*, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas Board of Chiropractic Examiners, Little Rock AR, #AR7296, 2019

**Clinical Instructor, Primary Spine Care 7: Spinal Biomechanical Pathology and Collaborative Management Webinar**, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, New York Board of Chiropractic, NYSCB - 2020, Albany NY, 2019-2022

**Clinical Instructor, Spinal Biomechanical Engineering:** Diagnostic Imaging Interpretation, Differential diagnosis of pathobiomechanics in the cervical, thoracic and lumbar spine as sequelae to micro and macro trauma and chronic biomechanical instabilities. Understanding the clinical implications of long-term biomechanical failure in resultant disc pathology, ligament pathology and osseous pathology, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas Board of Chiropractic Examiners, Little Rock AR, #AR7253, 2019

**Clinical Instructor, MRI Spine Interpretation Basics,** MRI Physics in determining T1, T2, STIR images along with proper ordering sequencing. Diagnosis of variations of bulges and herniations and other pathology both intra and extra-dural in etiology. Viewing methodology and requirements in determining an accurate diagnosis, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, New York Board of Chiropractic, NYSCB - 2004, Albany NY, 2019-2021

**Clinical Instructor, Spinal Biomechanical Engineering:** Diagnostic Imaging Interpretation, Differential diagnosis of pathobiomechanics in the cervical, thoracic and lumbar spine as sequelae to micro and macro trauma and chronic biomechanical instabilities. Understanding the clinical implications of long-term biomechanical failure in resultant disc pathology, ligament pathology and osseous pathology, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, South Dakota Board of Chiropractic Examiners, Yankton SD, 2019

**Clinical Instructor, MRI Spine Interpretation Basics,** MRI Physics in determining T1, T2, STIR images along with proper ordering sequencing. Diagnosis of variations of bulges and herniations and other pathology both intra and extra-dural in etiology. Viewing methodology and requirements in determining an accurate diagnosis, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas Board of Chiropractic Examiners, Little Rock AR, #AR7246, 2019

**Clinical Instructor, MRI Spine Credentialing,** Differential or Physical Diagnosis or both, Spinal MRI findings related to degenerative changes vs. traumatic changes of the intervertebral disc by using definitions provided by the American Society of Neuroradiology. Anatomy of the intervertebral disc, spinal cord, nerve roots and spinal ligaments correlated to T1, T2, STIR sagittal, stacking and axial images. Anatomical MRI differentiation of normal, degenerative and traumatic changes, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas Board of Chiropractic Examiners, Little Rock AR, #AR7247, 2019

**Clinical Instructor, Primary Spine Care 7:** Spinal Biomechanical Pathology and Collaborative Management Webinar, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, New York Board of Chiropractic, NYSCB - 2020, Albany NY, 2019-2022

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Growth of Interventional Pain Management Techniques and Current Trends in Pharmacological Management of Neuropathic Pain.** *ESI comparison to gabapentin in lumbosacral radicular pain – current trends and future progress of pain management interventions. Mode of action, required dosage, advantages and side effects profiles of currently available pharmacological approaches.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Spinal Injection Therapy - Facet, medial branch blocks, prolotherapy and epidural interventions utilization within the Medicare population, effectiveness on lumbar central canal stenosis with and without steroids and effect on prevention of spinal surgery, herniated disc, fibromyalgia and chronic musculoskeletal pain.** Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Adverse Events Associated with Injection Therapy – transforaminal and interlaminar epidural steroid injections, anesthesia technical considerations, effects on cervical radiculopathy midline versus paramedian approaches and perineurial injection of autologous conditioned serum. Review of FDA risk assessment.**  
Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Correlation of MRI Findings and Injection Outcomes - MODIC Changes on MRI and effectiveness of facet injection, facet joint signal change on MRI with fat suppression comparison with SPECT/CT. Discussion of Modic 1, 2 and 3 with correlation of clinical outcomes and patient selection criteria.** Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Botulinum Toxin and Dry-Needling in Myofascial Pain Syndrome – cost effectiveness, patient response and triage of therapeutic interventions. Physiological review of trigger point etiology and clinical presentation of acute and chronic pain. Functional response of intervention including relief and recurrence.** Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Systematic Review Technical Considerations in Cervical Epidural Analgesia - Chemical blockage of cervical nerve roots, review of anatomical structures and correlation with MRI imaging. Blockage effects on the respiratory, circulatory and neurological systems. Review of cervical epidural space (CES) borders and variants in patient population.** Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Trends in opioid analgesic abuse and mortality in the USA, Evaluation of Opioid Pain Management in Injured Children, assessment of opioid reporting in Veteran Affairs – Emergency visitation in pediatric injury, pain management and adoption of best practices. Trends in use of prescription opioid medication using RADARS (Research Abuse, Diversion and Addiction Related Surveillance System), comparison between legitimate pharmacy channels and diversion and abuse. Opioid use prevalence and incidents in Veteran Affairs, new prescriptions or long-term conversion and relationship to persistent growth in opioid use.** Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Electrodiagnostic Testing, Transforaminal Epidural Steroid Injection, Intra-articular Facet Joint Injection, Spinal Manipulation Post-Epidural Injection– Needle EMG, active versus chronic denervation in lumbar, cervical spinal pathologies and differential diagnosis of spinal stenosis and intervertebral disc herniation. Systematic review of facet joint injections, clinical trials and conservative therapy in lower back pain. Results of spinal manipulation post-epidural injection in the cervical spine.** Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Radiofrequency Ablation and outcome measures - medication, function and pain in relation to pain of spinal origin. Medial Branch Block as prognostic tool prior to lumbar facet radiofrequency**

*denervation. Clinical comparison disc herniation, disc bulge, cervical and lumbar radiculopathy. Diagnosis and patient triage correlation to anatomical spine structures. Long, short term risk factors and outcomes in radiofrequency ablation. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Role of Cannabinoids in Pain Management** – review of pharmacological, botanical or synthetic origins of cannabinoids. Mechanism of action in alleviation of pain including analgesic, anti-inflammatory effects, modular actions on neurotransmitters and interactions with prescribed or endogenous opioids. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in MRI Physics – The Hardware – magnet types including permanent, resistive and superconducting magnets.** Volume RF, surface, quadrature and phase array coils and other hardware necessary for the generation of MRI imaging. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 1 –** magnetization, excitation, relaxation, acquisition, computing and display. T1 relaxation and relaxation curves, T2 relaxation, phase and phase coherence, T2 relaxation curves. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 2 –** gradient coils, signal coding including slice encoding gradient, phase encoding gradient, Frequency encoding gradient. Gradient specifications and slice thickness. Filling k-space, k-space symmetry and k-space filling technique. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 3 –** pulse sequences, spine echo sequences including multi-slicing and multi-echo sequencing. T1, T2, proton density contrast and their applications. Turbo spine echo, fast advanced spine echo (HASTE) sequence and gradient echo sequence. Inversion recovery sequence including STIR and FLAIR sequence. Choosing the right sequence pros and cons, T1, T2 and PD parameters. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation – technical parameters and artifacts** – repetition time, echo time, flip angle, inversion time, number of acquisitions, matrix and field of view. Slice thickness, slice gap, phase encoding direction 1 and direction 2 and relation to bandwidth. Motion artifact, para-magnetic artifact, phase wrap artifact, susceptibility artifact, clipping artifact, spine and zebra artifacts. Effects on image quality and acquisition. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – radiographic evolution of a Schmorl's node** – acute Schmorl's node and progression to chronic stage comparison to serial MRI. Endplate fracture and acute presentation and correlation to clinical findings and pain patterns. Presentation in plain film radiograph and MRI images were compared and contrasted in both acute and chronic stages. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – syringomyelia, fluid dynamics and spinal cord motion** – scoliosis curve patterns and syrinx characteristics versus Chiari I malformation. Normal MRI appearance and motion artifacts related to cerebral spinal fluid motion related phenomena and common appearances on MRI imaging. Syrinx wall and fluid motion and correlation to cardiac cycle with comparison between systolic and diastolic presentations. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Biomechanics, Thoracolumbar Deformity and Surgical Outcomes** – *full spine analysis, adjacent spinal biomechanics and its impact on surgical outcomes. Sagittal alignment pelvis to cervical spine and association with kyphosis and lordosis mechanical positioning.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI and EMG comparison in denervated muscle diagnosis** – *lumbar spine pathology and age in relation to paraspinal muscle size and fatty infiltration. Fatty degeneration of paraspinal muscle in degenerative lumbar kyphosis and CT versus MRI digital analysis. Positive correlations with edema on MRI and fibrillations, positive sharp waves, denervation and the level of reduced recruitment pattern.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – association between annular tear and disc degeneration** – *high intensity zone (HIZ) in lumbar disc and association to annular fissure on MRI. Identification of dual HIZ and its relationship to acute inflammation and calcified tissue and its association with discogenic pain patterns. Influence of phenotype, population size and inclusion sequence. T1, T2 and STIR imaging comparison and correlation.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – degenerative cervical myelopathy** – *paraspinal muscle morphology, clinical symptoms and functional status. Review of fatty infiltration, asymmetry findings and correlation with clinical symptoms and functional scores. Review of complex anatomical arrangement of superficial and deep muscle layers in the cervical spine, correlation to MRI findings.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Neurography, Diffuse Tensor Imaging (DTI)** – *diagnostic accuracy and fiber tracking in spinal cord compression. Review of spinal cord structural integrity, peripheral neuropathy and correlation to diffuse tensor imaging findings. Comparison in combining DTI with T2 and T2 alone and its value in magnetic resonance neurography.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – Nomenclature and Classification of Lumbar Disc Pathology** – *modified Pfirrmann grading system and lumbar disc degeneration. Consensus driven description of intervertebral disc nomenclature including intervertebral disc bulge, herniation, protrusion, broad based disc herniation, extrusion and sequestration.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI evaluation of intradural tumor** – *neuroimaging of spinal tumors and correlation to histological study. Determining method of choice for evaluation, review of numerous types of intradural-extramedullary masses including meningioma and schwannoma. Signal intensities, contrast enhancement patterns, presence of cysts and other key differentiation findings of spinal cord tumors.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Cord Compression, Myelomalacia, MRI Imaging and Clinical Correlation** – *positional cervical spinal cord compression and fibromyalgia. T1 and T2 weighted images, comparison of hypo and hyperintense signals and extent of intramedullary changes on MRI. Review of MRI findings associated with myelomalacia and discussion of correlation with clinical findings.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Characteristics of Lumbar Facet Synovial Cyst** – *formation characteristics of synovial cyst, relation to degenerative changes in spinal facet joints as demonstrated on MRI. Pre and post-surgical procedural MRI were reviewed and compared. Surgical management and subsequent resection were demonstrated.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Neuroradiology – Variability in MRI Diagnostic Error Rates** – *in depth review of quality of MRI imaging and comparison to consistent MRI diagnosis between facilities. Errors of interpretation in the study examinations were considered and presented. Impact of radiological diagnosis, location of MRI study and reading radiologist and impact on treatment choice and clinical outcomes.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Wrist Anatomy and Osseous Kinematics** – *normal kinematics using biplanar radiographic model were reviewed. Discussion of extensive database of carpal bone anatomy and kinematics from a large number of healthy subjects. 3-D motion of each bone was calculated for each wrist position and discussed. Database constructed including high-resolution surface models, measures of bone volume and shape, and the 3-D kinematics of each segmented bone.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Normal Motion of the Shoulder and Glenohumeral Instability** – *normal motion of the shoulder joint compared with clinical implications of glenohumeral joint instability including surgical recommendations. Review and overview of the anatomy of the glenohumeral joint, emphasis on instability based on the current literature. Description of detailed anatomy and anatomical variants of the glenohumeral joint associated with anterior and posterior shoulder instability.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Orthopedic Testing and Shoulder Pathology Diagnosis** - *use of orthopedic special tests (OSTs) to diagnose shoulder pathology and clinical examination. Review OST clusters, examination of methodology and illustration of their use in arriving at a pathology-based diagnosis. Discussion of examination of the biceps tendon and clinical relevance. Review of SLAP lesion and shoulder impingement syndrome were reviewed.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Electrodiagnostic Testing and Carpal Tunnel Syndrome** – *Review of the most common mononeuropathy in the human body. Relationship between clinical findings, neurological examination and electrodiagnostic testing in the diagnosis of carpal tunnel syndrome. Acute and chronic symptoms including progression of the disorder were reviewed.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Current Concepts in Elbow Disorders** – *Detailed anatomy of osseous, ligamentous and muscular structure of the elbow was reviewed. Common disease of elbow disorders and their treatment was discussed. Lateral epicondylitis and medial collateral ligament injury of the elbow were outlined. Rheumatoid arthritis, posttraumatic osteoarthritis, and elderly patients with comminuted distal humeral fractures. Surgical design and technique were outlined.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Differentiating Cervical Spine from Shoulder Pathology** – *anatomical review of cervical spine and glenohumeral joint focus on similarities and differences. Cervical disorders masking shoulder pain, cervical radiculopathy, cervical spondylotic myelopathy, facet and discogenic pain patterns were outlined. Details of shoulder*

*pathology parsonage-tuner syndrome, subscapular neuropathy and thoracic outlet were presented. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI of the Shoulder and Shoulder Girdle** – *review of MRI analysis of scapular fracture. Detailed review of scapular function rehabilitation and training on chronic pain syndromes. Reliability of magnetic resonance imaging versus arthroscopy for the diagnosis and classification of superior glenoid labrum anterior to posterior lesions. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Ankle, Hip and Spine** - *Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Shoulder, Elbow, Wrist and Hand** - *Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI and Diagnosis of Shoulder Disorders** – *normal and abnormal shoulder anatomy as viewed on MRI was presented. Review and presentation of MRI in the diagnosis and treatment of brachial plexus injury. Discussion of preganglionic avulsions and muscular denervation. Comparison of CT myelography to MRI myelography were outlined. Enhanced three dimensional T1 high-resolution isotropic volume excitation MR in the evaluation of shoulder pathology. Comparison with two-dimensional enhanced T1 fat saturation MRI were discussed. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Clinical Evaluation of Upper and Lower Extremity Pathology** – *review of relevant anatomy in shoulder, elbow, wrist, hip, knee and ankle was presented. Physical examination including orthopedic, neurological and range of motion testing was presented and compared with findings on MRI results. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Fusion Surgery and Lumbar Stenosis** – *efficacy of fusion and decompression surgery in patients with lumbar spinal stenosis. Review of degenerative spondylolisthesis and patient selection criteria. Discussion of correlation of MRI, CT findings and clinical evaluation. Review of sedimentation sign on MRI and indications of prognostic factors. Surgery versus nonsurgical treatment outlined and outcomes discussed. Compensation for lumbar spinal stenosis and clinical sagittal plane deformity was presented. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Posterior Lumbar Interbody Fusion and Adjacent Segment Degeneration (ASD)** – *adjacent segment degeneration as major consequence of spinal fusion. Review of occurrence and location with correlation between surgical outcomes were discussed. Discussion of age, BMI and pre-existing stenosis in cranial adjacent segment as risk factors. ASD prevalence in radiographic evidence between cranial and caudal segments were reviewed. Presentation of risk factors and pre-operative radiological features. Facet sagittalization and tropism were discussed. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Morbidity and Mortality Predictions in Spinal Surgery** – *Review of the Charlson Comorbidity Index (CCI) and the American Society of Anesthesiologist (ASA) Physical Status Classification System. Review of index outcomes and relation to costs of care. Discussion of index rating and likelihood of complications. Review of classification system in cerebral spinal fluid (CSF) leaks.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spondylolisthesis, clinical and radiographic classifications** – *classification system that considers disc space height, sagittal alignment and translation, and the absence or presence of unilateral or bilateral leg pain was discussed. Detailed review of spondylolisthesis etiology, clinical presentation and imaging findings was reviewed. Review of inter and interobserver reliabilities of radiographic and clinical criteria. Review of consensus driven treatment options for degenerative spondylolisthesis presented. Transforaminal Lumbar Interbody Fusion (TLIF) in degenerative disc disease with associated spondylolisthesis grade I was reviewed and correlated.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Sagittal Alignment and Spinal Surgery, Clinical Outcomes and Follow up** – *discussion of outcomes and sagittal alignment in single unilateral transforaminal lumbar interbody fusion (TLIF). Detailed review of surgical TLIF procedure and associated mid and long-term clinical outcomes. Discussion and presentation of influence of pelvic incidents and lumbar lordosis mismatch and post-operative residual symptoms. Analysis of adjacent segment disease following fusion.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Complications and Outcomes in Adult Spinal Deformity Surgery** – *review of surgical approaches and complications in correction of adult spinal deformity. Relevance of age, comorbidities, blood loss, osteoporosis and smoking were discussed. Discussion of Cobb Angle, Sagittal Vertical Axis, Pelvic Tilt, Thoracic Kyphosis were reviewed and examined in relation to transposas lateral interbody fusion (LIF), percutaneous pedicle screw (PPS), transforaminal lumbar interbody fusion (TLIF). Comparison between minimally invasive and traditionally open procedures was provided and reviewed. Discussion of minimally invasive surgery options were emphasized and outcomes reviewed with correlation to diagnosis and procedural coding.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Surgical Interventions in Lumbar Disc Herniation** – *review of differences in surgical treatment of recurrent lumbar disc herniation. Clinical correlation between plain film radiography, MRI studies and clinical presentation were reviewed. Data on frequency in management of recurrent lumbar intervertebral disc herniations presented. Duration of symptoms and influence of patient outcomes in sciatica patients undergoing micro-discectomy and decompressions.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Length of Stay in Lumbar Spinal Surgery** – *discussion on epidemiology of lumbar surgery outcomes and hospital stay. Correlation to clinical presentation and comorbidities were reviewed. Outline of decompression and instrumental fusion in the lumbar spine. Review of costs of lumbar surgery, trends in hospital stay and costs both on a cumulative and daily basis. Comparison of the nationwide inpatient sample and national surgical quality improvement program databases for lumbar spine fusion procedures was reviewed and presented.* Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Pre-Surgical Planning and Implant Design** – *3-D printing and surgical planning discussion a variety of historical materials in the creation of patient specific implants based on unique individual anatomy. Historical trends in the*

