

PROGRAM AND ABSTRACTS

29th Annual

Physical Medicine and Rehabilitation Research Day

May 25, 2017

Cardinal Hill Rehabilitation Hospital

Lexington, KY



*Physical Medicine
and Rehabilitation*



29th Annual

**Physical Medicine and Rehabilitation
Research Day**

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Cardinal Hill Rehabilitation Hospital
Lexington, KY

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**UNIVERSITY OF KENTUCKY
DEPARTMENT OF PHYSICAL MEDICINE & REHABILITATION
29th ANNUAL RESEARCH DAY AGENDA**

7:00 a.m. – 8:30 a.m. Dr. Michael Boninger Roundtable with Residents
(Cardinal Hill Boardroom)

8:40 a.m. – 8:50 a.m. Opening Remarks/Announcements (CL3):
Susan McDowell, MD, Chairperson
Lumy Sawaki, MD, PhD, Vice Chair of Research
Physical Medicine & Rehabilitation

PM&R RESIDENT RESEARCH PRESENTATIONS – CL3

8:50 a.m. – 9:05 a.m. Brian Barnett, DO, Physical Medicine & Rehabilitation
Supporting Safe Participation in Outdoor Activities for People
with Physical Impairment: Developing Consensus

9:05 a.m. – 9:20 a.m. Pooja Chopra, MD, Physical Medicine & Rehabilitation
Ultrasound-Guided Dextrose Prolotherapy for Treatment of
Chronic Hamstring Tendinopathy: A Case Report

9:20 a.m. – 9:35 a.m. Justin Huber, MD, Physical Medicine & Rehabilitation
Three-Dimensional Printing of a Spring to Complement
Fabrication of an Upper Extremity Orthotic

9:35 a.m. – 9:50 a.m. Mike McGuirk, DO, Physical Medicine & Rehabilitation
Injectable Chorioamnionic Membrane Allograft: An Effective
Treatment Option for Chronic Rotator Cuff Tendinopathy?

9:50 a.m. – 10:05 a.m. Wesley Troyer, DO, Physical Medicine & Rehabilitation
Management of Spasticity in Stiff Person Syndrome
Undergoing General Anesthesia: A Case Study

10:05 a.m. – 10:10 a.m. *BREAK*

10:15 a.m. – 10:30 a.m. Clay Guynn, DO, Physical Medicine & Rehabilitation
Patient-Assisted Myofascial Release of Adhesions in Lateral
Epicondylitis: A Potential Treatment Adjunct

10:30 a.m. – 10:45 a.m. Amy Hiller, DO, Physical Medicine & Rehabilitation
Pediatric Care Across Transitions of Service (PCATS): A
Retrospective Study of Interprofessional Collaboration in Caring
for Pediatric Patients with Complex Chronic Conditions

10:45 a.m. – 11:00 a.m. Prasanth Bobby Katta, JD, DO, Physical Medicine & Rehab
Influence of Motor FIM Score and Feeding Status on Emergent
Transfers from an Inpatient Rehabilitation Facility to a Level I
Trauma Center: Preliminary Findings of an Ongoing Study

11:00 a.m. – 11:15 a.m. Andrew Savoie, DO, Physical Medicine & Rehabilitation
Can Effective Opioid Weaning Be Achieved with an Algorithmic
Protocol?: A Multicenter, Prospective, Observational Cohort
Study

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DEPARTMENT OF PHYSICAL MEDICINE & REHABILITATION
29th ANNUAL RESEARCH DAY AGENDA
(Continued)

11:15 a.m. – 11:30 a.m. Walter Wofford, MD, Physical Medicine & Rehabilitation
Hallucinations Induced by Oral Baclofen Taper Following
Intrathecal Pump Placement: A Case Report

11:30 a.m. – 11:45 a.m. Raechel Percy, DO, Physical Medicine & Rehabilitation
Prevention of Friction Blisters in Outdoor Pursuits: A Systematic
Review

BUFFET LUNCH – CL2

11:45 a.m. – 12:15 p.m. **Buffet Lunch (CL2)**

KEYNOTE SPEAKER – CL3 & CL4

12:15 p.m. – 1:15 p.m. Michael Boninger, MD
Professor, UPMC Endowed Vice Chair for Research
Department of Physical Medicine and Rehabilitation
University of Pittsburgh, School of Medicine

The Hype and Hope of Assistive and Regenerative Technology

CLOSING REMARKS – CL3

1:15 p.m. – 1:20 p.m. Jessica Colyer, MD, Residency Program Director

POSTER PRESENTATIONS – CL1

1:30 p.m. – 2:30 p.m.

