

University of Kentucky  
Department of Physical Medicine and Rehabilitation  
31st Annual PM&R Research Day  
May 23, 2019

Cardinal Hill Rehabilitation Hospital  
Center of Learning  
Lexington, Kentucky

**CARDINAL**  
**HILL**® REHABILITATION  
HOSPITAL

**UK** College of  
Medicine  
*Physical Medicine  
and Rehabilitation*

# PROGRAM AND ABSTRACTS

*31st Annual*

## Physical Medicine and Rehabilitation Research Day

May 23, 2019

Cardinal Hill Rehabilitation Hospital

Lexington, KY





*31st Annual*

# **Physical Medicine and Rehabilitation Research Day**

**May 23, 2019  
Cardinal Hill Rehabilitation Hospital  
Lexington, KY**

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**UNIVERSITY OF KENTUCKY  
DEPARTMENT OF PHYSICAL MEDICINE & REHABILITATION  
31st ANNUAL RESEARCH DAY AGENDA**

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7:00 a.m. – 8:30 a.m. Dr. Joanne Borg-Stein, Roundtable with Residents  
(Cardinal Hill Boardroom)

8:45 a.m. – 9:00 a.m. Opening Remarks/Announcements (CL3):  
Susan McDowell, MD, Chairperson  
Sara Salles, DO, Vice-Chair  
Physical Medicine & Rehabilitation

**PM&R RESIDENT RESEARCH PRESENTATIONS – CL3**

9:00 a.m. – 9:15 a.m. Nicholas Annichiarico, DO, Physical Medicine & Rehabilitation  
Chronicity of Stroke does not affect outcomes of Somatosensory  
Stimulation paired with Task Oriented Motor Training: A Secondary  
Analysis of a Randomized Controlled Trial

9:15 a.m. – 9:30 a.m. Nicholas Elwert, DO, MS, Physical Medicine & Rehabilitation  
Effects of Dynamic Body-Weight Support on Functional  
Independence Measures in Acute Ischemic Stroke

9:30 a.m. – 9:45 a.m. Joseph Mallory, MD, Physical Medicine & Rehabilitation  
Middle-aged Female with Wernickes Encephalopathy

9:45 a.m. – 10:00 a.m. Jared Potter, MD, Physical Medicine & Rehabilitation  
Serotonin Reuptake Inhibitors Cause Worsening Spasticity in a  
Patient with Cerebral Palsy

10:00 a.m. – 10:15 a.m. Vanessa Roos, MD, Physical Medicine & Rehabilitation  
Ultrasound-guided Injections for Treatment of Hip Pain in a Patient  
with Dercum's disease: A Case Report

10:15 a.m. – 10:30 a.m. ***BREAK***

10:30 a.m. – 10:45 a.m. Morgan Drake, MD, Physical Medicine & Rehabilitation  
Injectable Amniotic Membrane Allograft for Treatment of Gluteus  
Medius Tendon Tear: A Case Report

10:45 a.m. – 11:00 a.m. John Lopez, DO, Physical Medicine & Rehabilitation  
Impact of Dynamic Body-Weight Supported Therapy on Inpatient  
Rehabilitation Outcomes Following Traumatic Spinal Cord Injury

11:00 a.m. – 11:15 a.m. Ruth Stanton, MD, MS, Physical Medicine & Rehab  
Single Limb Standing Test, GMFM and Reported Fall  
Frequencies in Children Diagnosed with Cerebral Palsy

11:15 a.m. – 11:30 a.m. L. Brian Barnett, DO, Physical Medicine & Rehab  
An Assessment of Individuals with Disabilities and their  
Participation in Outdoor Pursuits

**UNIVERSITY OF KENTUCKY  
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31st ANNUAL RESEARCH DAY AGENDA  
(Continued)**

## **LUNCH & POSTER EVALUATIONS**

11:30 a.m. – 12:55 p.m.

Buffet Lunch (CL2)  
 Poster Evaluations (CL4)

## **POSTER PRESENTATIONS – CL4**

- 1 Pooja Chopra, MD, Physical Medicine & Rehabilitation  
Surgically Placed Paddle Leads at C5-6 and T7-T8 with Spinal  
Cord Stimulation for Cervical and Lumbar Radiculopathy in a  
Patient with Severe Degenerative Disc Disease using one IPG
- 2 Nick Elwert, DO, MS, Physical Medicine & Rehabilitation  
Anterior Cutaneous Nerve Entrapment Syndrome: A Case Report
- 3 Justin Huber, MD, MS, Physical Medicine & Rehabilitation  
Reverse Engineering Enables User-Centered Design of a  
Dynamic Wrist-Hand Orthosis for a Chronic Stroke Patient: A  
Case Study
- 4 John Lopez, DO, Physical Medicine & Rehabilitation  
Ultrasound Guided Dextrose Prolotherapy for Chronic Knee Pain in  
a Patient with Spinal Cord Injury: A Case Report
- 5 Maeve McDonald, BS, Biomedical Engineering  
Work-related Changes in Lumbo-Pelvic Coordination During Trunk  
Forward Bending and Backward Return Among Nurses
- 6 Mike McGuirk, DO, Physical Medicine & Rehabilitation  
Differential Effects on Non-invasive Brain Stimulation in Chronic  
Neuropathic Pain: Preliminary Findings of an Ongoing Double-  
Blind Randomized Controlled Trial
- 7 Elizabeth Powell, MS, Physical Medicine & Rehabilitation  
The Absence of Motor Evoked Potentials does not Predict Poor  
Recovery in Severe Stroke
- 8 Camille Skubik-Peplaski, PhD OTR/L FAOTA  
Eastern Kentucky University, Occupational Science and  
Occupational Therapy  
The Effects of Occupation-based Interventions vs Handwriting  
Interventions on Children's Handwriting: a Pilot Study
- 9 Wes Troyer, DO, Physical Medicine & Rehabilitation  
Pronator Teres Syndrome (PTS): Contribution of  
Ultrasonographic Examination when Electrodiagnostic Studies  
are Inconclusive: A Case Report
- 10 Clare Tyler, BS, Biomedical Engineering  
Work-Related Changes in Trunk Stiffness of Nursing Personnel

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DEPARTMENT OF PHYSICAL MEDICINE & REHABILITATION  
31st ANNUAL RESEARCH DAY AGENDA  
(Continued)**

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**KEYNOTE SPEAKER – CL3 & CL4**

12:55 p.m. – 1:00 p.m.