*creation of prosthetics with 3-D modeling software using neuroimaging data. Review of treatment complex spinal pathologies and surgical planning was discussed. Outline of current and future barriers to global implementation and commercialization was reviewed. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spine Surgery Procedures in Medical Specialty Training** – *discussion of current spine surgery training including fellowship programming in the United States. Accreditation Council for Graduate Medical Education (ACGME) cases logs were reviewed and discussed. Variability of procedures within programs and between medical specialty programs were outlined. Differential utilization between orthopedic and neurosurgical fellows was reviewed. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Cerebral Spinal Fluid Dynamics, Central Nervous System Pathology and Intracranial Hypotension** – *pathophysiology and various craniospinal disorders. Directional phase contrast MRI (4D Flow) was reviewed along with the anatomical and physiological properties of cerebral spinal fluid. Specific disorders such as Alzheimer's disease, hydrocephalus, Chiari Malformation and syringomyelia. Clinical correlation of CSF dynamics to understanding disease process was reviewed including normal and abnormal flow patterns. Recent advancements in fluid flow studies were outlined and presented. Signal intensity changes on MRI study in cervical spondylotic myelopathy was discussed and compared to normal parameters. Fluid dynamics patterns within syringomyelia and Chiari malformation was discussed and correlated to MRI findings and clinical presentations. Spinal microsurgical exploration surgery and resultant CSF leak and spontaneous intractable intracranial hypotension was reviewed and its pathoanatomical presentation outlined. Review of the natural and surgical history of Chiari malformation Type I in pediatric population and clinical correlation with MRI studies. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy and Physiology of the Blood Brain Barrier** – *Review of consequences of alterations in homeostatic control of the neuronal environment. Discussion of blood flow alterations and altered vessel permeability as determinants in the pathophysiology of brain injury. Review present day literature on the anatomy, development and physiological mechanisms of the blood–brain barrier. The blood brain barrier's role in the maintenance of the extracellular environment. Vascular anatomy of the spinal cord was review in relation to the physiology of the neural environment. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Neurosurgery – Spinal Cord Anatomy, Physiology and Vascular Reactivity** – *detailed review of the blood supply of the spinal cord, anatomy of the vascular system and physiology of blood flow. Pathophysiology of various conditions including Thoracic Aortic Occlusion and Spinal Cord Injury were discussed with specific relation to risk of neurological deficit. Severity and duration as an effect was reviewed and correlated clinically. Cerebral circulation and aging, discussion of effects on cognitive functioning and cerebrovascular disease in aging. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Neurosurgery – Upper Cervical Spine Anatomy and Cerebral Spinal Fluid Flow** – *MRI flow imaging and computational fluid dynamics in healthy patients with Chiari Malformations. Review of abnormal cerebral spinal fluid flow oscillations and their effects on healthy patients. Discussion of nonlaminar complex spatial and temporal variations with associated pressure waves and pressure gradients causing syringomyelia, headaches and other clinical manifestations in Chiari I malformation. Microsurgical anatomy and internal architecture of brainstem in 3D images and surgical considerations. CSF hydrodynamic changes, spinal cord injury and development of post traumatic syringomyelia (PTSM). Impact of spinal cord nerve roots and denticulate*

*ligaments on cerebral fluid dynamics in the cervical spine was reviewed and discussed. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Neurosurgery – Compression and Degeneration in Chronic Nerve Root Entrapment** – *differentiation between peripheral nerves and spinal nerve roots and effects of electrostimulation. Discussion of various stimulating or recording neurosurgical implants and success vs failure rates. Review of the nerve root compression and its relation to consequences of disc herniation and acute compression during surgery. Maximum pressure level a spinal nerve root can sustain is reviewed. Discussion of microsurgical anatomy of lumbosacral nerve rootlets, Rhizotomy and chronic spinal cord injury. Review of qualitative grading of severity of lumbar spinal stenosis on morphology of dural sac on MRI studies, review of classification systems and the consideration of impingement of neural tissue. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy of Circle of Willis, Cerebral Arteries and Stroke Etiology** – *discussion of stroke by embolism, source and cause in diagnosis and long-term treatment. Review of complex nature of embolus transport and its relation to etiology. Image based hemodynamics with discrete particle dynamics in relation to the distribution of emboli across the various cerebral arteries. Detailed anatomy of Circle of Willis reviewed and discussed with particular focus on size/inertia dependent trends in embolus distribution to the brain, distribution of cardiogenic versus aortogenic emboli among anterior, middle and posterior cerebral arteries, left versus right brain preference in cardio-embolus and aortic emboli transport and source-destination relationship for embolisms affecting the brain. Detailed review of the microsurgical anatomy of the posterior cerebral artery in three dimensional images. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Neurosurgery – Stroke Therapy, Implementation and Cost-Effectiveness** – *review of endovascular therapy in addition to standard care in acute ischemic vessel occlusion stroke. Comparison in National Institutes of Health Stroke Score (NIHSS) score, symptom onset, Alberta Stroke Program Early CT Score (ASPECTS) and occlusion location. Considerations in acute management and revascularization of tandem occlusions in acute ischemic stroke with literature review. Discussion of Transcirculation Pipeline embolization device deployment as a rescue technique. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 1** – *review of historical interventions, multilevel decompression and instrumented fusion in reduction of neural compression and spinal column stabilization. Discussion of morbidity and mortality in relation to surgical procedures. The use of the modified fragility index to predict 30-day morbidity and mortality from spine surgery. Differences in patient selection for minimally invasive versus open surgical procedures, and review of post-surgical outcomes. Morbidity, mortality and health care costs for patients undergoing spine surgery following ACGME resident duty-reform. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 2** *Predisposing factors for dural tears in lumbar spine surgery including degenerative conditions, prior surgery and age related indicators were reviewed. Discussion and review of re-admission rates in spine surgery through metanalysis and systematic review. Bibliometric study of the most important minimally invasive (MIS) spine surgery papers including Level III and IV studies with focus on moving toward Level I and Level II. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine and Spine Pain** – *review of lack of guidelines for the management of lower back pain in the ED. Frequency of lower back pain visitation in the emergency department including environmental/sociocultural*

*dimensions and physical/psychospiritual dimensions were reviewed. Discussion of utilization of significant healthcare resources with complete description of lower back pain characteristics, health services use in non-urgent lower back pain patients presenting to the ED. Managing spine pain in the ED using usual and customary medical intervention. Extent of appropriate CT and MRI scans in the hospital setting, accessibility reviewed in conjunction with presented national data. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Medication Usage and Motor Vehicle Accidents** – *review of ADHD medication utilization and motor vehicle accident data and frequency of motor vehicle accident sin this specific patient population. Review of the prevalent and preventable cause of morbidity and mortality among patients and concepts of restricting based on prognostic factors. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Department Imaging Perspectives** – *review of imaging protocols among a spectrum of clinical indications, perspective on aging populations and clinical complexity. Review of CT, MRI, plain film imaging and ultrasound and their relationships to internal medicine and musculoskeletal disorders examined on an emergency basis through patient generated national survey data. Details of specific contexts in which imaging has become concentrated and targeted efforts for optimization of utilization. considerations of utilization of CT in the emergency department and evaluation to increasing trends. Review of quality improvements in imaging utilization. Comparison between pediatric and adult imaging protocols and trends. Discussion and analysis of “Choose Wisely” recommendations and creating of guideline/policy/clinical pathways in New England EDs. MRI utilization in pediatric ED reviewed and analyzed. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Cauda Equina Syndrome and Other Emergent Conditions** – *traumatic injuries to the thoracolumbar spine and overall impact on emergency services. Discussion of exact definitions of Conus Medullaris Syndrome (CMS) and Cauda Equina Syndrome (CES). Diagnosis in acute phase and radiological findings clinically correlating with physical examination findings. Parameters for spinal regions of traumatic injury were presented and reviewed. Case presentations for neck and spine were included and reviewed with particular focus on differential diagnosis and case uniqueness. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine Residency Curriculum** – *review of Ohio State University Emergency Medicine Residency Program Musculoskeletal Emergencies Curriculum. Outline of the significant nature of musculoskeletal emergency presentations to ED. Details in the training required to master clinical experience, self-directed learning and small group didactics. Case study reviews and discussion was presented with particular focus on infection vs non-infections and traumatic vs non-traumatic presentations in ED. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Opioid vs Non-Opioid Medications in the Emergency Department** – *discussion of limited evidence of long-term outcomes of opioids with non-opioid medication for chronic pain. Literature review on effectiveness for opioid interventions. Discussion of alternative recommendations, evidence demonstrating lack of benefit and poor long term outcomes. Variation in physician opioid prescriptions discussed. Patterns of opioid initiation at first visits for pain in the ED in the United States including frequency and dosage. Emergency Department data concerning the persistent pain after motor vehicle accidents and comparison between opioid and NSAID prescribed in the ED. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Concussion and Repeat ED visits** – review of patients presenting to ED with concussion with re-visitation within 72 hours. Mechanism of injury including closed head injury, assault, fall and motor vehicle accidents discussed. Epidemiological evidence presented regarding number of visitations, characteristics and care paths reviewed. Discussion of adoption of a more comprehensive discharge plan to further prevent repeat visits was outlined. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Epidemiology of ED Visits in the United States, Adults Over 65 and Motor Vehicle Accidents** – Evaluation of data from the National Hospital Ambulatory Medical Care Survey and frequency of ED visitation. Percentage of visits requiring hospital admission was reviewed along with patterns of need for critical care. Review of imaging ordering statistics and clinical diagnosis was discussed. Details of primary and secondary ED diagnosis presented in relation to sprain/strain, contusion and spinal pathology including herniated intervertebral disc, fracture and spinal cord compression. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Emergency Medicine – National Hospital Ambulatory Medical Care Survey** – a review of the current representative data on ambulatory care visits to hospital emergency departments in the United States. Demographics, residence, insurance class, chief complaint with focus on traumatic injury, diseases of the nervous and musculoskeletal systems were outlined. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Emergency Medicine – Lower Back Pain and Emergency Room Visits** – detailed analysis of impact of lower back pain on ED globally. First systematic review of the trends in the literature including lower back pain as significant complaint and the variables in its definition. Discussion of the proper diagnosis and triage of lower back pain and its current impact on ED management was reviewed. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Emergency Medicine – Spinal Cord Injury without Radiographic Abnormality (SCIWORA) in Adults** – case reports – detailed review of Spinal Cord Injury without Radiographic Abnormality was presented. Syndrome of post traumatic myelopathy demonstrable on MRI with no evidence of osseous injury on plain film or CT scan. Reporting of incidence was included with detailed discussion of case presentations, accurate diagnoses and triage was reviewed. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Traumatic Brain Injury Data – Related Emergency Department Visits, Hospitalizations, Deaths – United States, 2007 and 2013** – traumatic brain injury, short and long term adverse clinical outcomes, death and disability reviewed and compared based on CDC data over a 7 year period. Mechanism of causation including motor vehicle accidents, falls and assault. Public health recommendations and interpretation of data was presented. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Data, Trends in Emergency Department Visits for Ischemic Stroke and Transient Ischemic Attack** – relationship between stroke and statistical cause of death, type of stroke and prognosis related to recurrence was discussed. Specific definitions of ischemic stroke, transient ischemic attack with etiology and relationship to emergency visits were outlined and presented. Cleveland University College of Chiropractic, 2018.

**Clinical Instructor - Specialty Research in Emergency Medicine – US Emergency Department Use by Children** – pediatric utilization of emergency medicine resources, description of trends on a national basis. Detailed analysis of specific demographics including race and resident status were reported and

*reviewed. Discussion in allocation of resources including insurance class and coverage were reviewed. Anticipated expansion of Medicaid was considered and reviewed. Estimates of nonurgent ED visits by children were presented and discussed. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Supply of Chiropractic Care and Visits to Primary Care Physicians for Neck and Back Pain** – *discussion of primary care visits and lower back pain. Expenditures and contributions to disability data. Discussion of supply of chiropractic care in context of visits for lower back pain and primary care physicians. Estimated national impact of primary care visits and expenditures was outlined with a focus on chiropractic's assistance in managing lower back pain. Defining an "episode" of lower back pain and relationship to collection of epidemiological data. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Safety of Chiropractic Care in Lower Back Pain and Migraine Headaches** – *review of adverse events associated with chiropractic care in the treatment of migraine. Outline of a prospective 3-armed, single-blinded, placebo RCT. Discussion of transient and mild events following chiropractic intervention. Randomized clinical trials and meta-analysis reviewed and discussed relating to the diagnosis and management of lower back pain including adverse event reporting. Risk of injury to the head, neck or trunk following an office visit for chiropractic spinal manipulation, as compared to office visit for evaluation by primary care physician. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Pain Management in Primary Care** – *evaluation of the analgesic effects of spinal manipulation on both healthy and pain inflicted patients. Discussion of evidence of increased in pressure pain thresholds in musculoskeletal pain at both local and remote sites. Detailed knowledge of patient population regarding demographics and socioeconomic factors as well as disease-specific characteristics. Suggestion that lower back pain should not be seen as benign and self-limiting with focus on management. Describe the communication system surrounding the management of chronic pain from the perspectives of allopathic providers, acupuncture and chiropractor providers, and chronic musculoskeletal pain patients. Chiropractic manipulative treatment (CMT) association with lower healthcare costs among multiply-comorbid Medicare beneficiaries with an episode of chronic low back pain was reviewed. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Perceptions of Chiropractic Care** – *demographic review of data on the perceptions of chiropractic care. Review of patient interest, trustworthiness, costs and frequency of visits was discussed. Nationally representative survey to compare characteristics and use of survey respondents with positive and negative perceptions of DCs and chiropractic care. Positive perceptions of DCs were more common than those for chiropractic care. US adults generally perceive DCs in a positive manner. Describe the preferences of older adults for low back pain co-management by MDs and DCs and identify their concerns for receiving care under such a treatment model. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Post-Surgical Care and Care for Veterans** – *discussion of persistent post-surgical lower back and radicular pain response to chiropractic care. Relevant anatomy related to lower back pain and intervertebral disc injury was outlined and presented. Discussion and development of an integrated care pathway for doctors of chiropractic, primary care providers, and mental health professionals who manage veterans with low back pain, with or without mental health comorbidity, within Department of Veterans Affairs health care facilities. Support for the inclusion of chiropractic care as a component of multidisciplinary health care for low back pain, as currently recommended in existing guidelines with a*

*focus on US Service Members. Discussion of availability of chiropractic care to military healthcare systems, referral and interprofessional communication models. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Effects of Chiropractic Care Combined with Medical Care, First Contact and Provider Type** – *differences in outcomes, patient satisfaction, and related healthcare costs in spinal, hip, and shoulder pain patients who initiated care with medical doctors (MDs) vs those who initiated care with doctors of chiropractic (DCs). Pain of musculoskeletal origin and epidemiology of reduced productivity. Comparison of data on health outcomes, patient satisfaction, and related healthcare costs in patients consulting differing first-contact care providers for musculoskeletal pain. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Integrating Chiropractic Care into Primary Care and Private Sector Healthcare Facilities** – *suggestion of a diverse role for chiropractors within conventional health care facilities. Discussion of chiropractic's effectiveness for managing musculoskeletal disorders, particularly spine-related pain and disability. Descriptions of doctors of chiropractic who work in nongovernmental, private sector health care settings in the United States. Shared electronic health records, face-to-face informal consultations methods for interprofessional communication. Cleveland University College of Chiropractic, 2018.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – American College of Physicians – Guideline Recommendations – Non-Invasive and Non-Pharmacological - American College of Physicians (ACP) developed this guideline to present the evidence and provide clinical recommendations on noninvasive treatment of low back pain. Systematically review the current evidence on non-pharmacologic therapies for acute or chronic non-radicular or radicular low back pain. Comparative benefits of non-pharmacological therapies in acute/subacute low back pain including exercise, spinal manipulation, lumbar supports, acupuncture, laser, ultrasound and traction. Discussion of first and second line therapies with reduction in opioid prescription. Cleveland University College of Chiropractic, 2018.**