- 1 Cecil T. Hollen, DO, Physical Medicine & Rehabilitation
Evaluation and Management of Residual Limb Pain and Prosthetic
Restoration in a Transtibial Amputee Using an Interdisciplinary
Ultrasound Guided Approach

- 2 Cheryl Carrico, MS, OT/L, Physical Medicine & Rehabilitation
Sensory-driven Motor Recovery in Poorly Recovered Subacute
Stroke Patients

UNIVERSITY OF KENTUCKY
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29th ANNUAL RESEARCH DAY AGENDA
(Continued)

POSTER PRESENTATIONS – CL1 (Continued)

- 3 Cheryl Carrico, MS, OT/L, Physical Medicine & Rehabilitation
Mantra Meditation to Improve Chronically Impaired Attention after Stroke: A Planned Non-Concurrent Multiple-Baseline Across-Subjects Trial
- 4 Clay C. Guynn, DO, Physical Medicine & Rehabilitation
Not Your Average Concussion
- 5 Justin Huber, MD, MS, Physical Medicine & Rehabilitation
Detecting PFO by Doppler Insonation of a Radial Artery
- 6 Prasanth B Katta, DO, Physical Medicine & Rehabilitation
Combination Strategies for Chronic Pain Management and Central Nervous System Side Effects: Literature Review
- 7 Prasanth B Katta, DO, Physical Medicine & Rehabilitation
Neuropathic Pain in High Level Spinal Cord Injury Effectively Controlled by Spinal Cord Stimulator: A Case Study
- 8 Elizabeth Powell, MS, Physical Medicine & Rehabilitation
Optimal Transcranial Direct Current Stimulation Polarity for Enhancing Motor Recovery from Severe Post-Stroke Hemiparesis
- 9 Andrew Savoie, DO, Physical Medicine & Rehabilitation
Chemotherapy-induced Peripheral Polyneuropathy: Monochromatic Infrared Light Energy Therapy Improves Symptoms and Mobility-related Function
- 10 Emily Eicher, OTS, Eastern Kentucky University,
Department of Occupational Science and Occupational Therapy
Using a Movement Program: Benefits for Children with Sensorimotor Deficits
- 11 Camille Skubik-Peplaski, PhD, OTR/L BCP FAOTA
Eastern Kentucky University, Department of Occupational Science and Occupational Therapy
What Makes a Master Clinician: Shifting from Novice to Expert
- 12 Namrata Raut, MD, Physical Medicine & Rehabilitation
Functional Improvement in Spinal Abscess Patients with Substance Abuse History
- 13 Sarah Thomas, MS, Biomedical Engineering
Brain-Machine Interface Controlled Peripheral Nerve Stimulation for Motor Rehabilitation after Spinal Cord Injury

UNIVERSITY OF KENTUCKY
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29th ANNUAL RESEARCH DAY AGENDA
(Continued)

POSTER PRESENTATIONS – CL1 (Continued)

- 14 Rajamanickam Yuvaraj, PhD, Biomedical Engineering
Towards Characterization of Movement Intention from Motor
Related Cortical Potentials in Individuals with Motor Incomplete
Spinal Cord Injury

- 15 Cazmon Suri, BS, Biomedical Engineering
Effects of Backpack Type on Lumbar Kinematics During Daily
Activities

- 16 Lumy Sawaki, MD, PhD, Physical Medicine and Rehabilitation
Robot-assisted Locomotor Training after Severe Stroke:
Discrete Versus Rhythmic Movement – a Randomized
Controlled Trial

PM&R Resident Presentations

ORAL PRESENTATIONS

Presenter:

Abstract Presentation:

Brian Barnett, DO

Supporting Safe Participation in Outdoor Activities for People with Physical Impairment: Developing Consensus

Pooja Chopra, MD

Ultrasound-Guided Dextrose Prolotherapy for Treatment of Chronic Hamstring Tendinopathy: A Case Report