Introductions  
Sara Salles, DO, Vice-Chair  
Physical Medicine & Rehabilitation

1:00 p.m. – 2:00 p.m.

Joanne Borg-Stein, MD  
Associate Professor of PM&R at Harvard Medical School  
Associate Chair for Sports and Musculoskeletal Rehabilitation  
Medical Director of the Spaulding-Wellesley Rehabilitation Ctr.  
Chief of PM&R and Medical Director of the Spine Center at  
Newton-Wellesley Hospital

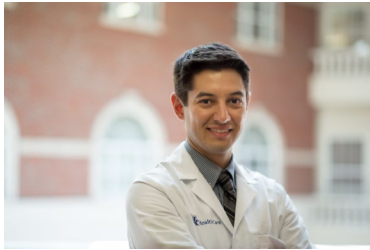
## **Stem Cells: Applications in Sports Medicine and Osteoarthritis**

**CLOSING REMARKS – CL3**

2:00 p.m. – 2:15 p.m.

Jessica Colyer, MD, Residency Program Director  
Physical Medicine & Rehabilitation

## PM&R RESIDENT PRESENTATION



### **Nicholas Annichiarico, DO**

#### **Chronicity of Stroke does not affect outcomes of Somatosensory Stimulation paired with Task Oriented Motor Training: A Secondary Analysis of a Randomized Controlled Trial**

**Presenter:**

Nicholas Annichiarico, DO<sup>1</sup>

**Collaborators:**

Elizabeth Powell, MS<sup>1,2</sup>, Cheryl Carrico, MS, OT/L<sup>1,3</sup>, Lumy Sawaki, MD, PhD<sup>1,2</sup>, Philip Westgate, PhD<sup>4</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

<sup>2</sup>Encompass Health, Cardinal Hill Rehabilitation Hospital, Lexington, KY

<sup>3</sup>Department of Occupational Science and Occupational Therapy, Eastern Kentucky University, Richmond, KY

<sup>4</sup>Department of Biostatistics and College of Public Health, University of Kentucky, Lexington, KY

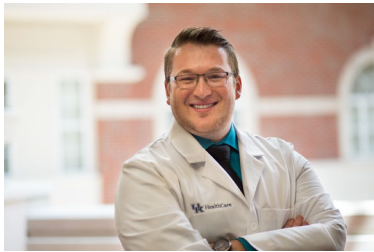
**Abstract Text:**

The objective of this study was to determine whether chronicity after stroke influences outcomes of somatosensory stimulation paired with task-oriented motor training for subjects with severe-to-moderate post-stroke upper extremity hemiparesis. Spearman's correlations were used to retrospectively analyze data drawn from a randomized controlled trial, which included 55 adults who ranged from 3 and 12 months post-stroke. Participants received 18 sessions pairing either 2 hours of active (n=33) or sham (n=22) somatosensory stimulation with 4 hours of intensive task-oriented motor training. The Wolf Motor Function Test (primary), Action Research Arm Test, Stroke Impact Scale, and Fugl-Meyer Assessment were collected as outcome measures. Analyses evaluated whether within-group chronicity correlated with pre-post changes on the aforementioned primary and secondary outcome measures of motor performance. The results demonstrated that both groups exhibited improvements on all outcome measures, and that there were no significant correlations between chronicity after stroke and the amount of motor recovery that were found. This led to the conclusion that somatosensory stimulation improved motor recovery compared with sham treatment in cases of severe-to-moderate hemiparesis between 3 and 12 months after stroke, and the extent of recovery did not significantly correlate with baseline levels of stroke chronicity.

**Key Words:** *Upper extremity, occupational therapy, humans, transcutaneous electric nerve stimulation, neuromodulation*



## PM&R RESIDENT PRESENTATION



### Nicholas Elwert, DO

#### **Effects of Dynamic Body-Weight Support on Functional Independence Measures in Acute Ischemic Stroke**

**Presenter:**

Nicholas Elwert, DO, MS<sup>1</sup>

**Collaborators:**

Elizabeth Powell, MS<sup>1,2</sup>, Lumy Sawaki, MD, PhD<sup>1,2</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

<sup>2</sup>Encompass Health, Cardinal Hill Rehabilitation Hospital, Lexington, KY

**Abstract Text:**

According to the Center for Disease Control, every 40 seconds an individual in the United States suffers a cerebrovascular accident (CVA) with ~610,000 new CVAs per year. Of all CVAs, nearly 87% are ischemic in etiology, while the remaining 13% are hemorrhagic. While novel technological advances and adaptations continue to be utilized in neuro-rehabilitation, it is unclear if these advances lead to greater functional improvements compared to standard of care (SOC) rehabilitation. Dynamic Body-Weight Support (DBWS) technology is a dynamic suspension system that supports the patients' body weight and reduces the potential of falls. The purpose of this retrospective cohort study is to compare patients who utilized DBWS with patients who received SOC during acute rehabilitation admission after ischemic CVA (no DBWS technology). Outcome measures include the following: functional independence measure (FIM) scores at admission and discharge. More specifically, we will evaluate total FIM score, motor FIM score (self-care, sphincter control, mobility, locomotion) and cognitive FIM score (cognition, social cognition). Patients for this study will be excluded if they have any of the following criteria: 1) no evidence of stroke on neuroimaging, 2) evidence of a chronic CVA, 3) admitted to inpatient rehabilitation for medical conditions not directly related to CVA and 4) transferred back to an acute care hospital within 7 days of admission. Comparative findings of the total FIM, total motor FIM and total cognitive FIM between the experimental and control data should provide evidence for or against the utilization of DBWS technology in acute rehabilitation after CVA.