**Clinical Instructor, Chiropractic as a Primary Spine Care**, based upon the literature conclusions and the documentation requirements to support those conclusions in an ethical collaborative environment inclusive of hospitals, emergency rooms, primary care medical doctors and medical specialists, Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Hampshire Board of Chiropractic Examiners, ID# 1014 Concord, NH 2018

**Clinical Instructor, Primary Spine Care:** Utilizing Research in Trauma, The ability of your electronic health records to convey tissue pathology while documenting case studies, field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care. Cleveland University, Kansas City, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, Minnesota Board of Chiropractic Examiners, ID #646628, Minneapolis MN, 2018

**Clinical Instructor, Primary Spine Care:** Utilizing Research in Trauma, The ability of your electronic health records to convey tissue pathology while documenting case studies, field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care. Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Board of Nevada, Index # NV20-108, Reno NV, 2018

**Clinical Instructor, Primary Spine Care:** Utilizing Research in Trauma, The ability of your electronic health records to convey tissue pathology while documenting case studies, field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care. Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Texas Board of Chiropractic, ID #O07-8624, Pasadena TX, 2018

**Clinical Instructor, Primary Spine Care:** Utilizing Research in Trauma, The ability of your electronic health records to convey tissue pathology while documenting case studies, field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care. Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, North Carolina Board of Chiropractic Examiners, 2018

**Clinical Instructor, Primary Spine Care:** Utilizing Research in Trauma, The ability of your electronic health records to convey tissue pathology while documenting case studies, field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care. Cleveland University, Kansas City, Academy of Chiropractic, Chiropractic Physicians' Arkansas State Board of Chiropractic Examiners, AR Course #AR6852 Little Rock AR, 2018

**Clinical Instructor, Primary Spine Care:** Utilizing Research in Trauma, The ability of your electronic health records to convey tissue pathology while documenting case studies, field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care. Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Kansas Chiropractic Association, Topeka KS, 2018

**Clinical Instructor, Primary Spine Care,** *Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care affecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification.* Texas Chiropractic College, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Alabama State Board of Chiropractic Examiners, ID #700176, 2018

**Clinical Instructor, Primary Spine Care,** *Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care affecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification.* Texas Chiropractic College, Academy. of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Board of Chiropractic Examiners, State of California CA-A-17-04-13557, Sacramento, CA, 2018

**Clinical Instructor, Primary Spine Care,** *Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care affecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification.* Cleveland University, Kansas City, Academy of Chiropractic, PACE

Recognized by the Federation of Chiropractic Licensing Boards, State of Georgia, Board of Chiropractic Examiners, Index #2018-108, 2018

**Clinical Instructor, Managing & Triaging Cases,** Early Stroke Diagnosis, DC vs. PT, Ensuring Chiropractic as the 1st Referral Option: Primary Spine Care 6, Cleveland University, Kansas City, Academy of Chiropractic, , State of Hawaii, Professional & Vocational Licensing Division, Board of Chiropractic Examiners, Department of Consumer Affairs, Index #HI 18-234, Honolulu HI, 2018

**Clinical Instructor, Managing & Triaging Cases,** Early Stroke Diagnosis, DC vs. PT, Ensuring Chiropractic as the 1st Referral Option: Primary Spine Care 6, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Kansas Chiropractic Association, Topeka KS, 2018

**Clinical Instructor, Managing & Triaging Cases,** Early Stroke Diagnosis, DC vs. PT, Ensuring Chiropractic as the 1st Referral Option: Primary Spine Care 6 ONLINE, Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Kansas Chiropractic Association, Topeka KS, 2018

**Clinical Instructor, Documenting Trauma and Non-Trauma Cases & Triaging Disc Pathology,** Triage, care and collaboration for herniated, bulged, protruded, extruded and fragmented spinal discs. Compliant documentation of evaluation and management of new and established patients inclusive of chief complaint, history of present illness, review of systems, past-family-social histories with case management protocols and the required elements. Clinically coordinating treatment with subjective complaints, clinical findings and diagnosis for each encounter. Cleveland University-Kansas City Chiropractic and Health Sciences, Academy of Chiropractic Post-Doctoral Division, Long Island, NY, 2018

**Clinical Instructor, Spinal Disc and Ligament Neurology and Pathology,** Cleveland University, Kansas City, Chiropractic and Health Sciences, The neurological cascade of mechanoreceptors, proprioceptors and nociceptors as sequella to trauma and the effect on the higher cortical area afferently and the compensatory reaction efferently, West Virginia Board of Chiropractic, South Charleston WV, 2018

**Clinical Instructor, Triage and Management of the Trauma and Non-Trauma Patient,** differentially diagnosing spinal issues in the trauma and non-trauma patient inclusive of spinal disc pathology utilizing x-ray, MRI, CAT Scan and clinical evaluations. Collaborative triaging protocols with neurologists, neurosurgeons, orthopedic surgeons, pain management and primary. medical care providers with both mechanical and anatomical spinal pathologies, Academy of Chiropractic, PACE Approved for the Federation of Chiropractic Licensing Boards, Cleveland University, Kansas City Chiropractic and Health Sciences, 2018

**Clinical Instructor, Neurology of Ligament Pathology-** Normal Morphology and Tissue Damage, Connective tissue morphology, embryology and wound repair as sequale to trauma. Full components of strain-sprain models and permanency implications with wound repair and osseous aberration with aberrant structural integrity, Academy of Chiropractic, Post-Doctoral Division, PACE approved of the Federation of Chiropractic Licensing Boards, Cleveland University-Kansas City, College of Chiropractic, Long Island NY, 2018

**Clinical Instructor, Neurology of Ligament Pathology-** Spinal Biomechanics and Disc Pathology, Disc pathology as sequella to trauma; herniation, extrusion, protrusion, sequestration and how the spinal unit as one system creates homeostasis to balance the pathology, Academy of Chiropractic, Post-

Doctoral Division, PACE approved of the Federation of Chiropractic Licensing Boards, Cleveland University-Kansas City, College of Chiropractic, Long Island NY, 2018

**Clinical Instructor, Neurology of Ligament Pathology-** Neurological Innervation, The peripheral and central innervation of the disc and spinal ligaments of the dorsal root ganglion, spinal thalamic tracts, periaqueductal gray areas innervating the Thalamus and multiple regions of the brain. The efferent neurological distribution to disparate areas of the spine to create homeostasis until tetanus ensues creating osseous changes under the effect of Wolff's Law, Academy of Chiropractic, Post-Doctoral Division, PACE approved of the Federation of Chiropractic Licensing Boards, Cleveland University-Kansas City, College of Chiropractic, Long Island NY, 2018

**Clinical Instructor, Interprofessional Hospital Based Spinal Care,** Identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequella to degenerative disc trauma, Texas Chiropractic College, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Minnesota Board of Chiropractic Examiners, ID #65848, Minneapolis MN, 2018

**Clinical Instructor, Interprofessional Hospital Based Spinal Care,** identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequella to degenerative disc trauma, Cleveland University, Kansas City, Academy of Chiropractic, District of Columbia Board of Chiropractic, Department of Health, Washington, D.C., 2018

**Clinical Instructor, Primary Spine Care,** *Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care effecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification.* Cleveland University, Kansas City, Academy of Chiropractic, District of Columbia Board of Chiropractic, Department of Health, Washington, D.C., 2018

**Clinical Instructor, Primary Spine Care,** *Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care affecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification.* Texas Chiropractic College, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, New Jersey Office of the Attorney General, Division of Consumer Affairs, State Board of Chiropractic Examiners, Newark NJ, 2018

**Clinical Instructor, Primary Spine Care,** *Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care affecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification.* Texas Chiropractic College, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, State of Missouri Board of

Chiropractic Examiners ID# 20170026688, Jefferson City MO, 2017-2019

**Clinical Instructor, Primary Spine Care 2,** *Connective tissue morphology, embryology and wound repair as sequela to trauma. Full components of strain-sprain models and permanency implications with wound repair and osseous aberration with aberrant structural integrity,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, New Mexico Board of Chiropractic Examiners, Santa Fe NM, 2018

**Clinical Instructor, Primary Spine Care 3,** *Connective tissue morphology, embryology and wound repair as sequela to trauma. Full components of strain-sprain models and permanency implications with wound repair and osseous aberration with aberrant structural integrity,* Cleveland University, Kansas City, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, New Mexico Board of Chiropractic Examiners, Santa Fe NM, 2018

**Clinical Instructor, Primary Spine Care,** *Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care affecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification.* Texas Chiropractic College, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Commonwealth of Pennsylvania, Department of State Bureau of Professional and Occupational Affairs, State Board of Chiropractic, DCE00087 Harrisburg PA, 2018

**Clinical Instructor, Primary Spine Care,** *Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care affecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification.* Texas Chiropractic College, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of West Virginia Board of Chiropractic, South Charleston WV, 2018

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Growth of Interventional Pain Management Techniques and Current Trends in Pharmacological Management of Neuropathic Pain.** *ESI comparison to gabapentin in lumbosacral radicular pain – current trends and future progress of pain management interventions. Mode of action, required dosage, advantages and side effects profiles of currently available pharmacological approaches.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Spinal Injection Therapy - Facet, medial branch blocks, prolotherapy and epidural interventions utilization within the Medicare population, effectiveness on lumbar central canal stenosis with and without steroids and effect on prevention of spinal surgery, herniated disc, fibromyalgia and chronic musculoskeletal pain.** Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Adverse Events Associated with Injection Therapy – transforaminal and interlaminar epidural steroid injections, anesthesia technical considerations, effects on cervical radiculopathy midline versus paramedian approaches and perineurial injection of autologous conditioned serum. Review of FDA risk**

*assessment.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Correlation of MRI Findings and Injection Outcomes -** *MODIC Changes on MRI and effectiveness of facet injection, facet joint signal change on MRI with fat suppression comparison with SPECT/CT. Discussion of Modic 1, 2 and 3 with correlation of clinical outcomes and patient selection criteria.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Therapeutic Effects of Botulinum Toxin and Dry-Needling in Myofascial Pain Syndrome –** *cost effectiveness, patient response and triage of therapeutic interventions. Physiological review of trigger point etiology and clinical presentation of acute and chronic pain. Functional response of intervention including relief and recurrence.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Systematic Review Technical Considerations in Cervical Epidural Analgesia -** *Chemical blockage of cervical nerve roots, review of anatomical structures and correlation with MRI imaging. Blockage effects on the respiratory, circulatory and neurological systems. Review of cervical epidural space (CES) borders and variants in patient population.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Trends in opioid analgesic abuse and mortality in the USA, Evaluation of Opioid Pain Management in Injured Children, assessment of opioid reporting in Veteran Affairs –** *Emergency visitation in pediatric injury, pain management and adoption of best practices. Trends in use of prescription opioid medication using RADARS (Research Abuse, Diversion and Addiction Related Surveillance System), comparison between legitimate pharmacy channels and diversion and abuse. Opioid use prevalence and incidents in Veteran Affairs, new prescriptions or long-term conversion and relationship to persistent growth in opioid use.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Electrodiagnostic Testing, Transforaminal Epidural Steroid Injection, Intra-articular Facet Joint Injection, Spinal Manipulation Post-Epidural Injection–** *Needle EMG, active versus chronic denervation in lumbar, cervical spinal pathologies and differential diagnosis of spinal stenosis and intervertebral disc herniation. Systematic review of facet joint injections, clinical trials and conservative therapy in lower back pain. Results of spinal manipulation post-epidural injection in the cervical spine.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Radiofrequency Ablation and outcome measures -** *medication, function and pain in relation to pain of spinal origin. Medial Branch Block as prognostic tool prior to lumbar facet radiofrequency denervation. Clinical comparison disc herniation, disc bulge, cervical and lumbar radiculopathy. Diagnosis and patient triage correlation to anatomical spine structures. Long, short term risk factors and outcomes in radiofrequency ablation.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Pain Management – Clinical and Procedural – Role of Cannabinoids in Pain Management –** *review of pharmacological, botanical or synthetic origins of cannabinoids. Mechanism of action in alleviation of pain including analgesic, anti-inflammatory effects, modular actions on neurotransmitters and interactions with prescribed or endogenous opioids.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in MRI Physics – The Hardware – magnet types including permanent, resistive and superconducting magnets.** *Volume RF, surface, quadrature and phase array coils and other hardware necessary for the generation of MRI imaging.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 1 –** *magnetization, excitation, relaxation, acquisition, computing and display. T1 relaxation and relaxation curves, T2 relaxation, phase and phase coherence, T2 relaxation curves.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 2 –** *gradient coils, signal coding including slice encoding gradient, phase encoding gradient, Frequency encoding gradient. Gradient specifications and slice thickness. Filling k-space, k-space symmetry and k-space filling technique.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation 3 –** *pulse sequences, spine echo sequences including multi-slicing and multi-echo sequencing. T1, T2, proton density contrast and their applications. Turbo spine echo, fast advanced spine echo (HASTE) sequence and gradient echo sequence. Inversion recovery sequence including STIR and FLAIR sequence. Choosing the right sequence pros and cons, T1, T2 and PD parameters.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in MRI Physics – Physics of Image Generation – technical parameters and artifacts –** *repetition time, echo time, flip angle, inversion time, number of acquisitions, matrix and field of view. Slice thickness, slice gap, phase encoding direction 1 and direction 2 and relation to bandwidth. Motion artifact, para-magnetic artifact, phase wrap artifact, susceptibility artifact, clipping artifact, spine and zebra artifacts. Effects on image quality and acquisition.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – radiographic evolution of a Schmorl's node –** *acute Schmorl's node and progression to chronic stage comparison to serial MRI. Endplate fracture and acute presentation and correlation to clinical findings and pain patterns. Presentation in plain film radiograph and MRI images were compared and contrasted in both acute and chronic stages.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – syringomyelia, fluid dynamics and spinal cord motion –** *scoliosis curve patterns and syrinx characteristics versus Chiari I malformation. Normal MRI appearance and motion artifacts related to cerebral spinal fluid motion related phenomena and common appearances on MRI imaging. Syrinx wall and fluid motion and correlation to cardiac cycle with comparison between systolic and diastolic presentations.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Biomechanics, Thoracolumbar Deformity and Surgical Outcomes –** *full spine analysis, adjacent spinal biomechanics and its impact on surgical outcomes. Sagittal alignment pelvis to cervical spine and association with kyphosis and lordosis mechanical positioning.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI and EMG comparison in denervated muscle diagnosis –** *lumbar spine pathology and age in relation to paraspinal muscle size and fatty infiltration. Fatty degeneration of paraspinal muscle in degenerative lumbar kyphosis and CT versus MRI digital analysis. Positive correlations with edema on MRI and fibrillations, positive sharp*