Justin Huber, MD

Three-Dimensional Printing of a Spring to Complement Fabrication of an Upper Extremity Orthotic

Mike McGuirk, DO

Injectable Chorioamnionic Membrane Allograft: An Effective Treatment Option for Chronic Rotator Cuff Tendinopathy

Wesley Troyer, DO

Management of Spasticity in Stiff Person Syndrome Undergoing General Anesthesia: A Case Study

Clay Guynn, DO

Patient-Assisted Myofascial Release of Adhesions in Lateral Epicondylitis: A Potential Treatment Adjunct

Amy Hiller, DO

Pediatric Care Across Transitions of Service (PCATS): A Retrospective Study of Interprofessional Collaboration in Caring for Pediatric Patients with Complex Chronic Conditions

Prasanth Bobby Katta, JD, DO

Influence of Motor FIM Score and Feeding Status on Emergent Transfers from an Inpatient Rehabilitation Facility to a Level Trauma Center: Preliminary Findings of an Ongoing Study

Andrew Savoie, DO

Can Effective Opioid Weaning Be Achieved with an Algorithmic Protocol?: A Multicenter, Prospective, Observational Cohort Study

Walter Wofford, MD

Hallucinations Induced by Oral Baclofen Taper Following Intrathecal Pump Placement: A Case Report

Raechel Percy, DO

Prevention of Friction Blisters in Outdoor Pursuits: A Systematic Review

NOTES

PM&R RESIDENT PRESENTATION



Brian Barnett, DO

Supporting Safe Participation in Outdoor Activities for People with Physical Impairment: Developing Consensus

Presenter:

Brian Barnett, DO¹

Collaborators:

Robert M. Worthing, MD²

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

²Department of Physical Medicine and Rehabilitation, VAMC, Lexington, KY

Abstract Text:

Background: Individuals with impairment resulting from traumatic brain injury (TBI), spinal cord injury (SCI), amputation, or multiple sclerosis (MS) represent a large and increasing proportion of outdoor activity participants. Current literature addresses organized sports, such as the Wheelchair Games and Paralympics. Few articles discuss specific medical issues for impaired individuals in outdoor pursuits. No protocols or general guidelines connect unique medical risks with activity-specific considerations to ensure safe outdoor participation for these populations.

Objectives: 1) Promote safe participation of impaired individuals in wilderness and outdoor activities; 2) Increase awareness among medical personnel and outdoor guides of activity-specific medical considerations for 4 specific populations: TBI, SCI, amputees, and MS.

Methods: 1) Keyword search and literature review of medical considerations for each population; 2) Assess anecdotal evidence from field experts who guide impaired groups in outdoor activities; 3) Assemble a group of medical experts to assess the data and make consensus recommendations; 4) Present findings in an easy-to-use format for medical staff and guides with varying degrees of medical knowledge.

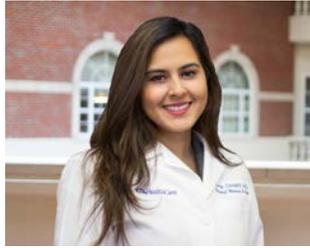
Clinical Implication: Findings should increase awareness about the activity-specific medical considerations of the 4 populations. Accordingly, medical/guide personnel will be better prepared to anticipate, assess, and respond to medical concerns that arise in the field before they become serious or life-threatening.

Conclusion: Consensus recommendations will increase awareness of the unique medical considerations of impaired individuals and serve to further promote their safe participation in wilderness and outdoor activities.

Key Words: *sports, wilderness medicine, outdoor sports, protocols, disability, physical impairments, safety*

NOTES

PM&R RESIDENT PRESENTATION



Pooja Chopra, MD

Ultrasound-Guided Dextrose Prolotherapy for Treatment of Chronic Hamstring Tendinopathy: A Case Report

Presenter:

Pooja Chopra, MD¹

Collaborators:

Namrata Raut, MD¹, Robert Worthing, MD²

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

²Department of Physical Medicine and Rehabilitation, VAMC, Lexington, KY

Abstract Text:

Proximal hamstring tendinopathy is a common cause of buttock/low back pain that limits participation in functional activities. It is often difficult to treat. The present report describes a case where several non-surgical conservative treatments failed, and only prolotherapy led to substantial improvement. Prolotherapy is a nonsurgical injection technique that applies small amounts of irritants such as dextrose and as a consequence leads to regenerative tissue response. In this case, a male patient 35 years of age presented to a musculoskeletal outpatient clinic with a 5-year history of pain with insidious onset in the left buttock area. He had no acute injury but did report active, regular participation in athletic running. Previous interventions including physical therapy and activity modifications had failed to provide pain relief. Likewise, platelet-rich plasma therapy (PRP), percutaneous needle fenestration (PNF), and steroids injection had not relieved the pain. However, he did obtain substantial relief with ultrasound-guided dextrose prolotherapy to the proximal hamstrings tendon. While prolotherapy is not a new intervention, this case highlights that dextrose prolotherapy can be singularly effective for refractory pain associated with deep tendinopathies.

Key Words: *musculoskeletal, tendon, regenerative medicine, glucose, pain, rehabilitation*

NOTES

PM&R RESIDENT PRESENTATION



Justin Huber, MD, MS

Three-Dimensional Printing of a Spring to Complement Fabrication of an Upper Extremity Orthotic

Presenter:

Justin Huber, MD, MS¹

Collaborators:

Lumy Sawaki, MD, PhD¹, L. Scott Stephens, PhD², Kevin Richardson, MS Candidate²

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

²College of Mechanical Engineering, University of Kentucky, Lexington, KY

Abstract Text:

For patients with upper extremity (UE) functional deficits after stroke or other neurological conditions, orthotic designs can employ complex assemblies to augment or facilitate functional participation. Three-dimensional (3D) printing technology can significantly enhance orthotic design, fabrication, and availability. Using advanced printers and an ever-diversifying selection of printable materials, 3D printing has potential to accommodate the design specifications (e.g., static support, dynamic assistance) of a multi-component assembly. Thus, 3D printing technology has promise to reduce fabrication overhead, improve access, minimize repair/replacement concerns, and facilitate rapid design modifications/turnaround. This latter benefit is a crucial aspect for rehabilitation patients who require serial adjustments to orthotic fit/function. To support technology development, the present research project compares the conventional fabrication of a UE orthotic (i.e., Saebo Glove) with a modified fabrication process. 3D printing will be used to fabricate elastic components comparable to original equipment manufacturer (OEM) parts (e.g., springs). Testing will comprise standard engineering measures and a clinical study. Engineering measures will include spring coefficient, tensile strength, and fatigue limit. The clinical study will involve a repeated measures experimental design with 3 patients who have UE deficits secondary to stroke. Each patient will perform a standardized UE functional assessment (Box and Block Test) using the OEM orthotic or the modified orthotic. Each patient will then crossover to the other orthotic and repeat the assessment. Data will be analyzed with intent to prove concept, demonstrate potential, and identify areas of improvement for 3D printing technology.

Key Words: *orthosis, 3D printing, hand, upper limb, elastomer, rehabilitation*

NOTES

PM&R RESIDENT PRESENTATION



Mike McGuirk, DO

Injectable Chorioamnionic Membrane Allograft: An Effective Treatment Option for Chronic Rotator Cuff Tendinopathy?

Presenter:

Mike McGuirk, DO¹

Collaborators:

Robert M. Worthing, MD²

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

²Department of Physical Medicine and Rehabilitation, VAMC, Lexington, KY

Abstract Text:

Amniotic/chorionic membrane-derived products have a well-established history of use for complex tissue regeneration in the fields of wound care, plastic surgery, ophthalmology and podiatry. In recent years, there has been growing interest in the utility of such products for nonoperative interventions within the field of musculoskeletal medicine. There are no published cases detailing the treatment of chronic rotator cuff tendinopathy with an amniotic-derived product. The present case study describes a male veteran aged 64 with chronic right shoulder pain referred to outpatient musculoskeletal clinic for a repeat glenohumeral corticosteroid injection. Initial evaluation was consistent with acromioclavicular arthropathy, rotator cuff tendinopathy, and scapular dyskinesis. After a failed trial of conservative treatment, diagnostic magnetic resonance imaging (MRI) of the right shoulder confirmed tears of the supraspinatus, infraspinatus, and subscapularis tendons. He subsequently elected ultrasound-guided injection with micronized amniotic/chorionic membrane (AmnioFix®) to the affected regions. During routine follow-up, he reported significant pain reduction and functional gains facilitating his job as a manual laborer. The intervention may represent a novel treatment option in the field of musculoskeletal medicine.