**Key Words:** *Neuro-rehabilitation, stroke, ischemic*



## PM&R RESIDENT PRESENTATION



**Joseph Mallory, MD**

### **Middle-aged Female with Wernickes Encephalopathy**

**Presenter:**

Joe Mallory, MD<sup>1</sup>

**Collaborators:**

Gerald Klim, DO<sup>1</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

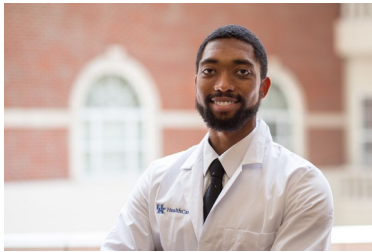
**Abstract Text:**

This case presentation describes a middle-aged female with history of gastric bypass, hypothyroidism, anxiety/depression, and remote alcohol abuse. Roux-en-Y performed 7+ years prior. She reportedly began having cognitive and coordination issues in early July, 2018, after the passing of a son-in-law. Per history, she became more withdrawn and her appetite and PO intake dramatically decreased. In early February, 2019, she presented to an outside hospital with generalized weakness, ataxia, and ophthalmoplegia. She was transferred to a regional major medical center for further evaluation and management. Following extensive exam with labs and imaging, she was diagnosed with Wernicke's encephalopathy and bilateral INO. She was treated with IV Thiamine, oral B12, and oral Folate with improvement. Attempts were made to transition to PO Thiamine replacement with significant drop in cognitive status; IV replacement was re-initiated. Following hospitalization at acute care hospital, she was discharged to our acute rehabilitation hospital to address ADL impairments, functional decline, gait impairment, and cognitive impairments.

Wernicke's encephalopathy is an important cause of acute/subacute delirium that is caused by Vitamin B12 (Thiamine) deficiency. This neurologic disorder presents with the classic triad of confusion, ataxia, and ophthalmoplegia. In most cases, early lesions can be reversed with immediate and adequate supplementation. However, her case was complicated by the chronic inhibition of absorption (secondary to her gastric bypass) and the subacute nutritional deficiency (secondary to alcohol abuse and poor oral intake).

**Key Words:** *Wernicke's encephalopathy, thiamine deficiency, bilateral ophthalmoplegia, gastric bypass, internuclear ophthalmoplegia (INO)*

## PM&R RESIDENT PRESENTATION



**Jared Potter, MD**

### **Serotonin Reuptake Inhibitors Cause Worsening Spasticity in a Patient with Cerebral Palsy**

**Presenter:**

Jared Potter, MD<sup>1</sup>

**Collaborators:**

Sara Salles, DO<sup>1</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

**Abstract Text:**

**Setting:** Outpatient Physical Medicine & Rehabilitation clinic.

**Patient:** A middle-aged woman with spastic cerebral palsy and concomitant anxiety.

**Case Description:** A patient with cerebral palsy with spastic diplegia presented with significant situational anxiety and functional decline, and multiple serotonergic agents were trialed. Selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRI) were prescribed at separate points in time, each with the result of worsening spasticity.

**Assessment/Results:** With the discontinuation of serotonergic agents, her hypertonia returned to baseline. Her anxiety went on to be pharmacologically managed using medications with alternative mechanisms.

**Discussion:** Neurologic injuries classically result in a decrease or loss in descending serotonergic input. While most commonly-used anti-spasmodic agents focus on modulation of other receptors, this case highlights the importance of serotonin in this phenomenon. Most information in the literature discussing the role of serotonin and its corresponding receptors in spasticity is typically in relation to patients with spinal cord injury. However, a similar mechanism is described in animal models of those with cerebral palsy. This case further supports that model.

**Conclusion:** Given these findings, it appears consistent that serotonin alteration is important in the development and management of spasticity. This case acts as a cautionary tale for physicians and providers who care for patients with neurologic injuries: to look for signs of increased spasticity upon initiation of this class of agents. Arguably, it argues for the utilization of other classes of medications for the management of mood disorder in patients with neurologic injuries. Furthermore, it raises the question of whether anti-serotonergic agents should be pursued as adjunct, or even alternative methods of spasticity control.

**Key Words:** *Spasticity, serotonin, cerebral palsy, SSRI, SNRI, anxiety*

## PM&R RESIDENT PRESENTATION



### Vanessa Roos, MD

#### **Ultrasound-guided Injections for Treatment of Hip Pain in a Patient with Dercum's disease. A Case Report**

**Presenter:**

Vanessa Roos, MD<sup>1</sup>

**Collaborators:**

Robert Worthing, MD, FAAPMR, FAWM<sup>2</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

<sup>2</sup>Physical Medicine and Rehabilitation, Lexington VA Healthcare System, Lexington, KY

**Case Diagnosis:** Femoroacetabular arthropathy in a patient with Dercum's disease.

**Case Description:** A middle-aged male with history of Dercum's disease, a rare condition characterized by painful subcutaneous lipomas, presented to outpatient musculoskeletal clinic with chronic hip pain. Clinical evaluation suggested femoroacetabular arthropathy. Plain radiograph and MRI of the left hip confirmed moderate osteoarthritis with a large CAM-type lesion. Conservative treatment (physical therapy, NSAIDs, topicals, etc.) failed to alleviate pain. Diagnostic ultrasound revealed multiple lipomas with tenderness under probe visualization scattered throughout the hip girdle. An ultrasound-guided corticosteroid injection was performed, avoiding disturbance of the lipomas. The patient reported minimal periprocedural pain without additional complication. Injection resulted in 75-80% pain relief lasting five months.

**Discussion:** Dercum's disease or adiposis dolerosa, is a rare condition characterized by accumulation of painful lipomas in subcutaneous tissue. Associated pain can be debilitating. Lipomas reoccur or increase in number if structurally disturbed. Corticosteroid injections are effective for short-term reduction in chronic hip pain. Direct ultrasound allows visualization of lipomas with good sensitivity and specificity and improves accuracy of intraarticular injection. In patients with Dercum's disease, ultrasound guidance allows for localization and avoidance of painful lipomas, thereby decreasing pain and lipoma multiplication. The present case is the first to describe use of ultrasound-guidance in a patient with Dercum's disease, highlighting its potential utility.

**Conclusion:** Use of ultrasound-guidance for intraarticular hip injection in a patient with Dercum's disease ensured avoidance of painful lipomas, and may reduce risk for complication in such conditions.