*waves, denervation and the level of reduced recruitment pattern.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – association between annular tear and disc degeneration** – *high intensity zone (HIZ) in lumbar disc and association to annular fissure on MRI. Identification of dual HIZ and its relationship to acute inflammation and calcified tissue and its association with discogenic pain patterns. Influence of phenotype, population size and inclusion sequence. T1, T2 and STIR imaging comparison and correlation.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – degenerative cervical myelopathy – paraspinal muscle morphology, clinical symptoms and functional status.** *Review of fatty infiltration, asymmetry findings and correlation with clinical symptoms and functional scores. Review of complex anatomical arrangement of superficial and deep muscle layers in the cervical spine, correlation to MRI findings.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Neurography, Diffuse Tensor Imaging (DTI)** – *diagnostic accuracy and fiber tracking in spinal cord compression. Review of spinal cord structural integrity, peripheral neuropathy and correlation to diffuse tensor imaging findings. Comparison in combining DTI with T2 and T2 alone and its value in magnetic resonance neurography.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – Nomenclature and Classification of Lumbar Disc Pathology** – *modified Pfirrmann grading system and lumbar disc degeneration. Consensus driven description of intervertebral disc nomenclature including intervertebral disc bulge, herniation, protrusion, broad based disc herniation, extrusion and sequestration.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI evaluation of intradural tumor – neuroimaging of spinal tumors and correlation to histological study.** *Determining method of choice for evaluation, review of numerous types of intradural-extramedullary masses including meningioma and schwannoma. Signal intensities, contrast enhancement patterns, presence of cysts and other key differentiation findings of spinal cord tumors.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – Spinal Cord Compression, Myelomalacia, MRI Imaging and Clinical Correlation** – *positional cervical spinal cord compression and fibromyalgia. T1 and T2 weighted images, comparison of hypo and hyperintense signals and extent of intramedullary changes on MRI. Review of MRI findings associated with myelomalacia and discussion of correlation with clinical findings.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – MRI Characteristics of Lumbar Facet Synovial Cyst** – *formation characteristics of synovial cyst, relation to degenerative changes in spinal facet joints as demonstrated on MRI. Pre and post-surgical procedural MRI were reviewed and compared. Surgical management and subsequent resection were demonstrated.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neuroradiology – Variability in MRI Diagnostic Error Rates** – *in depth review of quality of MRI imaging and comparison to consistent MRI diagnosis between facilities. Errors of interpretation in the study examinations were considered and presented. Impact of radiological diagnosis, location of MRI study and reading radiologist and impact on treatment choice and clinical outcomes.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Wrist Anatomy and Osseous Kinematics** – *normal kinematics using biplanar radiographic model were reviewed. Discussion of extensive database of carpal bone anatomy and kinematics from a large number of healthy subjects. 3-D motion of each bone was calculated for each wrist position and discussed. Database constructed including high-resolution surface models, measures of bone volume and shape, and the 3-D kinematics of each segmented bone.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Normal Motion of the Shoulder and Glenohumeral Instability** – *normal motion of the shoulder joint compared with clinical implications of glenohumeral joint instability including surgical recommendations. Review and overview of the anatomy of the glenohumeral joint, emphasis on instability based on the current literature. Description of detailed anatomy and anatomical variants of the glenohumeral joint associated with anterior and posterior shoulder instability.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Orthopedic Testing and Shoulder Pathology Diagnosis** – *use of orthopedic special tests (OSTs) to diagnose shoulder pathology and clinical examination. Review OST clusters, examination of methodology and illustration of their use in arriving at a pathology-based diagnosis. Discussion of examination of the biceps tendon and clinical relevance. Review of SLAP lesion and shoulder impingement syndrome were reviewed.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Electrodiagnostic Testing and Carpal Tunnel Syndrome** – *Review of the most common mononeuropathy in the human body. Relationship between clinical findings, neurological examination and electrodiagnostic testing in the diagnosis of carpal tunnel syndrome. Acute and chronic symptoms including progression of the disorder were reviewed.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Current Concepts in Elbow Disorders** – *Detailed anatomy of osseous, ligamentous and muscular structure of the elbow was reviewed. Common disease of elbow disorders and their treatment was discussed. Lateral epicondylitis and medial collateral ligament injury of the elbow were outlined. Rheumatoid arthritis, posttraumatic osteoarthritis, and elderly patients with comminuted distal humeral fractures. Surgical design and technique were outlined.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Differentiating Cervical Spine from Shoulder Pathology** – *anatomical review of cervical spine and glenohumeral joint focus on similarities and differences. Cervical disorders masking shoulder pain, cervical radiculopathy, cervical spondylotic myelopathy, facet and discogenic pain patterns were outlined. Details of shoulder pathology parsonage-tuner syndrome, subscapular neuropathy and thoracic outlet were presented.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI of the Shoulder and Shoulder Girdle** – *review of MRI analysis of scapular fracture. Detailed review of scapular function rehabilitation and training on chronic pain syndromes. Reliability of magnetic resonance imaging versus arthroscopy for the diagnosis and classification of superior glenoid labrum anterior to posterior lesions.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Ankle, Hip and Spine** - Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery -Cataloging Movements of the Shoulder, Elbow, Wrist and Hand** - Review Standardization and Terminology Committee (STC) of the International Society of Biomechanics (ISB) and classification of joint kinematics. Standard for the local axis system in each articulating bone is generated and presented. Rationale for international standards among researchers was presented. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – MRI and Diagnosis of Shoulder Disorders** – normal and abnormal shoulder anatomy as viewed on MRI was presented. Review and presentation of MRI in the diagnosis and treatment of brachial plexus injury. Discussion of preganglionic avulsions and muscular denervation. Comparison of CT myelography to MRI myelography were outlined. Enhanced three dimensional T1 high-resolution isotropic volume excitation MR in the evaluation of shoulder pathology. Comparison with two-dimensional enhanced T1 fat saturation MRI were discussed. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Extremity Surgery – Clinical Evaluation of Upper and Lower Extremity Pathology** – review of relevant anatomy in shoulder, elbow, wrist, hip, knee and ankle was presented. Physical examination including orthopedic, neurological and range of motion testing was presented and compared with findings on MRI results. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Fusion Surgery and Lumbar Stenosis** – efficacy of fusion and decompression surgery in patients with lumbar spinal stenosis. Review of degenerative spondylolisthesis and patient selection criteria. Discussion of correlation of MRI, CT findings and clinical evaluation. Review of sedimentation sign on MRI and indications of prognostic factors. Surgery versus nonsurgical treatment outlined and outcomes discussed. Compensation for lumbar spinal stenosis and clinical sagittal plane deformity was presented. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Posterior Lumbar Interbody Fusion and Adjacent Segment Degeneration (ASD)** – adjacent segment degeneration as major consequence of spinal fusion. Review of occurrence and location with correlation between surgical outcomes were discussed. Discussion of age, BMI and pre-existing stenosis in cranial adjacent segment as risk factors. ASD prevalence in radiographic evidence between cranial and caudal segments were reviewed. Presentation of risk factors and pre-operative radiological features. Facet sagittalization and tropism were discussed. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Morbidity and Mortality Predictions in Spinal Surgery** – Review of the Charlson Comorbidity Index (CCI) and the American Society of Anesthesiologist (ASA) Physical Status Classification System. Review of index outcomes and relation to costs of care. Discussion of index rating and likelihood of complications. Review of classification system in cerebral spinal fluid (CSF) leaks. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spondylolisthesis, clinical and radiographic classifications** - *classification system that considers disc space height, sagittal alignment and translation, and the absence or presence of unilateral or bilateral leg pain was discussed. Detailed review of spondylolisthesis etiology, clinical presentation and imaging findings was reviewed. Review of inter and interobserver reliabilities of radiographic and clinical criteria. Review of consensus driven treatment options for degenerative spondylolisthesis presented. Transforaminal Lumbar Interbody Fusion (TLIF) in degenerative disc disease with associated spondylolisthesis grade I was reviewed and correlated.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Sagittal Alignment and Spinal Surgery, Clinical Outcomes and Follow up** – *discussion of outcomes and sagittal alignment in single unilateral transforaminal lumbar interbody fusion (TLIF). Detailed review of surgical TLIF procedure and associated mid and long-term clinical outcomes. Discussion and presentation of influence of pelvic incidents and lumbar lordosis mismatch and post-operative residual symptoms. Analysis of adjacent segment disease following fusion.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Complications and Outcomes in Adult Spinal Deformity Surgery** – *review of surgical approaches and complications in correction of adult spinal deformity. Relevance of age, comorbidities, blood loss, osteoporosis and smoking were discussed. Discussion of Cobb Angle, Sagittal Vertical Axis, Pelvic Tilt, Thoracic Kyphosis were reviewed and examined in relation to transposas lateral interbody fusion (LIF), percutaneous pedicle screw (PPS), transforaminal lumbar interbody fusion (TLIF). Comparison between minimally invasive and traditionally open procedures was provided and reviewed. Discussion of minimally invasive surgery options were emphasized and outcomes reviewed with correlation to diagnosis and procedural coding.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Surgical Interventions in Lumbar Disc Herniation** – *review of differences in surgical treatment of recurrent lumbar disc herniation. Clinical correlation between plain film radiography, MRI studies and clinical presentation were reviewed. Data on frequency in management of recurrent lumbar intervertebral disc herniations presented. Duration of symptoms and influence of patient outcomes in sciatica patients undergoing micro-discectomy and decompressions.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Length of Stay in Lumbar Spinal Surgery** – *discussion on epidemiology of lumbar surgery outcomes and hospital stay. Correlation to clinical presentation and comorbidities were reviewed. Outline of decompression and instrumental fusion in the lumbar spine. Review of costs of lumbar surgery, trends in hospital stay and costs both on a cumulative and daily basis. Comparison of the nationwide inpatient sample and national surgical quality improvement program databases for lumbar spine fusion procedures was reviewed and presented.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Pre-Surgical Planning and Implant Design** – *3-D printing and surgical planning discussion a variety of historical materials in the creation of patient specific implants based on unique individual anatomy. Historical trends in the creation of prosthetics with 3-D modeling software using neuroimaging data. Review of treatment complex spinal pathologies and surgical planning was discussed. Outline of current and future barriers to global implementation and commercialization was reviewed.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Spine Surgery Procedures in Medical Specialty Training** – *discussion of current spine surgery training including fellowship programming in the United States. Accreditation Council for Graduate Medical Education (ACGME) cases logs were reviewed and discussed. Variability of procedures within programs and between medical specialty programs were outlined. Differential utilization between orthopedic and neurosurgical fellows was reviewed.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Orthopedic Spine Surgery – Cerebral Spinal Fluid Dynamics, Central Nervous System Pathology and Intracranial Hypotension** – *pathophysiology and various craniospinal disorders. Directional phase contrast MRI (4D Flow) was reviewed along with the anatomical and physiological properties of cerebral spinal fluid. Specific disorders such as Alzheimer's disease, hydrocephalus, Chiari Malformation and syringomyelia. Clinical correlation of CSF dynamics to understanding disease process was reviewed including normal and abnormal flow patterns. Recent advancements in fluid flow studies were outlined and presented. Signal intensity changes on MRI study in cervical spondylotic myelopathy was discussed and compared to normal parameters. Fluid dynamics patterns within syringomyelia and Chiari malformation was discussed and correlated to MRI findings and clinical presentations. Spinal microsurgical exploration surgery and resultant CSF leak and spontaneous intractable intracranial hypotension was reviewed and its pathoanatomical presentation outlined. Review of the natural and surgical history of Chiari malformation Type I in pediatric population and clinical correlation with MRI studies.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy and Physiology of the Blood Brain Barrier** – *Review of consequences of alterations in homeostatic control of the neuronal environment. Discussion of blood flow alterations and altered vessel permeability as determinants in the pathophysiology of brain injury. Review present day literature on the anatomy, development and physiological mechanisms of the blood-brain barrier. The blood brain barrier's role in the maintenance of the extracellular environment. Vascular anatomy of the spinal cord was review in relation to the physiology of the neural environment.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neurosurgery – Spinal Cord Anatomy, Physiology and Vascular Reactivity** – *detailed review of the blood supply of the spinal cord, anatomy of the vascular system and physiology of blood flow. Pathophysiology of various conditions including Thoracic Aortic Occlusion and Spinal Cord Injury were discussed with specific relation to risk of neurological deficit. Severity and duration as an effect was reviewed and correlated clinically. Cerebral circulation and aging, discussion of effects on cognitive functioning and cerebrovascular disease in aging.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neurosurgery – Upper Cervical Spine Anatomy and Cerebral Spinal Fluid Flow** – *MRI flow imaging and computational fluid dynamics in healthy patients with Chiari Malformations. Review of abnormal cerebral spinal fluid flow oscillations and their effects on healthy patients. Discussion of nonlaminar complex spatial and temporal variations with associated pressure waves and pressure gradients causing syringomyelia, headaches and other clinical manifestations in Chiari I malformation. Microsurgical anatomy and internal architecture of brainstem in 3D images and surgical considerations. CSF hydrodynamic changes, spinal cord injury and development of post traumatic syringomyelia (PTSM). Impact of spinal cord nerve roots and denticulate ligaments on cerebral fluid dynamics in the cervical spine was reviewed and discussed.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neurosurgery – Compression and Degeneration in Chronic Nerve Root Entrapment** – *differentiation between peripheral nerves and spinal nerve roots and effects of electrostimulation. Discussion of various stimulating or recording neurosurgical implants and success vs failure rates. Review of the nerve root compression and its relation to consequences of disc herniation and acute compression during surgery. Maximum pressure level a spinal nerve root can sustain is reviewed. Discussion of microsurgical anatomy of lumbosacral nerve rootlets, Rhizotomy and chronic spinal cord injury. Review of qualitative grading of severity of lumbar spinal stenosis on morphology of dural sac on MRI studies, review of classification systems and the consideration of impingement of neural tissue.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neurosurgery – Anatomy of Circle of Willis, Cerebral Arteries and Stroke Etiology** – *discussion of stroke by embolism, source and cause in diagnosis and long-term treatment. Review of complex nature of embolus transport and its relation to etiology. Image based hemodynamics with discrete particle dynamics in relation to the distribution of emboli across the various cerebral arteries. Detailed anatomy of Circle of Willis reviewed and discussed with particular focus on size/inertia dependent trends in embolus distribution to the brain, distribution of cardiogenic versus aortogenic emboli among anterior, middle and posterior cerebral arteries, left versus right brain preference in cardio-embolus and aortic emboli transport and source-destination relationship for embolisms affecting the brain. Detailed review of the microsurgical anatomy of the posterior cerebral artery in three dimensional images.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neurosurgery – Stroke Therapy, Implementation and Cost-Effectiveness** – *review of endovascular therapy in addition to standard care in acute ischemic vessel occlusion stroke. Comparison in National Institutes of Health Stroke Score (NIHSS) score, symptom onset, Alberta Stroke Program Early CT Score (ASPECTS) and occlusion location. Considerations in acute management and revascularization of tandem occlusions in acute ischemic stroke with literature review. Discussion of Transcirculation Pipeline embolization device deployment as a rescue technique.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 1** – *review of historical interventions, multilevel decompression and instrumented fusion in reduction of neural compression and spinal column stabilization. Discussion of morbidity and mortality in relation to surgical procedures. The use of the modified fragility index to predict 30-day morbidity and mortality from spine surgery. Differences in patient selection for minimally invasive versus open surgical procedures, and review of post-surgical outcomes. Morbidity, mortality and health care costs for patients undergoing spine surgery following ACGME resident duty-reform.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Neurosurgery – Surgical Approaches and Outcomes in Spine Surgery 2** *Predisposing factors for dural tears in lumbar spine surgery including degenerative conditions, prior surgery and age related indicators were reviewed. Discussion and review of re-admission rates in spine surgery through metanalysis and systematic review. Bibliometric study of the most important minimally invasive (MIS) spine surgery papers including Level III and IV studies with focus on moving toward Level I and Level II.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine and Spine Pain** – *review of lack of guidelines for the management of lower back pain in the ED. Frequency of lower back pain visitation in the emergency department including environmental/sociocultural dimensions and physical/psychospiritual dimensions were reviewed. Discussion of utilization of significant healthcare resources with complete description of lower back pain characteristics, health services use in non-urgent lower back pain patients presenting to the ED. Managing spine pain in the ED*

*using usual and customary medical intervention. Extent of appropriate CT and MRI scans in the hospital setting, accessibility reviewed in conjunction with presented national data. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Medication Usage and Motor Vehicle Accidents** – review of ADHD medication utilization and motor vehicle accident data and frequency of motor vehicle accident sin this specific patient population. Review of the prevalent and preventable cause of morbidity and mortality among patients and concepts of restricting based on prognostic factors. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Department Imaging Perspectives** – review of imaging protocols among a spectrum of clinical indications, perspective on aging populations and clinical complexity. Review of CT, MRI, plain film imaging and ultrasound and their relationships to internal medicine and musculoskeletal disorders examined on an emergency basis through patient generated national survey data. Details of specific contexts in which imaging has become concentrated and targeted efforts for optimization of utilization. considerations of utilization of CT in the emergency department and evaluation to increasing trends. Review of quality improvements in imaging utilization. Comparison between pediatric and adult imaging protocols and trends. Discussion and analysis of “Choose Wisely” recommendations and creating of guideline/policy/clinical pathways in New England EDs. MRI utilization in pediatric ED reviewed and analyzed. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Emergency Medicine – Cauda Equina Syndrome and Other Emergent Conditions** – traumatic injuries to the thoracolumbar spine and overall impact on emergency services. Discussion of exact definitions of Conus Medullaris Syndrome (CMS) and Cauda Equina Syndrome (CES). Diagnosis in acute phase and radiological findings clinically correlating with physical examination findings. Parameters for spinal regions of traumatic injury were presented and reviewed. Case presentations for neck and spine were included and reviewed with particular focus on differential diagnosis and case uniqueness. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Emergency Medicine – Emergency Medicine Residency Curriculum** – review of Ohio State University Emergency Medicine Residency Program Musculoskeletal Emergencies Curriculum. Outline of the significant nature of musculoskeletal emergency presentations to ED. Details in the training required to master clinical experience, self-directed learning and small group didactics. Case study reviews and discussion was presented with particular focus on infection vs non-infections and traumatic vs non-traumatic presentations in ED. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Emergency Medicine – Opioid vs Non-Opioid Medications in the Emergency Department** – discussion of limited evidence of long-term outcomes of opioids with non-opioid medication for chronic pain. Literature review on effectiveness for opioid interventions. Discussion of alternative recommendations, evidence demonstrating lack of benefit and poor long term outcomes. Variation in physician opioid prescriptions discussed. Patterns of opioid initiation at first visits for pain in the ED in the United States including frequency and dosage. Emergency Department data concerning the persistent pain after motor vehicle accidents and comparison between opioid and NSAID prescribed in the ED. Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Emergency Medicine – Concussion and Repeat ED visits** – review of patients presenting to ED with concussion with re-visitation within 72 hours. Mechanism of injury including closed head injury, assault, fall and motor vehicle accidents discussed. Epidemiological