Key Words: *prolotherapy, amniotic membrane, stem cell, musculoskeletal disorder, shoulder pain, tendinopathy*

NOTES

PM&R RESIDENT PRESENTATION



Wesley Troyer, DO

Management of Spasticity in Stiff Person Syndrome Undergoing General Anesthesia: A Case Study

Presenter:

Wesley Troyer, DO¹

Collaborators:

Sara Salles, DO¹

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

Abstract Text:

This case report describes a 53 year old male with Stiff Person Syndrome (SPS) who underwent a septoplasty for a deviated nasal septum and subsequently developed refractory generalized spasticity in the postoperative setting. Prior to septoplasty, his spasticity associated with SPS had been effectively managed with an intrathecal baclofen (ITB) pump and oral diazepam as needed. In the operative setting, general anesthesia was performed with propofol, fentanyl, midazolam, and rocuronium. Upon post-operative development of flexor and extensor tone, the attending physiatrist was contacted by the anesthesiologist as the patient was not tolerating extubation. Recommendations were provided for the administration of large doses of intravenous (IV) diazepam. Due to concern for respiratory depression, the patient was transferred while intubated and sedated to a neurological intensive care unit where he was successfully extubated. His physiatrist was then consulted again regarding further management of spasticity and ITB pump. Additional dose of oral diazepam was temporarily given while dose of ITB pump was readjusted. The patient's spasticity improved, and he was discharged to home after several days. Thereafter, the patient returned to his pre-operative dose of his medications. This case highlights how general anesthesia can impact spasticity and presents options for pre-operative and post-operative management of spasticity in individuals with SPS.

Key Words: *stiff man syndrome, Moersch-Woltman syndrome, anesthesia, hypertonicity, intrathecal baclofen*

NOTES

PM&R RESIDENT PRESENTATION



Clay Guynn, DO

**Patient-Assisted Myofascial Release of Adhesions in Lateral Epicondylitis:
A Potential Treatment Adjunct**

Presenter:

Clay Guynn, DO¹

Collaborators:

Theresa Wolfe, MD^{1,2}

Departmental Affiliations:

¹Department of Physical Medicine & Rehabilitation, University of Kentucky, Lexington, KY

²Veterans Administration, Department of Physical Medicine & Rehabilitation, Lexington, KY

Abstract Text:

Lateral epicondylitis, or tennis elbow, is a very common musculoskeletal diagnosis. It is an overuse disorder that can cause significant pain and functional impact on the daily lives of patients. Potential treatments include physical therapy exercises, Graston Technique, osteopathic manipulative technique, active release therapy, shock wave therapy, corticosteroid injections, prolotherapy, percutaneous needle tenotomy, massage techniques, extensor band, tenex, and surgical procedures. However, the literature does not delineate one treatment as superior to any other. This presentation will describe a project to assess outcomes of patient-assisted myofascial release as an adjuvant technique to an existing treatment protocol for tennis elbow. The project is currently being assessed for IRB approval through a local Veterans Administration Medical Center (VAMC). The Lexington VAMC commonly encounters patients with tennis elbow. The project will assess how adding the proposed manipulative technique to this institution's current protocol for tennis elbow management will improve both functional and pain outcomes for patients.

Key Words: *musculoskeletal pain, tennis elbow, myofascial pain, soft tissue, manipulation techniques*

NOTES

PM&R RESIDENT PRESENTATION



Amy Hiller, DO

Pediatric Care Across Transitions of Service (PCATS): A Retrospective Study of Interprofessional Collaboration in Caring for Pediatric Patients with Complex Chronic Conditions

Presenter:

Amy Hiller, DO¹

Collaborators:

Erika Erlandson, MD¹

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

Abstract Text:

Introduction: Children with chronic illnesses can require complex, painstaking, time-consuming services, especially when transitioning from acute care. The care team often comprises multiple clinicians, including the hospitalist/intensivist, medical subspecialists, rehabilitation therapists, nursing, respiratory, and case managers. Discharge may necessitate additional members, including nursing agencies, family support entities, and outpatient or home therapies. Their healthcare is costly due to high resource utilization including hospitalizations, long lengths of stay, and need for multiple diagnostics and interventions. Communication is crucial to the successful management of these complex patients and their transitions to post-acute settings. Improved communication may reduce hospital readmissions and complications, improve health outcomes, and ultimately improve the patient and family experience. The goal of this research is to examine the effectiveness and completeness of existing communication tools and their success and limitations in transitioning complex pediatric patients from acute care to acute rehabilitation.