**Key Words:** *Dercum's, adiposis dolerosa, intraarticular injections*

## PM&R RESIDENT PRESENTATION



**Morgan Drake, MD**

### **Injectable Amniotic Membrane Allograft for Treatment of Gluteus Medius Tendon Tear: A Case Report**

**Presenter:**

Morgan Drake, MD<sup>1</sup>

**Collaborators:**

Robert Worthing, MD, FAAPMR, FAWM<sup>2</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

<sup>2</sup>Physical Medicine and Rehabilitation, Lexington VA Healthcare System, Lexington, KY

**Abstract Text:**

**Setting:** Outpatient musculoskeletal clinic

**Patient:** A middle-aged female with greater trochanteric pain syndrome

**Case Description:** The patient presented with chronic lateral hip pain. Clinical findings were consistent with greater trochanteric pain syndrome. Conservative management including physical therapy failed to alleviate pain. Diagnostic ultrasound confirmed partial tear (less than 50%) of the gluteus medius tendon. The patient underwent ultrasound guided injection of 100mg amniotic membrane allograft reconstituted in 4ml of 0.9% sterile saline to the tendon defect utilizing an in-plane longitudinal approach.

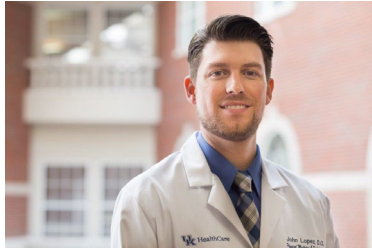
**Assessment/Results:** The procedure resulted in minimal periprocedural pain and no additional complication. Injection resulted in clinically significant pain reduction (VASmax 10 to 3, 90% subjective symptomatic improvement) after one year. No remaining evidence of gluteus medius tear was identified on repeat diagnostic ultrasound.

**Discussion:** Lateral hip pain is a common complaint in musculoskeletal medicine. Greater trochanteric pain syndrome encompasses multiple pathologies including trochanteric bursitis, tendonitis, tendinosis, and tears of the gluteal tendons. Patients with symptomatic tears often present with an insidious onset of lateral hip pain, tenderness to palpation over the greater trochanter, and weakness with hip abduction. Treatment may include conservative measures (rest, activity modifications, anti-inflammatories and physical therapy) or surgical intervention for refractory cases. There is a growing interest in the potential utility of injectable amniotic membrane allograft for nonoperative treatment of musculoskeletal disorders such as tendinopathy. A single prior study reporting use of injectable amniotic membrane allograft included treatment of two gluteus medius tendinopathy cases among a variety of other tendinopathies. This case is the first to detail successful treatment of gluteus medius tendon tear with injectable amniotic membrane allograft under ultrasound guidance.

**Conclusion:** Ultrasound guided injection of amniotic membrane allograft into the gluteus medius tendon was well tolerated with no significant complication. Amniotic membrane derived products may be useful for the treatment of gluteal tendon tears refractory to conservative treatment.

**Key Words:** *Greater trochanteric pain syndrome, gluteus medius tendinopathy, injectable amniotic allograft, gluteal tendon tear*

## PM&R RESIDENT PRESENTATION



**John Lopez, DO**

### **Impact of Dynamic Body-Weight Supported Therapy on Inpatient Rehabilitation Outcomes Following Traumatic Spinal Cord Injury**

**Presenter:**

John Lopez, DO<sup>1</sup>

**Collaborators:**

Elizabeth Powell, MS<sup>1</sup>, Emily Angelis, MS<sup>2</sup>, Lumy Sawaki, MD, PhD<sup>1</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

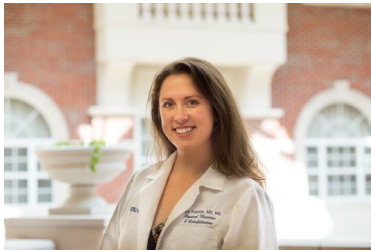
<sup>2</sup>College of Medicine, University of Kentucky, Lexington, KY

**Abstract Text:**

Traumatic spinal cord injury (SCI) is a devastating condition with lifelong impairments. Prior research has shown neuroplasticity can improve function via task specific, repetitive training. Many rehabilitation technologies exist to harness neuroplasticity; it is unclear if these technologies yield greater functional improvement compared to standard of care (SOC). Our objective was to determine whether overground gait and balance training with dynamic body-weight support (DBWS) during inpatient rehabilitation resulted in greater functional outcome improvement compared to SOC in adults with traumatic SCI. This retrospective cohort study compared patients who incorporated DBWS with patients who received SOC during inpatient rehabilitation. Outcome measures included functional independence measure (FIM) scores at admission and discharge including total FIM score, motor FIM score (self-care, sphincter control, mobility, locomotion) and cognitive FIM score (cognition, social cognition). Ten traumatic SCI patients were evaluated including 5 in the DBWS group and five in the SOC group. Length of stay was matched between the two groups. There was significant improvement in total, motor, and cognitive FIM scores at discharge compared to admission for both DBWS ( $p=0.008$ ,  $p=0.012$ ,  $p=0.008$ , respectively) and SOC ( $p=0.001$ ,  $p=0.003$ ,  $p=0.043$ , respectively) groups. DBWS showed significantly greater improvement in total FIM and motor FIM subscale of mobility compared to SOC ( $p=0.026$ ). Despite the small sample size, results present initial evidence that DBWS therapy during inpatient rehabilitation has potential for improved outcomes compared to SOC in traumatic SCI patients. Future prospective, randomized trials are warranted to substantiate preliminary findings.