*evidence presented regarding number of visitations, characteristics and care paths reviewed. Discussion of adoption of a more comprehensive discharge plan to further prevent repeat visits was outlined. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Epidemiology of ED Visits in the United States, Adults Over 65 and Motor Vehicle Accidents** – *Evaluation of data from the National Hospital Ambulatory Medical Care Survey and frequency of ED visitation. Percentage of visits requiring hospital admission was reviewed along with patterns of need for critical care. Review of imaging ordering statistics and clinical diagnosis was discussed. Details of primary and secondary ED diagnosis presented in relation to sprain/strain, contusion and spinal pathology including herniated intervertebral disc, fracture and spinal cord compression. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Emergency Medicine – National Hospital Ambulatory Medical Care Survey** – *a review of the current representative data on ambulatory care visits to hospital emergency departments in the United States. Demographics, residence, insurance class, chief complaint with focus on traumatic injury, diseases of the nervous and musculoskeletal systems were outlined. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Lower Back Pain and Emergency Room Visits** – *detailed analysis of impact of lower back pain on ED globally. First systematic review of the trends in the literature including lower back pain as significant complaint and the variables in its definition. Discussion of the proper diagnosis and triage of lower back pain and its current impact on ED management was reviewed. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Emergency Medicine – Spinal Cord Injury without Radiographic Abnormality (SCIWORA) in Adults** – *case reports – detailed review of Spinal Cord Injury without Radiographic Abnormality was presented. Syndrome of post traumatic myelopathy demonstrable on MRI with no evidence of osseous injury on plain film or CT scan. Reporting of incidence was included with detailed discussion of case presentations, accurate diagnoses and triage was reviewed. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Traumatic Brain Injury Data – Related Emergency Department Visits, Hospitalizations, Deaths – United States, 2007 and 2013** – *traumatic brain injury, short and long term adverse clinical outcomes, death and disability reviewed and compared based on CDC data over a 7 year period. Mechanism of causation including motor vehicle accidents, falls and assault. Public health recommendations and interpretation of data was presented. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Emergency Medicine – CDC Data, Trends in Emergency Department Visits for Ischemic Stroke and Transient Ischemic Attack** – *relationship between stroke and statistical cause of death, type of stroke and prognosis related to recurrence was discussed. Specific definitions of ischemic stroke, transient ischemic attack with etiology and relationship to emergency visits were outlined and presented. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Emergency Medicine – US Emergency Department Use by Children** – *pediatric utilization of emergency medicine resources, description of trends on a national basis. Detailed analysis of specific demographics including race and resident status were reported and reviewed. Discussion in allocation of resources including insurance class and coverage were reviewed. Anticipated expansion of Medicaid was considered and reviewed. Estimates of nonurgent ED visits by children were presented and discussed. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Supply of Chiropractic Care and Visits to Primary Care Physicians for Neck and Back Pain** – *discussion of primary care visits and lower back pain. Expenditures and contributions to disability data. Discussion of supply of chiropractic care in context of visits for lower back pain and primary care physicians. Estimated national impact of primary care visits and expenditures was outlined with a focus on chiropractic's assistance in managing lower back pain. Defining an "episode" of lower back pain and relationship to collection of epidemiological data. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Safety of Chiropractic Care in Lower Back Pain and Migraine Headaches** – *review of adverse events associated with chiropractic care in the treatment of migraine. Outline of a prospective 3-armed, single-blinded, placebo RCT. Discussion of transient and mild events following chiropractic intervention. Randomized clinical trials and meta-analysis reviewed and discussed relating to the diagnosis and management of lower back pain including adverse event reporting. Risk of injury to the head, neck or trunk following an office visit for chiropractic spinal manipulation, as compared to office visit for evaluation by primary care physician. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Pain Management in Primary Care** – *evaluation of the analgesic effects of spinal manipulation on both healthy and pain inflicted patients. Discussion of evidence of increased in pressure pain thresholds in musculoskeletal pain at both local and remote sites. Detailed knowledge of patient population regarding demographics and socioeconomic factors as well as disease-specific characteristics. Suggestion that lower back pain should not be seen as benign and self-limiting with focus on management. Describe the communication system surrounding the management of chronic pain from the perspectives of allopathic providers, acupuncture and chiropractor providers, and chronic musculoskeletal pain patients. Chiropractic manipulative treatment (CMT) association with lower healthcare costs among multiply-comorbid Medicare beneficiaries with an episode of chronic low back pain was reviewed. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Perceptions of Chiropractic Care** – *demographic review of data on the perceptions of chiropractic care. Review of patient interest, trustworthiness, costs and frequency of visits was discussed. Nationally representative survey to compare characteristics and use of survey respondents with positive and negative perceptions of DCs and chiropractic care. Positive perceptions of DCs were more common than those for chiropractic care. US adults generally perceive DCs in a positive manner. Describe the preferences of older adults for low back pain co-management by MDs and DCs and identify their concerns for receiving care under such a treatment model. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Chiropractic and Post-Surgical Care and Care for Veterans** – **discussion of persistent post-surgical lower back and radicular pain response to chiropractic care. Relevant anatomy related to lower back pain and intervertebral disc injury was outlined and presented.** *Discussion and development of an integrated care pathway for doctors of chiropractic, primary care providers, and mental health professionals who manage veterans with low back pain, with or without mental health comorbidity, within Department of Veterans Affairs health care facilities. Support for the inclusion of chiropractic care as a component of multidisciplinary health care for low back pain, as currently recommended in existing guidelines with a focus on US Service Members. Discussion of availability of chiropractic care to military healthcare systems, referral and interprofessional communication models. Cleveland University College of Chiropractic, 2017.*

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Effects of Chiropractic Care Combined with Medical Care, First Contact and Provider Type** – *differences in outcomes, patient satisfaction, and related healthcare costs in spinal, hip, and shoulder pain patients who initiated care with medical doctors (MDs) vs those who initiated care with doctors of chiropractic (DCs). Pain of musculoskeletal origin and epidemiology of reduced productivity. Comparison of data on health outcomes, patient satisfaction, and related healthcare costs in patients consulting differing first-contact care providers for musculoskeletal pain.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – Integrating Chiropractic Care into Primary Care and Private Sector Healthcare Facilities** – *suggestion of a diverse role for chiropractors within conventional health care facilities. Discussion of chiropractic's effectiveness for managing musculoskeletal disorders, particularly spine-related pain and disability. Descriptions of doctors of chiropractic who work in nongovernmental, private sector health care settings in the United States. Shared electronic health records, face-to-face informal consultations methods for interprofessional communication.* Cleveland University College of Chiropractic, 2017.

**Clinical Instructor - Specialty Research in Primary Care and Internal Medicine – American College of Physicians – Guideline Recommendations – Non-Invasive and Non-Pharmacological - American College of Physicians (ACP) developed this guideline to present the evidence and provide clinical recommendations on noninvasive treatment of low back pain. Systematically review the current evidence on non-pharmacologic therapies for acute or chronic non-radicular or radicular low back pain. Comparative benefits of non-pharmacological therapies in acute/subacute low back pain including exercise, spinal manipulation, lumbar supports, acupuncture, laser, ultrasound and traction. Discussion of first and second line therapies with reduction in opioid prescription.** Cleveland University College of Chiropractic, 2017.

**Clinical Instructor, Spinal Biomechanical Engineering** - Differential diagnosis of pathobiomechanics in the cervical, thoracic and lumbar spine as sequelae to micro and macro trauma and chronic biomechanic instabilities. Understanding the clinical implications of long-term biomechanical failure in resultant disc pathology, ligament pathology and osseous pathology, Texas Chiropractic College, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Chiropractic Physicians' Board of Nevada, Index #NV19-134, Reno NV, 2017

**Clinical Instructor, Spinal Biomechanical Engineering**, Differential diagnosis of pathobiomechanics in the cervical, thoracic and lumbar spine as sequelae to micro and macro trauma and chronic biomechanic instabilities. Understanding the clinical implications of long-term biomechanical failure in resultant disc pathology, ligament pathology and osseous pathology, Texas Chiropractic College, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas State Board of Chiropractic Examiners, AR Course #AR6446 Little Rock AR, 2017

**Clinical Instructor, Spinal Biomechanical Engineering**, Diagnostic Imaging Interpretation, Differential diagnosis of pathobiomechanics in the cervical, thoracic and lumbar spine as sequella to micro and macro trauma and chronic biomechanic instabilities. Understanding the clinical implications of long-term biomechanical failure in resultant disc pathology, ligament pathology and osseous pathology, Texas Chiropractic College, Academy of Chiropractic, PACERecognized by the Federation of Chiropractic Licensing Boards, State of Georgia, Board of Chiropractic Examiners, Index #2017-43, 2017

**Clinical Instructor, Interprofessional Hospital Based Spinal Care**, Identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequella to degenerative disc trauma, Texas Chiropractic College, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of Georgia, Board of Chiropractic Examiners, Index #2017-52, 2017

**Clinical Instructor, Chiropractic as a Primary Spine Care**, based upon the literature conclusions and the documentation requirements to support those conclusions in an ethical collaborative environment inclusive of hospitals, emergency rooms, primary care medical doctors and medical specialists, Texas Chiropractic College, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of Georgia, Board of Chiropractic Examiners, Index #2017-54, 2017

**Clinical Instructor, Primary Spine Care**, Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care effecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification. Texas Chiropractic College, Academy of Chiropractic, recognized by the PACE Program of the Federation of Chiropractic Licensing Board, State of Hawaii, Professional & Vocational Licensing Division, Board of Chiropractic Examiners, Department of Consumer Affairs, Index #HI 17-157, Honolulu HI, 2017

**Clinical Instructor, Primary Spine Care**, Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care effecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification. Texas Chiropractic College, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, Minnesota Board of Chiropractic Examiners, ID #61486, Minneapolis MN, 2017

**Clinical Instructor, Primary Spine Care**, Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care effecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification. Texas Chiropractic College, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, Texas Board of Chiropractic, ID #O07-7868, Pasadena TX, 2017

**Clinical Instructor, Primary Spine Care**, Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care effecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification. Texas Chiropractic College, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board, Chiropractic Physicians' Board of Nevada, Index # NV19-157, Reno NV, 2017

**Clinical Instructor, Spinal Biomechanical Engineering,** Differential diagnosis of pathobiomechanics in the cervical, thoracic and lumbar spine as sequella to micro and macro trauma and chronic biomechanic instabilities. Understanding the clinical implications of long- term biomechanical failure in resultant disc pathology, ligament pathology and osseous pathology, Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Chiropractic Physicians' Board of Nevada, Index # NV19-134, Reno NV, 2017

**Clinical Instructor, Spinal Biomechanical Engineering,** Differential diagnosis of pathobiomechanics in the cervical, thoracic and lumbar spine as sequella to micro and macro trauma and chronic biomechanic instabilities. Understanding the clinical implications of long- term biomechanical failure in resultant disc pathology, ligament pathology and osseous pathology, Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, Arkansas State Board of Chiropractic Examiners, AR Course #AR6446 Little Rock AR, 2017

**Clinical Instructor, Primary Spine Care Symposium 3-** Connective Tissue and Spinal Disc Pathology, *The morphology and pathology of connective tissue, inclusive of spinal disc disorders and prognosticating wound repair with permanency implications. Disc bulge, herniation, protrusion and extrusion classifications based upon contemporary literature and how to age- date disc pathology.* Texas Chiropractic College, Post-Doctoral Division, Academy of Chiropractic Post-Doctoral Division, Melville, NY, 2017

**Clinical Instructor, Primary Spine Care Symposium 3-** Physiology and Anatomy of Spinal Manual Adjusting, *Understanding the role of mechanoreceptors, proprioceptors and nociceptors with facets, ligaments, tendons and muscles in aberrant spinal biomechanics. MRI and imaging studies of decompressing via a chiropractic spinal adjustment of the bio-neuro-mechanical lesion and its effects on the central nervous system both reflexively and supratentorial.* Texas Chiropractic College Post-Doctoral Division, Academy of Chiropractic Post-Doctoral Division, Melville, NY, 2017

**Clinical Instructor, Primary Spine Care Symposium 3-** Medical-Legal Documentation, *The contemporary documentation required in a medical-legal environment that is evidenced based and meets the standards of the courts and academia. Utilizing the scientific data to support a diagnosis, prognosis and treatment plan while meeting the admissibility standards based upon a professional's credentials.* Texas Chiropractic College, Post-Doctoral Division, Academy of Chiropractic Post-Doctoral Division, Melville, NY, 2017

**Clinical Instructor, Contemporary Literature of the Chiropractic Spinal Adjustment,** The bio-neuro-mechanical scientific foundation of spinal lesion and the neurological pathways, both in the lower and upper motor neuron pathways. The autonomic sequella of the vertebral subluxation and the effects of the correction and maintenance of those lesions. Texas Chiropractic College, PACE Approved for the Federation of Chiropractic Licensing Board, Academy of Chiropractic, Melville, NY, 2017

**Clinical Instructor, MRI Spine Interpretation and Spinal Biomechanics,** Bulging, herniated, protruded and extruded disc contemporary nomenclature, analysis and differential diagnosis. Connective tissue physiology and pathology with aberrant biomechanical permanent sequelae. Texas Chiropractic College, PACE Approved for the Federation of Chiropractic Licensing Board, Academy of Chiropractic, Melville, NY, 2017.

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 2,** Analyzing the integration of collision reconstruction and spinal biomechanics utilizing a

mathematical model. Understanding the model and transference of energy from the bullet car to the target car to the occupant to aberrant spinal biomechanics. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering – Part 2**, Understanding the mathematical models required to analyse a collision and create coefficients of forces transferred in a collision that effect the automobile and the occupant. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 3**, Calculation worksheets in the mathematical models required to analyse a collision and create coefficients of forces transferred in a collision that effect the automobile and the occupant. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 4**, An analysis of vehicle parts and construction design that contribute to the energy translated to the human body and spine inclusive of seatbelts, airbags, bumpers, event data recorders, tires, axles and auto frames. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 5**, When correlating crash to injury, inspecting the vehicle for evidence of damage to verify causality and extent of malformation of the vehicle beyond that of the outer shell of the vehicle. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 6**, Newton's laws of inertia and the determinant calculations required based upon the action of the vehicle and how spinal biomechanics are affected. Analyzing the vehicle and accident site to reconstruct the actions of the car to create a mode. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering – Part 7**, Reconstructing and calculating minimal speed and velocity as injury and damage factors based upon skid marks considering coefficients of friction based upon various road surfaces. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Collision Reconstruction & Biomechanical Engineering - Part 8**, Reconstructing and calculating speed and velocity as injury and damage factors based upon yaw marks considering coefficients of friction based upon various road surfaces. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 9**, Coefficients of momentum and calculating plastic vs. elastic deformation. Direction of forces as mathematical determinants of collision and resultant bodily injury forces. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering – Part 10**, Coefficients of acceleration, negative acceleration and G-forces in collisions that contribute to vehicular and bodily injuries. Analyzing time, speed and weight of bullet and target automobiles to reconstruct the energy of a collision and injury potential. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 11,** The osseous and ligamentous structures that are subject to pathology in bodily injury. The pathological reaction of connective tissue when it exceeds its parapsychological limits and the bio-neuro-mechanical changes the connective tissue undergoes as sequella to trauma. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 12,** Energy and momentum coefficients and data utilized as determinants and error ranges in calculations. Considering the stiffness of the vehicle, air bag function and formulation of timing in its release point and injury potential to facial and spinal structures. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering – Part 13,** Mathematical worksheet reviewing kinetic and work energy, momentum, acceleration and G-forces in numerically quantifying a collision, the energy created to deform an automobile and the transference of forces creating connective tissue pathology and altered spinal biomechanics. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 14,** Analyzing a sample accident (case 1) utilizing all the vehicle, road surface combining standardized calculation variables in reconstructing an accident and the resultant energy considered for connective tissue pathology and resultant aberrant spinal biomechanics. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 15,** Analyzing a sample accident (case 2) utilizing all the vehicle, road surface combining standardized calculation variables in reconstructing an accident and the resultant energy considered for connective tissue pathology and resultant aberrant spinal biomechanics. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Collision Reconstruction & Biomechanical Engineering - Part 16,** Analyzing a sample accident (case 3) utilizing all the vehicle, road surface combining standardized calculation variables in reconstructing an accident and the resultant energy considered for connective tissue pathology and resultant aberrant spinal biomechanics. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Connective Tissue Spinal Disc Permanent Pathology, Primary Spine Care,** Herniated, bulged, protruded and extruded discs, etiology and morphology. Age-dating disc pathology inclusive of Modic changes, piezoelectric effect, Wolff's Law and radicular clinical presentation. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Clinical Instructor, Bio-Neuro-Mechanical Lesions and Spine Care, Primary Spine Care,** Mechanoreceptor, proprioceptor, nociceptor innervation and control of the spinal system with central nervous system action and interaction. The integration of the pain processing network and the HPA Axis (hypothalamus, adrenal and pituitary) with the chiropractic spinal adjustment. Academy of Chiropractic Post-Doctoral Division, Texas Chiropractic College, Long Island, NY, 2017

**Instructor, Evidence Based Spine Care:** Epidemiology of spine care, the opioid epidemic and spinal manipulation for pain management. Functional neuroanatomy and neurochemistry of pain perception, including descending modulation of pain in the central nervous system. Review of specific research outlining spinal manipulations influence on the central nervous system in the spine pain patient.