**Key Words:** *Spinal cord injury, dynamic body-weight support, FIM score*

## PM&R RESIDENT PRESENTATION



**Ruth Stanton, MD**

### **Single Limb Standing Test, GMFM and Reported Fall Frequencies in Children Diagnosed with Cerebral Palsy**

**Presenter:**

Ruth Stanton, MD, MS<sup>1</sup>

**Collaborators:**

Ryan Callahan, MS<sup>2</sup>, Michael Pohl, PhD<sup>2</sup>, Hank White, PT, PhD<sup>2</sup>, Robert Shapiro, PhD<sup>2</sup>, Henry Iwinski, MD<sup>2</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

<sup>2</sup>Shriners Hospitals for Children Medical Center, Lexington, KY

**Abstract Text:**

Cerebral Palsy (CP) is a motor disorder that arises in the developing fetal or infant brain. Children with CP are at increased risk of falling due to balance impairments. Evaluating stability through measures such as gross motor functional measure (GMFM) or Center of pressure excursion (COPE) may help predict falls and can guide clinical interventions, but they can be time consuming or unavailable in some locations. More efficient and accessible balance and fall risk measures could potentially improve the evaluation process and guide clinical interventions. This study assessed relationships between COPE measurements, GMFM, and fall frequency in children with CP. It was a prospective observational study of 20 youth with CP. Gross functionality was measured using GMFM scores, balance via motion analysis force plate and SLST on each leg, and fall risk via questionnaire. Outcomes were COPE area and COPE velocity during SLST. Results showed that SLST demonstrated a high positive correlation with section E of GMFM and a moderate positive correlation with section D of GMFM. SLST and COPE area had moderate positive correlation. Fall frequency demonstrated a low positive correlation with COPE velocity and negligible correlations with other measures. The study results indicated that SLST moderately correlates with GMFM and COPE area, and children with higher reported fall frequencies did not demonstrate worse single leg stance times, functional measures, or COPE measurements.

**Key Words:** *Cerebral Palsy, fall frequency, balance assessment, single leg stance*



## PM&R RESIDENT PRESENTATION



**L. Brian Barnett, DO**

### **An Assessment of Individuals with Disabilities and their Participation in Outdoor Pursuits**

**Presenter:**

L. Brian Barnett, DO<sup>1</sup>

**Collaborators:**

Robert Worthing, MD, FAAPMR, FAWM<sup>2</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

<sup>2</sup>Physical Medicine and Rehabilitation, Lexington VA Healthcare System, Lexington, KY

**Abstract Text:**

**Background:** Impaired individuals collectively represent a large sport and recreational user group with diverse needs. As the incidence and prevalence of impairments such as amputation and spinal cord injury increases, participation in outdoor activity among impaired individuals may also increase. Current literature describes participation of impaired individuals in field-based organized sports such as Paralympic events. However, there is no data specific to wilderness and outdoor pursuits. The aim of this research is to quantify the size of this user group and potential barriers to participation.

**Objective:** 1) Formulate quantitative and qualitative description of individuals with impairments who currently participate or are interested in participating in wilderness and outdoor pursuits; 2) Assess perceived barriers to participation; 3) Determine need for support of safe participation.

**Methods:** 1) Design a forced-choice web-based survey; 2) Pilot the survey at the 2020 National Wheelchair Games; 3) Review results and make necessary improvements; 4) Post the survey on national databanks for individuals with specific impairments; 5) Extrapolate relative user group size, demographics, and barriers to participation.

**Clinical Implication:** Results should increase awareness of this user group and assist support of safe participation.

**Conclusion:** We anticipate results will reveal a large user group with multiple perceived barriers to participation in wilderness and outdoor pursuits. Results will highlight need for additional guidance to support safe participation.

**Key Words:** *Wilderness medicine, outdoor sports, disability, physical impairments, user group, barriers*



## KEYNOTE SPEAKER PRESENTATION

# **Stem Cells: Applications in Sports Medicine and Osteoarthritis**

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## **Joanne Borg-Stein, MD**

Dr. Joanne Borg-Stein is an Associate Professor of PM&R at Harvard Medical School. She is the Associate Chair for Sports and Musculoskeletal Rehabilitation. She is the Medical Director of the Spaulding-Wellesley Rehabilitation Center. She is Chief of PM&R and Medical Director of the Spine Center at Newton-Wellesley Hospital.

Dr. Borg-Stein serves as team physician for varsity athletics at Wellesley College and Director of the Sports Medicine Fellowship at Spaulding Rehabilitation Hospital/Harvard Medical School. A major area of clinical and research focus is in regenerative injection therapies for osteoarthritis and sports injuries.

## POSTER PRESENTATION - 1

### **Surgically Placed Paddle Leads at C5-6 and T7-T8 with Spinal Cord Stimulation for Cervical and Lumbar Radiculopathy in a Patient with Severe Degenerative Disc Disease using one IPG**

**Presenter:**

Pooja Chopra, MD<sup>1</sup>

**Collaborators:**

Anjum Bux, MD<sup>2</sup>, Kyla Anderson, APRN<sup>2</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine & Rehabilitation, University of Kentucky, Lexington, KY

<sup>2</sup>Bux Pain Management, Danville, KY

**Abstract Body:**

**Introduction:** This patient is a 59 year old male presented with a history of neck pain with cervical radicular pain into bilateral hands and low back pain radiating into bilateral legs and feet. He failed conservative therapy including lyrica, anti-inflammatories, narcotics, PT, and injective therapy. The patient was not a candidate for surgery. He was deemed a good candidate for spinal cord stimulation (SCS) given his significant radicular symptoms. A decision was made to attempt spinal cord stimulation with one cervical lead at C4-C5-C6 and one thoracolumbar lead at T7-T8-T9 in an attempt to relieve the patient's persistent arm, leg and foot pain.

**Methods:** The patient underwent midline percutaneous lead placement at C4-C5-C6 and T7-T8-T9 for SCS trial without complications. Intraoperative mapping revealed adequate upper and lower extremity coverage bilaterally. This was a 7 day trial with follow up and reprogramming at Day 3.

**Results:** The patient achieved 90% relief in his upper and lower extremity pain following his SCS trial. He reported resolution of finger weakness allowing him to be able to play the piano again. He also achieved significant improvement in overall functionality. This was a successful trial, however, because of difficulty in placement of leads it was decided to send the patient for surgical paddle lead placement for permanent SCS.

**Conclusion:** The patient subsequently underwent SCS implant with surgically placed paddle leads placed at C5-C6 and T8-T9 with identical relief in pain as in his trial. Since he has good pain relief he is currently in the process of weaning off his opioids without any complications post-implant. With the return of finger function, he is now able to cook again and play the piano. This patient was able to have adequate coverage of both cervical and lumbar radicular symptoms with two surgically placed paddle leads and one IPG using a Nuvectra stimulator system.

**Key Words:** SCS, radiculopathy, DDD

## POSTER PRESENTATION - 2

### **Anterior Cutaneous Nerve Entrapment Syndrome: A Case Report**

**Presenter:**

Nick Elwert, DO, MS<sup>1</sup>

**Collaborators:**

Derek Dixon, MS, OMS-IV<sup>2</sup>, Cecil Todd Hollen, DO<sup>1</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

<sup>2</sup>Lincoln Memorial University-DeBusk College of Osteopathic Medicine, Harrogate, TN

**Abstract Text:**

Anterior cutaneous nerve entrapment syndrome (ACNES) is an often-misdiagnosed condition characterized by chronic abdominal pain with an inconclusive medical work-up. ACNES occurs due to entrapment of the cutaneous branch of the lower thoracoabdominal intercostal nerve within the rectus abdominis muscle. The typical patient population effected are women between 30-50 years old. In this case, a 21-year-old presented with chronic abdominal pain dating back to 2016 following her appendectomy. She endorsed left sided “stabbing” pain, worsened with running and abdominal crunches, located along the anterior aspect of ribs 9-10. She rated her pain a 0/10 at rest on visual analog scale (VAS) but endorsed a 9/10 pain with activity as described above. Previous extensive medical work-up was unremarkable. On physical examination, she had point tenderness, in a 1cm<sup>2</sup> area along the belly of the left rectus abdominis corresponding to ribs 9-10. This pain was exacerbated with forward flexion of her spine from a supine position (+ Carnett’s test) and by pinching the area of skin affected (+ Pinch test). The patient underwent a diagnostic/therapeutic injection of 3ml of 1% Lidocaine, 1ml of 40mg Triamcinolone and 6ml of 5% Dextrose of the left T9 anterior cutaneous nerve under ultrasound guidance. Immediately after the procedure, the patient endorsed complete relief of symptoms with 0/10 pain on VAS with activity at her 2 week follow up. This case represents the need for careful and thorough interview of the patient with specific physical exam maneuvers and treatment with ultrasound guided hydro-dissection of ACNES.

**Key Words:** ACNES, hydro-dissection, dextrose, ultrasound

## POSTER PRESENTATION - 3

### **Reverse Engineering Enables User-Centered Design of a Dynamic Wrist-Hand Orthosis for a Chronic Stroke Patient: A Case Study**

**Presenter:**

Justin Huber, MD, MS<sup>1</sup>

**Collaborators:**

Lumy Sawaki, MD, PhD<sup>1</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

**Abstract Text:**

Upper extremity impairment after stroke is a major cause of disability as it affects meaningful and independent engagement in multiple life domains, such as dressing, eating, and performing self-hygiene. Ultimately, this impacts a patient's quality of life. In an effort to reduce disability, an expansive selection of assistive technology (AT) is being designed and commercialized. However, the poor adoption rate of these new devices remains a critical barrier. Acceptance of new AT is improved by engaging patients early during the initial device design (user-centered design), but manufacturers are wary of this approach for fear of long lead times, high costs, and prolonged time-to-market. The advent of reverse engineering (RE) is decreasing such fears by accelerating design and compressing product development cycles. By applying principles of RE, user-center design of AT is more plausible. In fact, studies support feasibility of RE for user-centered design of splints—simple AT designed to immobilize limbs or digits during rehabilitation. The present case study explores the application of RE for user-centered design of a dynamic wrist-hand orthosis—a more complex AT which provides graded mobility for patients during rehabilitation.

**Key Words:** *Hemiparesis, dynamic splint, assistive technologies, upper extremity, 3D scanning*

## POSTER PRESENTATION - 4

### **Ultrasound Guided Dextrose Prolotherapy for Chronic Knee Pain in a Patient with Spinal Cord Injury: A Case Report**

**Presenter:**

John Lopez, DO<sup>1</sup>

**Collaborators:**

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**Abstract Text:**

An elderly male with chronic incomplete paraplegia was referred to musculoskeletal clinic for progressive knee pain, right greater than left, resulting in functional decline in ambulation and transfers. Clinical evaluation suggested concomitant neuropathic/nociceptive pain secondary to spinal cord injury (SCI) and knee osteoarthritis. Radiographs confirmed tricompartmental osteoarthritis with severe medial compartment narrowing bilaterally. Conservative treatment failed to provide significant relief. The patient elected to undergo two sessions of right knee prolotherapy under ultrasound guidance utilizing 25% intraarticular and 15% extraarticular dextrose solutions. Treatment sessions were spaced thirty days apart. Prolotherapy was well tolerated with no apparent side effects. Two months after initial treatment, patient reported clinically significant pain relief (VAS 3 from baseline 9) and functional improvement (minimum assistance to modified independent). He subsequently proceeded with contralateral knee dextrose prolotherapy. Studies support dextrose prolotherapy in treatment of chronic musculoskeletal ailments. In addition to tissue regeneration, recent literature suggests dextrose may have a neuromodulatory effect on pain nerves. The present case is the first to describe dextrose prolotherapy for mixed nociceptive and neuropathic pain treatment in a patient with SCI and the first to detail dextrose prolotherapy of the knee utilizing ultrasound guidance. Further study is needed to validate safety in patients with sensory impairment and efficacy in mixed nociceptive and neuropathic pain. Ultrasound guided dextrose prolotherapy for treatment of mixed neuropathic and nociceptive pain in an incomplete paraplegia patient with primary knee osteoarthritis was well tolerated, resulted in clinically significant pain relief, and allowed return to functional baseline.