Clinical assessment and interprofessional communications relating to the diagnosis and management of the mechanical spine pain patient. Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Dallas Texas, March 2017

**Instructor, Evidence Based Spine Care:** Spinal biomechanics and response to trauma. Detailed review of spinal instability, mechanical spine trauma and global spinal biomechanical balance. The influence of spinal sagittal curvature, pelvic incidence, sacral slope and pelvic tilt on conservative and surgical care outcomes. Clinical correlation with radiographic and advanced imaging findings specific to the spine pain patient. Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Dallas Texas, March 2017

**Instructor, Evidence Based Spine Care:** Coordination of care and clinical documentation associated with interprofessional communication. Focus on the safety of chiropractic management of the spine pain patient and review of research related to specific phases of care, acute intervention, corrective care and health maintenance care were reviewed. Documentation and workflows related to an interprofessional team approach focusing on compliance and delivery in the modern practice environment. Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Dallas Texas, March 2017

**Clinical Instructor, Primary Spine Care 2:** Utilizing Research in Trauma, The ability of your electronic health records to convey tissue pathology while documenting case studies, , field experiments, randomized trials and systematic literature reviews, Introducing evidence based macros in documentation to support the literature and necessity of care, Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Setauket NY, 2016

**Clinical Instructor, Primary Spine Care 2:** Chiropractic Evidence, Analyzing segmental pathology, adjusting vs. mobilization with cervicogenic headaches, Opioid alternatives and case management of mechanical spine pain based upon outcome studies, Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Setauket NY, 2016

**Instructor, Disc Definitions from Trauma and Insurance Settlement Formulas,** Washington State Continuing Education Board, Seattle, WA 2016

**Instructor, Spinal Biomechanics and Rehabilitation in Primary and Specialty Medical Practice,** A review of current trends in spine care including anatomical vs biomechanical etiology of spine pain, opioid analgesic trends and effectiveness with a particular focus on the diagnosis and case management of spine patients from the clinical entry point to advanced surgical procedures. A particular focus was on epidemiological trends associated with neuromusculoskeletal medicine, advanced imaging techniques such as MRI, detailed review of plain film radiographs in the assessment of clinical spinal biomechanics. Specific research papers were reviewed related to Interprofessional collaboration, Interprofessional care outcomes, the natural history of spine pain in patients as well as the pain modulation effects of spinal manipulation. ACCME Joint Providership with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, St Petersburg, FL, 2016.

**Co-Instructor, Spinal Biomechanics and Rehabilitation in Primary and Specialty Medical Practice,** A review of current trends in spine care including anatomical vs biomechanical etiology of spine pain, opioid analgesic trends and effectiveness with a particular focus on the diagnosis and case management of spine patients from the clinical entry point to advanced surgical procedures. A particular focus was on epidemiological trends associated with neuromusculoskeletal medicine, advanced imaging

techniques such as MRI, detailed review of plain film radiographs in the assessment of clinical spinal biomechanics. Specific research papers were reviewed related to Interprofessional collaboration, Interprofessional care outcomes, the natural history of spine pain in patients as well as the pain modulation effects of spinal manipulation. ACCME Joint Providership with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Reading, PA, 2016.

**Instructor, Spinal Biomechanics and Rehabilitation in Primary and Specialty Medical Practice,** A review of current trends in spine care including anatomical vs biomechanical etiology of spine pain, opioid analgesic trends and effectiveness with a particular focus on the diagnosis and case management of spine patients from the clinical entry point to advanced surgical procedures. A particular focus was on epidemiological trends associated with neuromusculoskeletal medicine, advanced imaging techniques such as MRI, detailed review of plain film radiographs in the assessment of clinical spinal biomechanics. Specific research papers were reviewed related to Interprofessional collaboration, Interprofessional care outcomes, the natural history of spine pain in patients as well as the pain modulation effects of spinal manipulation. ACCME Joint Providership with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Chicago, IL, 2016

**Instructor, Spinal Biomechanics and Rehabilitation in Primary and Specialty Medical Practice,** A review of current trends in spine care including anatomical vs biomechanical etiology of spine pain, opioid analgesic trends and effectiveness with a particular focus on the diagnosis and case management of spine patients from the clinical entry point to advanced surgical procedures. A particular focus was on epidemiological trends associated with neuromusculoskeletal medicine, advanced imaging techniques such as MRI, detailed review of plain film radiographs in the assessment of clinical spinal biomechanics. Specific research papers were reviewed related to Interprofessional collaboration, Interprofessional care outcomes, the natural history of spine pain in patients as well as the pain modulation effects of spinal manipulation. ACCME Joint Providership with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Newark, Delaware, 2016.

**Clinical Instructor, Mild Traumatic Brain Injury, Traumatic Brain Injury and Concussion,** *differentially diagnosing spinal issues in the trauma and non-trauma patient inclusive of spinal disc pathology utilizing x-ray, MRI, CAT Scan and clinical evaluations. Collaborative triaging protocols with neurologists, neurosurgeons, orthopedic surgeons, pain management and primary medical care providers with both mechanical and anatomical spinal pathologies, Academy of Chiropractic, Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, PACE Recognized by the Federation of Chiropractic Licensing Boards, State of West Virginia Board of Chiropractic, South Charleston WV, 2017*

**Clinical Instructor, Primary Spine Care 2:** *Spinal Trauma Pathology, Morphology of healthy and traumatized connective tissue and the permanency implication of adhesions, spinal disc morphology in the healthy and pathological patient as sequela to trauma in relationship to bulges, herniations, protrusions, extrusions and sequestrations. Aberrant spinal biomechanics and negative sequela to trauma. Texas Chiropractic College, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Board and the following states licensure boards: AZ, CA, CO, CT, DE, IA, ID, IL, MD, MI, MT, ND, NE, NH, NY, OR, PA, RI, SC, TX, UT, VT, WA, WV, Setauket NY, 2016*

**Clinical Instructor, Primary Spine Care 2:** *Chiropractic Spinal Adjustment Central Nervous System Processing, Literature reviews of mechanoreceptor, proprioceptor and nociceptor stimulation of later horn grey matter with periaqueductal stimulation affecting the thalamus and cortical regions with efferent distribution in disparate regions of the body in both pain and systemic stimulation. Texas Chiropractic College, Academy of Chiropractic, Recognized by the PACE Program of the Federation*

of Chiropractic Licensing Board and the following states licensure boards: AZ, CA, CO, CT, DE, IA, ID, IL, MD, MI, MT, ND, NE, NH, NY, OR, PA, RI, SC, TX, UT, VT, WA, WV, Setauket NY, 2016

**Clinical Instructor, Primary Spine Care** – Central Nervous System Processing of Pain and Physiology, Central neural pathways of pain and higher cortical responses to pain and the effect of high amplitude-low velocity forces on mechanoreceptors and proprioceptors. The effects of neuropeptides on the hypothalamus, pituitary and adrenal axis when treating patients. Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Melville NY, 2016

**Clinical Instructor, Primary Spine Care** – Hospital and Emergency Room Care, Identifying spinal lesions inclusive of cord and root lesion through examination and advanced imaging in creating an accurate diagnosis, prognosis and treatment plan to effectively triage in collaboration and coordination with medical specialists and emergency department physicians. Differentially diagnosing and triaging disc degenerative bulges, traumatic disc bulges, protrusion herniations, extrusion herniations and fragmented herniations along with managing traumatically induced pain as sequella to degenerative disc trauma, Texas Chiropractic College, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Melville NY, 2016

**Clinical Instructor, Connective Tissue Pathology and Trauma**, Wound repair of axial connective tissue and the negative spinal biomechanical engineering sequella. Determining causality from an accident reconstruction perspective inclusive of transference of forces and G's of energy realized by automobile occupants, Academy of Chiropractic, PACE approved for the Federation of Chiropractic Licensing Boards, Melville NY, 2016

**Instructor, Clinical Spinal Biomechanics and Rehabilitation in Primary and Specialty Medicine**, A review of current trends in spine care including anatomical vs biomechanical etiology of spine pain, opioid analgesic trends and effectiveness with a particular focus on the diagnosis and case management of spine patients from the clinical entry point to advanced surgical procedures. A particular focus was on epidemiological trends associated with neuromusculoskeletal medicine, advanced imaging techniques such as MRI, detailed review of plain film radiographs in the assessment of clinical spinal biomechanics. Specific research papers were reviewed related to Interprofessional collaboration, Interprofessional care outcomes, the natural history of spine pain in patients as well as the pain modulation effects of spinal manipulation. ACCME Joint Providership with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Saddlebrook, NY 2016.

**Instructor, Interprofessional Care in the Primary Care and Medical Specialty Environment**, A review of current trends in spine care including anatomical vs biomechanical etiology of spine pain, opioid analgesic trends and effectiveness with a particular focus on the diagnosis and case management of spine patients from the clinical entry point to advanced surgical procedures. A particular focus was on epidemiological trends associated with neuromusculoskeletal medicine, advanced imaging techniques such as MRI, detailed review of plain film radiographs in the assessment of clinical spinal biomechanics. Specific research papers were reviewed related to Interprofessional collaboration, Interprofessional care outcomes, the natural history of spine pain in patients as well as the pain modulation effects of spinal manipulation. ACCME Joint Providership with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Rochester NY, 2015

**MRI Spine Interpretation and Spinal Biomechanical Engineering-Primary Spine Care**, Correlating spinal biomechanics secondary to trauma and MRI findings inclusive of herniation, bulging, protruded and extruded discs. Correlating co-efficient of forces translated from the bullet vehicle to the target vehicle to the occupant in determining causality of bodily injury, Academy of

Chiropractic, PACE approved for the Federation of Chiropractic Licensing boards, Texas Chiropractic College, Las Vegas NV, 2015

**MRI Spine Interpretation and Spinal Biomechanical Engineering-Primary Spine Care,** correlating spinal biomechanics secondary to trauma and MRI findings inclusive of herniation, bulging, protruded and extruded discs. Correlating co-efficient of forces translated from the bullet vehicle to the target vehicle to the occupant in determining causality of bodily injury, Academy of Chiropractic, PACE approved for the Federation of Chiropractic Licensing boards, Texas Chiropractic College, Las Vegas NV, 2015

**Contemporary Literature Review of the Chiropractic Adjusting Mechanisms- Primary Spine Care,** The latest scientific evidence of the effects of the chiropractic spinal adjustment on the central nervous system, both upper and lower motor neurons. A comparative analysis of chiropractic vs. other modalities and therapies, Academy of Chiropractic, PACE approved for the Federation of Chiropractic Licensing boards, Texas Chiropractic College, Las Vegas NV, 2015

**Instructor, Clinical Spinal Biomechanics and Rehabilitation in Primary and Specialty Medicine,** A review of current trends in spine care including anatomical vs biomechanical etiology of spine pain, opioid analgesic trends and effectiveness with a particular focus on the diagnosis and case management of spine patients from the clinical entry point to advanced surgical procedures. A particular focus was on epidemiological trends associated with neuromusculoskeletal medicine, advanced imaging techniques such as MRI, detailed review of plain film radiographs in the assessment of clinical spinal biomechanics. Specific research papers were reviewed related to Interprofessional collaboration, Interprofessional care outcomes, the natural history of spine pain patients as well as the pain modulation effects of spinal manipulation. ACCME Joint Providership with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Saddlebrook, NY 2015.

**Clinical Instructor, Primary Spine Care,** Neurophysiological central and peripheral nervous systems mechanisms of pain with integrated higher cortical functions of the thalamus, cingulate, amygdala, pre-frontal, motor and sensory cortexes. Trauma and chronic pain care effecting mechanoreceptors, nociceptors and proprioceptors through adjustive therapy based upon evidenced based care and current literature verification, Texas Chiropractic College, New York State Department of Education Board for Chiropractic, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Islandia NY 2015

**Clinical Instructor, Primary Spine Care with Interdisciplinary Collaborative Care,** Triage of patients based upon MRI findings of disc herniation, disc bulge, protrusion, extrusion or sequestrations and spinal cord or nerve root negative sequella, clinical findings of neuro- compressive pathologies and neurodiagnostic findings of EMG- NCV, SSEP, VEP, BAER, VEP and V-ENG findings. Texas Chiropractic College, New York State Department of Education Board for Chiropractic, Academy of Chiropractic, Academy of Chiropractic, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Islandia NY 2015

**Clinical Instructor, Chiropractic Legal-Insurance Documentation,** Complete documentation of E&M findings, functional losses, active and passive care. Accurate reporting of MRI, X-ray, CT, EMG-NCV, SSEP, BAER in medical-legal and insurance documentation, Florida Board of Chiropractic Medicine, Boca Raton FL, 2015

**Documentation and Evidence in a Medical-Legal Practice,** The role of scientific research conclusions with contemporary documentation to effectively support the necessity for clinically indicated care. The role of timely evaluations and re-evaluations in coordinating care inclusive of history, physical and

evaluation report and concludes with the correlation of the SOAP note and HCFA that correlates the conclusion of the evolutionary findings. Coordinating research and clinical findings with primary care providers and medical specialists in the rehabilitation process inclusive of insurance requirements and contemporary MRI research nomenclature. Academy of Chiropractic Post-Doctoral Division, Recognized by the PACE Program of the Federation of Chiropractic Licensing Boards, Boca Raton, FL, 2015

**Co-Instructor, Advanced Imaging In Clinical Practice**, discussion and review of MRI technical and clinical ordering parameters in Primary and Specialty Medicine. Analysis and review of spinal intervertebral disc pathology including disc bulge, disc herniation, disc protrusion, annular tear, Schmorl's nodes and myelopathy. Particular focus on spinal stenosis, and etiology of spinal injury correlated to physical examination findings was provided. Certified by: ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Buffalo NY. Certified in, NJ, NY, MI, NC, WA, CA, IL. 2015-Present.

**Clinical Consultant, Biomechanical Engineering and X-Ray Digitizing**, applying spinal algorithmic variations to clinical practice in conjunction with the American Medical Association's impairment ratings to conclude whole body impairments in creating an accurate diagnosis, prognosis and treatment plan, Spinal Analytics Inc., Weldon Springs, MO, 2014

**Clinical Co-Instructor, Spinal Biomechanical Engineering**, Cartesian coordinates, cervical and lumbar pathobiomechanics, biomechanics in trauma, organizational analysis in both a normal and pathological spine, cervical, lumbar and full spine digital analysis. Certified by: ACCME Joint Sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences, Buffalo NY, Federation of Chiropractic Licensing Boards, 2013-presently

**Clinical Instructor, Spinal Biomechanical Engineering**, Differential diagnosis of pathobiomechanics in the cervical, thoracic and lumbar spine as sequella to micro and macro trauma and chronic biomechanical instabilities. Understanding the clinical implications of long-term biomechanical failure in resultant disc pathology, ligament pathology and osseous pathology. Federation of Chiropractic Licensing Boards, Academy of Chiropractic Post Doctoral Division, Boca Raton, FL, 2013

**Clinical Instructor, MRI Spine Interpretation**, Bulge, herniated, protruded, extruded, sequestered discs, differential diagnoses and clinical triage implications. MRI physics and slice protocols. Federation of Chiropractic Licensing Boards, Academy of Chiropractic Post Doctoral Division, Boca Raton, FL, 2013.

**Instructor, Admissibility Standards of the Medical Expert in Trauma**, Documentation requirements of the courts in a medical-legal case including causality, bodily injury and persistent functional losses, ethically reporting of functional loss as it pertains to the integrity of the joint and activities of daily living and implications of chronicity, reporting of normal findings, maximum medical improvement and the release of the patient in the medical-legal arena, Federation of Chiropractic Licensure Boards, Academy of Chiropractic, American Academy of Medical-Legal Professionals, Hollywood, Florida, 2012

**Instructor, Medical-Legal Research and the Documentation** of Causal Relationship, Prognosis and Treatment of the Traumatically Injured, Review of current research published in peer reviewed medically indexed journals focusing on traumatic injuries and how current literature affects the diagnostic conclusion and how to formulate treatment plans. Federation of Chiropractic Licensure Boards, Academy of Chiropractic, American Academy of Medical-Legal Professionals, Hollywood, Florida, 2012

**Instructor, Documentation and Triage in Trauma**, ICD-9 and CPT requirements in coding for the traumatically injured including integrating electronic health records including informed consent, evaluation and management, testing orders. The utilization of research in medical reports for both the trauma and non-trauma patients.

**Clinical coordination of care and reporting to healthcare and legal providers**, Federation of Chiropractic Licensure Boards, Academy of Chiropractic, American Academy of Medical-Legal Professionals, Hollywood, Florida, 2012

**Certification Protecting Human Research Participants**, National Institute for Health Office of Extramural Research, 2012

**Instructor, Advanced Imaging in Clinical Practice**, Clinically correlating advanced imaging principles, ordering criteria and objective findings to physical examination, electrodiagnostic testing results. Application of clinical principles to the daily practice of family and specialty medical clinics including Attending and Resident medical providers with particular attention to traumatic etiology and subtle ominous neurological and orthopedic findings in office. Sheehan Memorial Hospital, Buffalo NY 2011

**Instructor, Advanced Imaging in Clinical Practice**, clinically correlating advanced imaging principles, ordering criteria and objective findings to physical examination, electrodiagnostic testing results. Application of clinical principles to the daily practice of family and specialty medical clinics including Attending and Resident medical providers with particular attention to traumatic etiology and subtle ominous neurological and orthopedic findings in office. UB Family Medicine, Buffalo NY 2011.

**Instructor, Workplace Head and Neck Pain**, clinically correlating ergonomic and workplace conditions to history, physical examination, diagnostic testing, electrodiagnostic testing and MRI findings to the cervical spine as a source of headache pain and dysfunction. Creating self-care driven plans and instruction on self-identification of symptoms requiring emergency medical evaluation. Neonatal Intensive Care Unit Nursing Staff, Women and Children's Hospital, Buffalo NY, 2011.

**Instructor, Acute Care Guidelines of the New York State Workers Compensation Board**, clinically correlating the causal history, examination, imaging, advanced imaging, electrodiagnostic testing, prognosis and treatment plans of the injured and implementing care within the guidelines as outlined by New York State. Creating diagnosis driven metrics of care in relation to the pathophysiology of the bodily injury, New York Chiropractic Council, East Elmhurst NY, 2010

**Director, MD Lecture Program**, Design, management and implementation of national medical lecture programs and coordination with State University of New York at Buffalo Continuing Medical Education Department to obtain CME approval, administering and auditing compliance with program requirements reporting of course outcomes, testing and facilitation of AMA Cat 1 Credits to medical professional participants. Academy of Chiropractic – MD Relationship Program, NY 2010-2012

**Clinical Instructor, Accident Reconstruction; Research, Causality and Bodily Injury**, CMCS Post Doctoral Division, New York Chiropractic Council, New York State Department of Education, Board for Chiropractic, Long Island, NY, 2010

**Clinical Instructor, Whiplash – Past, Present and Future**, American Academy of Medical Legal Professionals (presenter), AACME Joint sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences and American Academy of Medical Legal Professionals, Buffalo, NY, 2009

Clinical Supervisor, University of Buffalo, Exercise Science Department, 2007-Present

Co-Presenter, Head Injury & Brain Trauma, Understanding Medical Testing Devices, Sponsoring entity, Buffalo, NY, 2008

Co-Presenter, Forensic Analysis of Medical Reports, Correlating Objective Findings to Functional Loss, Sponsoring entity, Buffalo, NY, 2008

Co-Presenter, Medical Testing Devices and Their Relationship to Bodily Injury, Sponsoring entity, Buffalo, NY, 2007

Co-presenter, Functional Loss in Trauma, Sponsoring entity, Buffalo, NY, 2007

Co-presenter, Forensic Analysis of Low Speed Rear Impact Crashes, Sponsoring entity, Buffalo, NY, 2007

Co-presenter, Forensic Analysis of Herniated Discs and Correlating Court Rulings to Medical Reports, Sponsoring entity, Buffalo, NY, 2006

Presenter, Chiropractic and the Parkinson's Patient, Parkinson's Association of Western New York, location, 2005

Presenter, Antioxidant Therapy and Chiropractic, Sponsoring entity, Cheektowaga, NY, 2001-2006

Presenter, Men's Health, Nutrition and Chiropractic, Sponsoring entity, Cheektowaga, NY, 2001-2006

Presenter, Women's Health, Nutrition and Chiropractic, Sponsoring entity, Cheektowaga, NY, 2001-2006

Presenter, Cardiovascular Health and Nutrition, Sponsoring entity, Cheektowaga, NY, 2001-2006

Presenter, Bone/ Joint Nutrition and Chiropractic, Sponsoring entity, Cheektowaga, NY, 2001-2006

Instructor, Introduction to Chiropractic, Villa Maria College, Cheektowaga, NY, 2003

Instructor, Neurology I and II, New York Institute of Massage, Williamsville, NY 1999-2003  
Instructor,

Pathology I and II, New York Institute of Massage, Williamsville, NY 1999-2003

Instructor, Anatomy and Physiology, New York Institute of Massage, Williamsville, NY 1998-2003

Instructor, Myology I and II, New York Institute of Massage, Williamsville, NY, 1998-2003

Certified Instructor, Child and Infant CPR, American Red Cross, Lombard, Illinois, 1995-1997

Certified Instructor, First Aid, American Red Cross, city, Illinois, 1995-1997

Certified Instructor, Adult CPR, American Red Cross, city, Illinois, 1995-1997

### **SELECTED PUBLICATIONS**

Studin., Owens W., Edwards J. (2019) No Evidence Exists Between Chiropractic Care and Cervical Artery Dissection, The American Chiropractor 41(10) pgs. 28, 30-32

Studin M., Owens W., Erickson M., (2019), The Chiropractic Adjustment Changes Brain Function - The Evidence of Increased Muscle Strength is Added to Pain Sensitivity and Autonomic Changes, AmericanChiropractor, 41 (2) 46,48-50, 52-53

Studin M., Owens W. (2018) Chiropractic Adjustments Increase Maximal Bite Forces ThroughEffecting Cortical Changes, American Chiropractor, 40 (12) 12, 14, 16

Studin M., Owens W., Herbert N., (2018) The Legal and Appropriate Use of X-Ray in Chiropractic, Retrieved  
from: [http://www.uschirodirectory.com/index.php?option=com\\_k2&view=item&id=839:the-legal-and-appropriate-use-of-x-ray-in-chiropractic-to-consider-the-american-chiropractic-association-american-board-of-internal-medicine-x-ray-recommendations-poses-a-potential-public-risk&Itemid=320](http://www.uschirodirectory.com/index.php?option=com_k2&view=item&id=839:the-legal-and-appropriate-use-of-x-ray-in-chiropractic-to-consider-the-american-chiropractic-association-american-board-of-internal-medicine-x-ray-recommendations-poses-a-potential-public-risk&Itemid=320)

Studin M., Owens W., Weir T. (2018) Deceptive Dogmatic Reporting Despite SuccessfulChiropractic Outcomes, American Chiropractor, 40 (11) 10, 12-15

Studin M., Owens W. (2018) Efficacy of Chiropractic Treatment for Post-Surgical ContinuedLow Back and Radical Pain, American Chiropractor,40 (9) 26, 27, 30-33

Studin M., Owens W. (2018), Efficacy and Adverse Effects of Chiropractic Treatment forMigraines, Retrieved  
from: [http://www.uschirodirectory.com/index.php?option=com\\_k2&view=item&id=829:efficacy-and-adverse-effects-of-chiropractic-treatment-for-migraines&Itemid=320](http://www.uschirodirectory.com/index.php?option=com_k2&view=item&id=829:efficacy-and-adverse-effects-of-chiropractic-treatment-for-migraines&Itemid=320)

Studin M., Owens W. (2018), Chiropractic Primary Spine Care: A mandatory “future trend” for chiropractic success that has already begun, Retrieved  
from [http://www.uschirodirectory.com/index.php?option=com\\_k2&view=item&id=824:chiropractic-primary-spine-care-a-mandatory-future-trend-for-chiropractic-success-that-has-already-begun&Itemid=377](http://www.uschirodirectory.com/index.php?option=com_k2&view=item&id=824:chiropractic-primary-spine-care-a-mandatory-future-trend-for-chiropractic-success-that-has-already-begun&Itemid=377)

Studin M., Owens W. (2018) Chiropractic Reduces Opioid Use by 55% in Low Back Pain, Retrieved  
from: [http://www.uschirodirectory.com/index.php?option=com\\_k2&view=item&id=826:chiropractic-reduces-opioid-use-by-55-in-low-back-pain&Itemid=320](http://www.uschirodirectory.com/index.php?option=com_k2&view=item&id=826:chiropractic-reduces-opioid-use-by-55-in-low-back-pain&Itemid=320)

Studin M., Owens W. (2018) Vertebral Subluxation Complex, American Chiropractor, 40 (7) 12, 14-16, 18, 20, 22, 24, 26-27

Studin M. (2018) Chiropractic and Prescriptive Rights; Should Chiropractors be Allowed toPrescribe Drugs? American Chiropractor, 16, 17, 18, 19

Studin M., Owens W. (2018) Chiropractic Reduces Opioid Use by 55% in Low Back Pain,

Retrieved. from:

[http://www.uschirodirectory.com/index.php?option=com\\_k2&view=item&id=826:chiropractic-reduces-opioid-use-by-55-in-low-back-pain&Itemid=320](http://www.uschirodirectory.com/index.php?option=com_k2&view=item&id=826:chiropractic-reduces-opioid-use-by-55-in-low-back-pain&Itemid=320)

Studin M., Personal Injury Collections by State: 2011 vs. 2013 vs. 2015 vs. 2017, (2018) Comparison of Collections vs. Cost of Living, American Chiropractor 40 (1) pgs. 12-14, 16

Studin M, Owens W (2018) Chiropractic Verified as Primary Spine Care Providers, Retrieved from: [http://uschiropracticdirectory.com/index.php?option=com\\_k2&view=item&id=823:chiropractic-verified-as-primary-spine-care-providers&Itemid=320](http://uschiropracticdirectory.com/index.php?option=com_k2&view=item&id=823:chiropractic-verified-as-primary-spine-care-providers&Itemid=320)

Studin M., Owens W., (2017) The Mechanism of the Chiropractic Spinal Adjustment/Manipulation: Chiropractic vs. Physical Therapy for Spine, Part 5 of 5, American Chiropractor 39 (12) pgs. 20, 22, 24, 26, 28, 30, 31

Studin M, Owens W., Barone M., (2017) Chiropractic and Central Afferent Inhibition: A Chiropractic Care Path & Mechanism for Chronic Pain, Tumors, Spatial and Inhibitory Distortion, Retrieved from: [http://uschiropracticdirectory.com/index.php?option=com\\_k2&view=item&id=821:chiropractic-central-afferent-inhibition-a-chiropractic-care-path-mechanism-for-chronic-pain-tremors-spatial-and-inhibitory-distortion&Itemid=320](http://uschiropracticdirectory.com/index.php?option=com_k2&view=item&id=821:chiropractic-central-afferent-inhibition-a-chiropractic-care-path-mechanism-for-chronic-pain-tremors-spatial-and-inhibitory-distortion&Itemid=320)

Studin M, Owens W., (2017) Should Chiropractic Follow the American Chiropractic Association / American Board of Internal Medicine's Recommendations on X-Ray? Retrieved from: [http://uschiropracticdirectory.com/index.php?option=com\\_k2&view=item&id=816:should-chiropractic-follow-the-american-chiropractic-association-american-board-of-internal-medicine-s-recommendations-on-x-ray&Itemid=320](http://uschiropracticdirectory.com/index.php?option=com_k2&view=item&id=816:should-chiropractic-follow-the-american-chiropractic-association-american-board-of-internal-medicine-s-recommendations-on-x-ray&Itemid=320)

Studin M., Owens W., (2017) The Mechanism of the Chiropractic Spinal Adjustment/Manipulation: Bio-Neuro-Mechanical Component Part 3 of 5, American Chiropractor 39 (7), pgs. 30,32,34, 36, 38, 40-41

Studin, M, Owens W. (2017) A Chiropractic Adjustment Has a Direct Effect of the Pre-Frontal Cortex of the Brain: Verifying a positive effect of the chiropractic spinal adjustment on reflexes, memory, coordination and decision making, retrieved from: [http://www.uschirodirectory.com/index.php?option=com\\_k2&view=item&id=809:a-chiropractic-adjustment-has-a-direct-effect-of-the-pre-frontal-cortex-of-the-brain&Itemid=320](http://www.uschirodirectory.com/index.php?option=com_k2&view=item&id=809:a-chiropractic-adjustment-has-a-direct-effect-of-the-pre-frontal-cortex-of-the-brain&Itemid=320)

Studin, M, Owens W. (2017) Chiropractic Care is More Effective in Lowering Disability than Medical Care for Acute and Sub-Acute Low Back Pain, Retrieved from: [http://www.uschirodirectory.com/index.php?option=com\\_k2&view=item&id=806:chiropractic-care-is-more-effective-in-lowering-disability-than-medical-care-for-acute-and-sub-acute-low-back-pain&Itemid=320](http://www.uschirodirectory.com/index.php?option=com_k2&view=item&id=806:chiropractic-care-is-more-effective-in-lowering-disability-than-medical-care-for-acute-and-sub-acute-low-back-pain&Itemid=320)

Studin M., Owens W. (2017) Chiropractic's Role in Decreasing Premature Death with Associated Back Pain, Retrieved from: [http://www.uschirodirectory.com/index.php?option=com\\_k2&view=item&id=802:chiropractic-s-role-in-decreasing-premature-death-with-associated-back-pain&Itemid=320](http://www.uschirodirectory.com/index.php?option=com_k2&view=item&id=802:chiropractic-s-role-in-decreasing-premature-death-with-associated-back-pain&Itemid=320)

Studin M., Owens W. (2017) Strain/Sprain Is One Syndrome Not 2 Separate Pathologies and is Permanent, American Chiropractor 39 (2) 26, 28, 30-31

Studin M., Owens W. (2017) Chiropractic as the Solution for Mechanical Spine Failure and Failed Back Surgery, American Chiropractor, 34 (12) 24, 26, 28, 29

Sa, Ruhan; Owens, William; Wiegand, Raymond; and Chaudhary, Vipin (February 2017).

Towards and Affordable Deep Learning System: Automated Intervertebral Disc Detection in X-Ray Images. For Oral presentation to be presented SPIE Medical Imaging Symposium Symposium, Orlando, Florida United States. ACCEPTED

Ruhan Sa, William Owens Jr, Raymond Wiegand, Mark Studin, Donald Capoferri, Kenneth Bahooora, Alexander Greaux, Robbrey Rattray, Adam Hutton, John Cintineo, Vipin Chaudhary. Intervertebral Disc Detection in X-Ray Images Using Faster R-CNN. 39th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC'17) to be held at the International Convention Center, JeJu Island, S. Korea, from 11-15 July 2017

Studin M., Owens W., (2017) The Mechanism of the Chiropractic Spinal Adjustment/Manipulation: Ligaments and the Bio-Neuro-Mechanical Component, Part 2 of 5, American Chiropractor 39 (6), pgs. 22,24-26, 28-31

Studin M., Owens W. (2016) Chiropractic Care Improves Senses and Reduces Risks of Falling in the Elderly Population, Retrieved from: <http://www.uschirodirectory.com/research/item/788-chiropractic-care-improves-senses-and-reduces-risks-of-falling-in-the-elderly-population.html>

Studin M., Owens W. (2016) Chiropractic Care for Neck and Low Back: Evidenced Based Outcomes, Retrieved from: <http://www.uschirodirectory.com/research/item/787-chiropractic-care-for-neck-and-low-back-pain-evidenced-based-outcomes.html>

Studin M., Owens W. (2016) Concussion: Diagnosis-Testing-Chiropractic “New Testing is Available Using Biomarkers”, American Chiropractor 34(7) 26, 28 -30

Studin M., Owens W. (2016) Bulging Discs and Trauma: Causality and a Risk Factor, American Chiropractor 34(6) 18, 20,22-24, 26, 28

Bahooora K., Studin M, Sundby P. (Spring 2016) Conservation of Momentum in Collision and Injuries: Where Does the Energy Go? Vegas Legal, 17-19, Johnston J, Studin M (2016) Disc and Ligament: How Spinal Experts Document Causality, retrieved from: <http://uschirodirectory.com/medical-legal-white-papers/item/783-disc-and-ligament-injuries-how-spinal-experts-document-causality.html>

Studin M., Owens W. (2016) Fibromyalgia Improvement has been Linked to Chiropractic Care, Retrieved from: <http://uschirodirectory.com/research/item/778-fibromyalgia-improvement-has-been-linked-to-chiropractic-care.html>

Studin M., Owens W. (2016) Chiropractic Outcomes on Fragmented/Sequestered and Extruded Discs and Radicular Pain, American Chiropractor, 34 (11) 26, 28, 30, 32-33

Studin M., Owens W. (2016) Ligament Failure and Strain-Sprain Reported as Permanent in Whiplash, Retrieved from: <http://www.uschirodirectory.com/medical-legal-white-papers/item/794-ligament-failure-and-strain-sprain-reported-as-permanent-in-whiplash.html>

Sa, Ruhan; Owens, William; Wiegand, Raymond; and Chaudhary, Vipin (July 2016). Fast scale-invariant lateral lumbar vertebrae detection and segmentation in X-ray images. Paper Submitted for presentation at the 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society of the IEEE Engineering in Medicine and Biology Society in Walt Disney World Resort, Orlando, FL, USA

Studin M., Owens W. (2016) Bulging Discs and Trauma: Causality and a Risk Factor, Retrieved from: <http://www.uschirodirectory.com/medical-legal-white-papers/item/784-bulging-discs-and-trauma-causality-and-a-risk-factor.html>

Studin, M., & Owens, W. (2016). Chiropractic's Mechanism in Pain Modulation and the Connection to Systemic Disease. *Dynamic Chiropractor* 34 (3) 26, 33.