**Key Words:** *Primary osteoarthritis, dextrose prolotherapy, spinal cord injury*

## POSTER PRESENTATION - 5

### **Work-related Changes in Lumbo-Pelvic Coordination During Trunk Forward Bending and Backward Return Among Nurses**

**Presenter:**

Maeve McDonald, BS<sup>1</sup>

**Collaborators:**

Matt Ballard, BS<sup>1</sup>, Clare Tyler, BS<sup>1</sup>, Babak Bazrgari, PhD<sup>1</sup>, Lumy Sawaki Adams, MD, PhD<sup>2</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Biomedical Engineering, University of Kentucky, Lexington, KY

<sup>2</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

**Abstract Text:**

Timing and magnitude of flexion-extension activities are studied to identify the effects of occupational activities and diurnal changes on trunk kinematics and trunk stiffness. The physiological diurnal changes that occur throughout a day have a large impact on trunk stiffness and are especially affected by physical demands of a job, including the amount a person is seated or up and moving throughout a work shift. In this study, 30 nurses organized into groups based on physical demands and location of their 8-12 hour work shift are asked to come for data collection before and immediately following work shifts to monitor diurnal changes experienced. Participants are asked to stand on a force plate and complete three repetitions of a forward bending and backward return exercise at a self-selected pace and then repeat the exercises "as fast as possible". Participants then repeat the exercise while lifting a weight from the ground to chest height. Magnetic inertial motion trackers are placed on the posterior thorax and pelvis to record segment rotation data and monitor changes in magnitude and timing of flexion and extension. Using methods implemented by Stergiou, et al., 2001, data can be used to create continuous relative phase curves and obtain the mean absolute relative phase and deviation phase to evaluate timing of tasks. It is hypothesized that lumbar flexion-extension magnitude is smaller, and timing is more synchronous following a work shift and in more demanding occupational activities, using a mixed ANOVA to find differences between groups.

**Key Words:** *Back pain, nurses, lumbo-pelvic coordination*

## POSTER PRESENTATION - 6

### **Differential Effects of Non-invasive Brain Stimulation in Chronic Neuropathic Pain: Preliminary Findings of an Ongoing Double-blind Randomized Controlled Trial**

**Presenter:**

Mike McGuirk, DO<sup>1</sup>

**Collaborators:**

Pooja Chopra, MD<sup>1,2</sup>, Elizabeth Powell, MS<sup>1,2</sup>, Lumy Sawaki, MD, PhD<sup>1,2</sup>

**Departmental Affiliations:**

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<sup>2</sup>Encompass Health Cardinal Hill Rehabilitation Hospital, Lexington, KY

**Abstract Text:**

**Objective:** Determine and compare the anatomical site-specific effects of transcranial direct current stimulation (tDCS), a form of non-invasive brain stimulation, on chronic neuropathic pain and associated quality of life.

**Design:** Randomized, double-blinded, controlled study.

**Setting:** Outpatient Neurorehabilitation Research Clinic.

**Participants:** 9 subjects diagnosed with chronic neuropathic pain (7 subjects with complex regional pain syndrome and 2 subjects with pain associated with spinal cord injury).

**Interventions:** Subjects received 10 consecutive weekdays of tDCS. Each subject was randomly assigned to receive tDCS at 1 of 3 anatomical sites: 1) primary motor cortex (M1); 2) dorsolateral prefrontal cortex (DLPFC); or 3) sham tDCS.

**Main Outcome Measures:** Visual Analog Scale (VAS) and SF-36 Health Survey at pre-intervention, midpoint (i.e., after 1<sup>st</sup> week), and post-intervention.

**Results:** On the physical component of SF-36, the M1 group had greater improvement compared to the DLPFC and sham groups. On the mental component of SF-36, the DLPFC and sham groups had greater improvement than the M1 group. On the VAS, the M1 group yielded greater improvement than DLPFC and sham groups.

**Conclusions:** There are differential effects of tDCS on chronic neuropathic pain according to neuroanatomical site of stimulation. The most improvement on the physical component of SF-36 Health Survey and VAS occurred with M1 stimulation. More improvement on the mental component of SF-36 occurred with DLPFC stimulation and sham stimulation compared with M1 stimulation. In sum, tDCS to M1 might be optimal to improve pain as measured by physical components of SF-36, while tDCS to DLPFC might have the most efficacy to improve mental aspects of pain. Future studies are recommended to build on these results, in part because these results show high variability.

**Level of Evidence:** Level II

**Key Words:** tDCS, neuropathic pain, neuromodulation



## POSTER PRESENTATION - 7

### **The Absence of Motor Evoked Potentials does not Predict Poor Recovery in Severe Stroke**

**Presenter:**

Elizabeth Powell, MS<sup>1</sup>

**Collaborators:**

Philip M Westgate, PhD<sup>2</sup>, Lumy Sawaki, MD, PhD<sup>1</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

<sup>2</sup>Department of Biostatistics, College of Public Health, University of Kentucky, Lexington, KY

**Abstract Text:**

**Background:** Stroke continues to be a major public health concern. Most research has focused on individuals with mild impairments. Little is known about the potential for recovery in individuals with severe stroke, the role of motor evoked potentials (MEPs) in this population, and whether they can achieve meaningful improvements. The purpose of this study was to pragmatically and retrospectively analyze recovery in severe stroke, taking into account the presence or absence of MEPs.

**Methods:** This analysis includes 129 individuals with severe-moderate stroke who participated in previous studies combining neuromodulatory stimulation and upper extremity motor training. Outcome measures included Fugl-Meyer Assessment (FMA), Action Research Arm Test (ARAT) and transcranial magnetic stimulation. Analyses were conducted regarding 1) stimulation condition (active or sham), 2) MEP status (+ or -), 3) both stimulation condition AND MEP status. Within-group and between-group changes were assessed with longitudinal repeated measures ANOVA and ANCOVA, respectively.

**Results:** When grouping subjects by stimulation condition or by MEP status all groups were found to have improved significantly at post and follow-up. Analysis by stimulation condition AND MEP status showed significant improvements for MEP-/active and MEP+/active groups on both FMA and ARAT at post and follow-up. No significant differences were found between any groups.

**Conclusions:** These results suggest that many individuals with severe stroke are able to achieve significant improvements with therapy. While those who have MEPs do tend to improve more, outcomes for both groups can be enhanced through neuromodulatory stimulation. Future studies to prospectively analyze this concept are warranted.