Studin M., Owens W., Peyster R., Sundby P. (2016) Age Dating Disc Injuries, Causally Relating Traumatic Disc, *American Chiropractor*, 34 (8) 38, 40-44

Studin M., Owens W. (2016) Chiropractic's Mechanism in Pain Modulation and the Connection to Systemic Disease, *Dynamic Chiropractor* 4(3) 26-33

Studin M., Owens W., (2016) Chiropractic Spinal Adjustments and the Effects on the Neuroendocrine System and the Central Nervous System Connection, *The American Chiropractor*, 38(1) 46-51

Studin M., Owens W., (2016) Chiropractic Spinal Adjustments and the Effects on the Neuroendocrine System and the Central Nervous System Connection, *The American Chiropractor*, 38(1) 46-51

Studin M., Owens W., (2015) Chiropractic Spinal Adjustments, Changes in Organ Systems and Treatment of Disease, *The American Chiropractor*, 38(11) 20, 22-25

Studin M., Owens W., (2015) Chiropractic, Chronic Back Pain and Brain Shrinkage: A Better Understanding of Alzheimer's, Dementia, Schizophrenia, Depression and Chiropractic's Role - A Literature Review of the Mechanisms, *The American Chiropractor*, 38(10) 36-38, 40-42, 43-44

Studin M., Owens W. (2015) Back Pain: Who Should Be Seen First & WHY, *Chiropractor vs. Medical Primary Care Doctor*, *The American Chiropractor* 37 (9) 50, 52, 54, 56

Studin M., Owens W. (2015) How Does the Chiropractic Adjustment Work? A Literature Review of Pain Mechanisms and Brain Function Alteration, *The American Chiropractor*, 37(8) 30, 32-34, 35-38, 40, 42-43

Studin M., Owens J., (2015) Research Proves Chiropractic Adjustments Effect Multiple Areas, Not Just the Area Treated: THE BRAIN CONNECTION, Retrieved From: <http://uschirodirectory.com/research/item/745-research-proves-chiropractic-adjustments-effect-multiple-areas,-not-just-the-area-treated.html>

Studin M., Owens J., (2015) Research Proves Chiropractic Adjustments Effect Emotions, Learning, Memory, Consciousness, Motivation Homeostasis, Perception, Motor Control, Self-Awareness, Cognitive Function, Voluntary Movement, Decision Making, Touch and Pain, Retrieved From: <http://uschirodirectory.com/research/item/744-research-proves-chiropractic-adjustments-effect>

emotions,- learning,-memory,-consciousness,-motivation,-homeostasis,- perception,-motor-control,- self-awareness,- cognitive-function,-voluntary-movement,-decision-making,-touch-and-pain.html

Studin M., Owens W., (2015) The Chiropractor as the 1st Referral Option, Is Chiropractic Headed Towards Back Pain Only? The American Chiropractor, 37(5) 32, 34, 36-37

Studin M., Zientek M., Owens W. (2015) Cervical Disc Herniation with Radiculopathy (Arm Pain) Shows Significant Improvement in Lowering Pain and Disability with Chiropractic Care, Retrieved from: <http://uschirodirectory.com/research/item/740-cervical-disc-herniation-with- radiculopathy- arm-pain-shows- significant-improvement-in-lowering-pain-and-disability-with-chiropractic- care.html>

Studin M., Mah S., Owens W., (2015) Attention-Deficit Hyperactivity Disorder (ADHD) Outcomes Improve with Chiropractic Care, retrieved from: <http://uschirodirectory.com/research/item/739-attention-deficit-hyperactivity- disorder-adhd- outcomes-improve-with-chiropractic-care.html>

Ferguson S., Owens W., Studin M. (2015) Chiropractic Proves More Effective than Standard Medical Care in the Military, Retrieved from: <http://uschirodirectory.com/research/item/738-chiropractic- proves-more-effective- than-standard-medical-care-in-the-military.html>

Herbert N., Owens W., Studin M., (2015) Harvard Study Points to Chiropractic Care for Pain Relief& The Safety of the Chiropractic Adjustment, Retrieved From: <http://uschirodirectory.com/research/item/737-harvard- study-points-to-chiropractic-care-for- pain-relief-the-safety-of-the-chiropractic-adjustment.html>

Studin M., Owens W., (2015) Chiropractic, The Solution for the Lack of Medical Education on Spin and Pain, The American Chiropractor 37 (4) 60, 62, 64

Owens W., Studin M., (2015) Chiropractic vs. Primary Medical Care, Who is Best and Safer for Primary Spinal Care? The American Chiropractor, 37 (3) 24, 26, 28, 30

Capoferri D., Owens W., Studin M., (2015) Back Pain: Chiropractic vs. Medical Doctors, Who Gets Better Results and Who is More Cost Effective?, Retrieved from: <http://uschirodirectory.com/research/item/733-back- pain-chiropractic-vs-medical-doctors- who- get-better-results-and-who-is-more-cost-effective.html>

Studin, M, Owens, W, (2015) Chiropractic First, Chiropractor as the Primary Spine Care Provider for Spine, The American Chiropractor, 37 (2) 24, 26, 28, 30

Studin, M, Owens W (2012 July) Chiropractic: A Solution to Preventing Recurrence of Low Back Pain and Disability for both Non-complicated and Complex Diagnosis in Acute and Chronic Care, The American Chiropractor 34 (7) 46-48

Owens, W. (2012). Working with the Medical Community Without Losing Our Identity. American Chiropractor, 34(6), 38.

Owens, W.J. (2011) Practice Statistics and the MD Report of Findings, Demonstrating external vs. internal practice statistics and how to properly report chiropractic principles and findings to the medical community in a series of steps designed to build a secure and mutually respectful long term

relationship with the MD, The American Chiropractor, 31 (3), 47-48.

Owens, W.J. (2011) Practice Statistics and the MD Report of Findings, Demonstrating external vs. internal practice statistics and how to properly report chiropractic principles and findings to the medical community in a series of steps designed to build a secure and mutually respectful long term relationship with the MD, The American Chiropractor, 31 (3), 47-48.

Owens, W.J. (2010) MD Referrals – the time is now 15 years ago, The American Chiropractor, what two common mistakes when corrected will lead to positive long term relationships with the medical community. 30(10) 13-14.

Studin M. & Owens W., (2010, October). Acute (Severe) Low Back Pain, Early Intervention and Chiropractic, US Chiropractic Directory. Retrieved from [http://uschirodirectory.com/index.php?option=com\\_flexicontent&view=items&id=264](http://uschirodirectory.com/index.php?option=com_flexicontent&view=items&id=264)

Studin, M. (2010, October). Getting Paid on Insurance is Easy; Keeping Your Money is Another Issue, The American Chiropractor, 32(10) 26

Studin, M. (2010, September). Workers Compensation and Chiropractic; A solution for skyrocketing healthcare costs in America, Dynamic Chiropractor, 28(19) 1, 18-19, 25

Studin M. & Owens, W (2010, September). Chiropractic and Children; A Study in Adverse Effects, US Chiropractic Directory. Retrieved from [http://uschirodirectory.com/index.php?option=com\\_flexicontent&view=items&id=261](http://uschirodirectory.com/index.php?option=com_flexicontent&view=items&id=261)

Studin M. & Owens, W (2010, September). Decreased Muscle Spasms and Chiropractic Care, US Chiropractic Directory. Retrieved from [http://uschirodirectory.com/index.php?option=com\\_flexicontent&view=items&id=258](http://uschirodirectory.com/index.php?option=com_flexicontent&view=items&id=258)

Studin M. & Owens, W (2010, September). Injured Worker, Workers Compensation & Chiropractic: A solution to lowering health care costs in America, US Chiropractic Directory. Retrieved from [http://uschirodirectory.com/index.php?option=com\\_flexicontent&view=items&id=241](http://uschirodirectory.com/index.php?option=com_flexicontent&view=items&id=241)

Studin, M. (2010, September). Caring for 95% of the Population, The American Chiropractor, 32(9) 30-32 Studin M. & Owens, W (2010, August). Prediction of Outcomes with Chiropractic Care and Cervical Pain, US Chiropractic Directory. Retrieved from [http://uschirodirectory.com/index.php?option=com\\_flexicontent&view=items&id=253](http://uschirodirectory.com/index.php?option=com_flexicontent&view=items&id=253)

Studin M. & Owens, W (2010, August). Balance and Movement and The Effect of Chiropractic Care; Utilization with the Elderly, Cerebral Palsy, the Athlete and the General Population, US Chiropractic Directory. Retrieved from [http://uschirodirectory.com/index.php?option=com\\_flexicontent&view=items&id=250](http://uschirodirectory.com/index.php?option=com_flexicontent&view=items&id=250)

Studin, M., & Owens, W. J. (2010, July). Increased balance, movement and kinematics as a result of chiropractic care, A research conclusion that affects rehabilitation patients, athletes, balance disorders and increased production in the workplace. US Chiropractic Directory, Retrieved from <http://uschirodirectory.com/index.php/patient-information/item/243-increased-balance-movement-kinematics-and-chiropractic-care-a-research-conclusion-that-affects-rehabilitation-patients-athletes-balance-disorders-and-increased-production-in-the-workplace>

Owens, W. J., & Studin, M. (2010, June). Work injuries, full recovery and chiropractic care,

Resolving the myth that doing nothing is better. US Chiropractic Directory, Retrieved from <http://uschirodirectory.com/index.php/patient-information/item/241-work-injuries-full-recovery-and-chiropractic-care-resolving-the-myth-that-doing-nothing-is-better>

Studin, M., & Owens, W. J. (2010, June). Chronic neck pain and chiropractic, A comparative study with massage therapy. US Chiropractic Directory, Retrieved from <http://uschirodirectory.com/index.php/patient-information/item/240-chronic-neck-pain-and-chiropractic-with-a-comparative-study-with-massage-therapy>

Studin, M., & Owens, W. J. (2010, June). Increased sports performance and chiropractic. US Chiropractic Directory, Retrieved from <http://uschirodirectory.com/index.php/patient-information/item/239-increased-sports-performance-and-chiropractic>

Studin, M., & Owens, W. J. (2010, June). Arthritis and low back pain: Chiropractic care vs. heat treatment. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/238-arthritis-and-low-back-pain-chiropractic-care-vs-heat-treatment>

Studin, M., & Owens, W. J. (2010, June). Disc arthroplasty (disc replacement surgery), low back pain and the efficacy of post-surgical chiropractic care. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/237-disc-arthroplasty-replacement-surgery-low-back-pain-and-the-efficacy-of-post-surgery-chiropractic-care>

Owens, W. J., & Studin, M. (2010, June). Balance, chronic pain and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/234-balance-chronic-pain-and-chiropractic>

Owens, W. J., & Studin, M. (2010, June). Muscle pain, trigger points and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/216-muscle-pain-trigger-points-and-chiropractic>

Owens, W. J., & Studin, M. (2010, June). Comparing the satisfaction of low back pain patients receiving medical vs. chiropractic care, Results from the UCLA back pain study. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/232-comparing-the-satisfaction-of-low-back-pain-patients-receiving-medical-vs-chiropractic-care>

Owens, W. J., & Studin, M. (2010, June). Carpal tunnel syndrome and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/231-carpal-tunnel-syndrome-and-chiropractic>

Owens, W. J., & Studin, M. (2010, May). Recurrent low back pain and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/227-recurrent-low-back-pain-and-chiropractic>

Owens, W. J., & Studin, M. (2010, May). Chronic back pain, prevention and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/223-chronic-back-pain-prevention-a-chiropractic>

Owens, W. J., & Studin, M. (2010, May). Chronic or acute (non-cardiac) chest pain and chiropractic. US Chiropractic Directory, Retrieved

from <http://www.uschirodirectory.com/index.php/patient-information/item/228-chronic-or-acute-non-cardiac-chest-pain-and-chiropractic>

Owens, W. J., & Studin, M. (2010, May). Chiropractic treatment and neck pain. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/220-chiropractic-treatment-and-neck-pain>

Owens, W. J., & Studin, M. (2010, May). Shoulder pain, neck pain and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/221-shoulder-pain-neck-pain-and-chiropractic>

Owens, W. J., & Studin, M. (2010, May). Disc herniations, bulges, sciatic pain and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/219-disc-herniations-bulges-sciatic-pain-and-chiropractic>

Owens, W. J., & Studin, M. (2010, May). Muscle pain, trigger points and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/216-muscle-pain-trigger-points-and-chiropractic> Studin M., Owens W. (2019) Chiropractic Practice Trends and Preparing for 2020,

Studin, M., & Owens, W. J. (2010, May). Chronic neck pain and chiropractic, A comparative study with massage therapy. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/240-chronic-neck-pain-and-chiropractic-with-a-comparative-study-with-massage-therapy>

Owens, W. J., & Studin, M. (2010, April). Sciatica, low back pain and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/181-sciatic-and-low-back-pain-and-chiropractic>

Owens, W. J., & Studin, M. (2010, April). Low back pain and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/159-low-back-pain-and-chiropractic>

Owens, W. J., & Studin, M. (2010, April). Low back injuries and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/180-low-back-injuries-and-chiropractic>

Owens, W. J., & Studin, M. (2010, April). Migraine headaches and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/179-migraine-headaches-and-chiropractic>

Owens, W. J., & Studin, M. (2010, April). Chest pain, mid-back pain and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/178-chest-pain-mid-back-pain-a-chiropractic>

Owens, W. J., & Studin, M. (2010, April). Hip, knee, ankle and foot problems. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/176-3-hip-knee-ankle-and-foot-problems>

Owens, W. J., & Studin, M. (2010, April). Neck pain and headaches. US Chiropractic Directory,

Retrieved from <http://www.uschirodirectory.com/index.php/patient-information/item/174-neck-pain-a-headaches>

Owens, W. J., & Studin, M. (2010, April). Shoulder, arm, elbow, wrist, hand and chiropractic. US Chiropractic Directory, Retrieved from <http://www.uschirodirectory.com/index.php/shoulder-arm-hand-problems/item/173-3-shoulder-arm-elbow-wrist-and-hand-problems>

Owens, W. J. (2009-present). Bi-monthly educational research review [Review of the most current research in the medical-legal profession provided to professionals at a national level, twice per month].

Owens, W.J. (2009). Thirty percent of disc herniations are missed on MRI. *The American Chiropractor*, 31(5), 8-10.

Owens, W.J. (2009). Permanency issues and ligament/tendon injuries, The biology of soft tissue injury and permanent functional impairment. *The American Chiropractor*, 31(4), 10-12.

Owens, W.J. (2009). Low velocity impacts cause whiplash. *The American Chiropractor*, 31(3), 12-14.

Owens, W.J. (2009). Neurogenic thoracic outlet syndrome - a new orthopedic test. *The American Chiropractor*, 31(2), 12-14.

Owens, W.J. (2009). Pre-existing injuries increase bodily injury. *The American Chiropractor*, 31(1), 8-10.

Whiplash – Past, Present and Future, A comprehensive look at the history, etiology, diagnosis and socioeconomic impact of Whiplash Syndrome by reviewing major clinical studies from peer-reviewed Medline indexed manuscripts utilizing a database starting in 1953. This 56 year history will offer a unique glimpse into this disorder and how it has evolved both clinically and academically. This is an exploratory journey through history offering the participant a review of the significant scientific literature. This course will meet the needs of anyone practicing in the primary care, medical specialty or medical-legal arena who interview, examine and treat patients who have sustained traumatic injuries to the cervical spine. American Academy of Medical Legal Professionals (presenter), AACME Joint sponsorship with the State University of New York at Buffalo, School of Medicine and Biomedical Sciences and American Academy of Medical Legal Professionals, Buffalo, NY, 2009

Owens, W.J. (2008). Increased injury to vertebrae adjacent to fused segments. *The American Chiropractor*, 30(12), 14-15.

Owens, W.J. (2008). Vestibular deficits after whiplash injury. *The American Chiropractor*, 30(11), 10-11.

Owens, W.J. (2008). Schmorl's nodes, acute vs chronic diagnosis. *The American Chiropractor*, 30(9), 32-50.

Owens, W. J. (2008). Spinal cord injury without radiographic abnormalities; A synopsis. *The American Chiropractor*, 30(10), 50-60.

### **SELECTED HONORS**

Doctor of the Year, American Academy of Medical Legal Professionals, 2012

Outstanding Service Award, New York State Chiropractic Association, 2003

Outstanding Service Award, New York State Chiropractic Association, 2002

Outstanding Instructor Award, New York Institute of Massage, 2002

Outstanding Instructor Award, New York Institute of Massage, 2001 Outstanding Instructor Award, New York Institute of Massage, 2000

**SELECTED COMMUNITY SERVICE**

New York State Chiropractic Association, Erie County Fair Chiropractic Information Booth, 2000-2002 Cheektowaga 24-Hour Relay, Chiropractic Provider, 2000

Lancaster-Depew Chamber of Commerce, Member, 1998-2001 Chicago AIDS Run, Chiropractic Provider, 1996