**Key Words:** *Stroke, neuroplasticity, chronic*

## POSTER PRESENTATION - 8

### **The Effects of Occupation-based Interventions vs Handwriting Interventions on Children's Handwriting: A Pilot Study**

**Presenter:**

Camille Skubik-Peplaski, PhD, OTR/L, FAOTA<sup>1</sup>

**Collaborators:**

Jennifer Hight, OTD OTR/L<sup>1</sup>, Carol Rushing-Carr, MOT, OTR/L<sup>1</sup>, Kaitlyn Todd, OTS<sup>1</sup>,  
Laura Bray, MS OTR/L<sup>1</sup>

**Departmental Affiliations:**

<sup>1</sup>Department of Occupational Science and Occupational Therapy, Eastern Kentucky University, Richmond, KY

**Abstract Text:**

**Purpose:** The purpose of this study was to compare the effects of occupation-based vs. handwriting interventions on a child's ability to write.

**Rationale/Background:** Effective use of the hands to engage in a variety of occupations is critical for a child to be successful. Fine motor skills have been found to be a predictor of later academic achievement, and when combined with attention and general knowledge were found to predict success in reading, math and science (Grissmer, Grimm, Alyer, Murrah & Steele, 2010). Yet, Smits-Engelsman, Niemeijer and van Galen (2001) found that 10-34% of school-aged children do not master handwriting.

**Methods:** A quasi-experimental quantitative pretest, post-test, follow-up test design was used at 2 outpatient pediatric clinics. Nineteen children ages 5-10 presented with diagnoses including; autism, sensory processing impairments and development delay. Children were conveniently placed in either an occupation-based or a handwriting group based on their residence location. Each child received 6 sessions of intervention and one follow-up session. Outcome measures were Test of Visual Motor Skills, Test of Visual Perceptual Skills and The Print Tool. Comparison of the group differences were carried out using a MANOVA analysis.

**Results:** All groups made changes in perceptual skills, however due to the variability in participant skill level no significant changes were noted. Handwriting changes included; improved letter recognition, letter production, improved prehension, sustained fine motor involvement and less frustration to use their hands for occupational performance.

**Conclusion:** All children benefitted from intense fine motor interventions and at the 11-week follow-up assessment improvements were sustained.

**Key Words:** *Writing, fine motor skills, visual perception, perceptual motor, occupational therapy*

## POSTER PRESENTATION - 9

### **Pronator Teres Syndrome (PTS): Contribution of Ultrasonographic Examination when Electrodiagnostic Studies are Inconclusive: A Case Report**

**Presenter:**

Wesley Troyer, DO<sup>1</sup>

**Collaborators:**

Oscar Ortiz-Vargas, MD<sup>2</sup>

**Departmental Affiliations:**

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<sup>2</sup>Physical Medicine and Rehabilitation, Lexington VA Healthcare System, Lexington, KY

**Abstract Text:**

**Case Description:** 68 year-old male with right arm weakness and pain presented to the clinic with history of several years of progressively worsening numbness and weakness in his right hand. He noted that a few weeks prior to evaluation he started dropping objects and had a loss of grip strength. He characterized his pain as a sharp pain in the proximal forearm and also described associated numbness of his thumb, index finger, and middle finger. His past medical history was significant for cervical spondylosis, osteoarthritis, and heavy tobacco use. Physical examination showed right hand with moderate thenar muscle atrophy, decrease key grip strength, weakness to FDS and FDP (4/5), and decreased sensation in the median nerve distribution with positive Tinel sign at both the pronator teres and carpal tunnel. Forearm pain increased with resisted pronation.

**Assessment/Results:** Nerve conduction and EMG studies revealed a median entrapment neuropathy best located at the wrist (carpal tunnel syndrome), with some findings suggesting entrapment at the forearm. Ultrasound evaluation showed flattening of the right median nerve by >50 percent when passing through the pronator teres muscle. Patient was then referred to plastic surgery for surgical release which confirmed pathology. Patient reported resolution of symptoms at six-month follow-up.

**Discussion:** Because of overlapping symptoms or the possibility of coexisting pathology, patients with findings of carpal tunnel syndrome have to be carefully evaluated for the presence of PTS.

**Conclusion:** Ultrasound is a readily available diagnostic tool that can be used by physiatrists to complement electrodiagnostic testing. Electrodiagnosis can have a limited value or fail to confirm the diagnosis due to the presence of additional neuropathy, as it happened in this case. In these circumstances, ultrasonography can satisfactorily confirm the diagnosis and assist in the treatment plan.

**Key Words:** *Electrodiagnostic study, pronator teres syndrome, median nerve compression*

## POSTER PRESENTATION - 10

### **Work-Related Changes in Trunk Stiffness of Nursing Personnel**

**Presenter:**

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**Collaborators:**

Maeve McDonald, BS<sup>1</sup>, Matt Ballard, BS<sup>1</sup>, Babak Bazrgari, PhD<sup>1</sup>, Lumy Sawaki Adams, MD, PhD<sup>2</sup>, F. Joseph Halcomb, III, MD<sup>1</sup>

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**Abstract Text:**

Nurses, nursing assistants, and others working in similar careers experience varying degrees of physical activity in their jobs – some sit more during their shifts, while others stand more and perform strenuous activities during their shifts. These varying activities may produce different effects on the biomechanics of the lower back (e.g., trunk stiffness) of these nurses and others in similar careers. Given the important role of the biomechanics of the lower back in the occurrence of occupational low back pain, it would be beneficial to quantify the changes that occur in the biomechanics of their lower backs throughout their work shift. This study seeks to quantify these effects on the biomechanics of the lower back (specifically trunk stiffness). In order to collect the necessary data, this study will recruit approximately 30 nurses, nursing assistants, and others working in this profession (some who have more sedentary jobs and others who have more physically demanding jobs) to form three equal groups. Each participant will come in pre- and post-shift and will perform certain activities which will provide data related to trunk stiffness. This will allow for quantifying how the biomechanics of the lower back change over the course of a work shift and how the biomechanics of the lower back vary between the different levels of physical demand of the participants. In order to understand how trunk stiffness is affected by a work shift, the ratio of changes in moment over changes in angle will be calculated and appropriate analyses will be conducted.

**Key Words:** *Trunk stiffness, nursing personnel, pre-shift, post-shift*

## **NOTES**

## **NOTES**