Methods: Retrospective chart review of up to 50 patients between the ages of 6 months and 17 years who are admitted to the Children's Hospital at the University of Kentucky Hospital and then transferred to Cardinal Hill Rehabilitation Hospital between 1/1/16 to 3/31/17. The information that contributes to avoiding common complications in children with chronic complex medical conditions will be assessed across the transition of care.

Key Words: *pediatric rehabilitation, hospital, discharge planning, chronic disease, readmission, patient-centered*

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PM&R RESIDENT PRESENTATION



Prasanth Bobby Katta, JD, DO

Influence of Motor FIM Score and Feeding Status on Emergent Transfers from an Inpatient Rehabilitation Facility to a Level 1 Trauma Center: Preliminary Findings of an Ongoing Study

Presenter:

Prasanth Bobby Katta, JD, DO¹

Collaborators:

Susan McDowell, MD¹

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

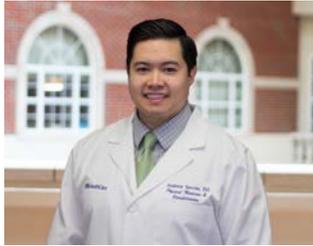
Abstract Text:

Current published evidence indicates that Motor FIM and feeding status may increase the likelihood of a patient transfer back to acute care from an Inpatient Rehabilitation Facility. The present retrospective study, which is part of a quality improvement project initiated within the University of Kentucky Department of Physical Medicine and Rehabilitation, examines reasons for patient transfer from a freestanding rehabilitation hospital (Cardinal Hill) to a Level I trauma center (University of Kentucky Chandler Hospital). Thus far, the records of 21 Cardinal Hill patients transferred to acute care were analyzed for dietary regimens and Functional Independence Measure (FIM) admission scores. While this is a very limited dataset, initial indications are that patients on soft diet or nasogastric tube may have a higher rate of acute transfer. There was no apparent correlation with FIM admission score. Increasing the sample size and applying other systematic parameters of control (e.g., age; cognitive status; documented reason for transfer; comorbidities; medications) are needed to substantiate that these preliminary findings are a valid indicator of a relationship between dietary status and need for transfer.

Key Words: *cerebrovascular accident; diet; rehabilitation*

NOTES

PM&R RESIDENT PRESENTATION



Andrew Savoie, DO

Can Effective Opioid Weaning Be Achieved With an Algorithmic Protocol?: A Multicenter, Prospective, Observational Cohort Study

Presenter:

Andrew Savoie, DO¹

Collaborators:

Ugo Bitussi, DO², David Schwanebeck, DO³, Susan McDowell, MD¹

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

²University of Texas Southwestern PM&R

³University of Wisconsin PM&R

Abstract Text:

This study is designed to determine the effectiveness of algorithm-driven opioid weaning while maintaining adequate patient pain control in the acute inpatient rehabilitation setting. It is a multicenter, prospective, observational cohort study with a historical comparative control group. The primary outcome measure is the mean rate of opioid tapering compared between groups. Change in Functional Independence Measure (FIM) score will also be compared between the control group and patients who have not undergone a formal opioid taper. The FIM score will help determine if tapering opioid medications affects functional improvement and will also be used as a proxy to assure the tapering algorithm allows for adequate rehabilitation participation. The algorithm uses the previous 4 days of opioid taken to determine the current day's recommended opioid allowance. By taking or deferring their as-needed opioids, patients actively guide the tapering process—quickly for those who require less medication, slowly for those who require more. Enrolled patients will be 18 years or older and admitted from an acute care hospital with any diagnosis that fits within the Centers for Medicare & Medicaid Services (CMS) impairment group codes. Patients will be excluded if they have a substance abuse history or opioid quantities exceeding 300mg morphine equivalents; are managed by an acute pain service; or have an opioid history that cannot be ascertained.

Study results may help lay groundwork for decreasing opiate prescriptions, lessening the potential for opiate abuse, and decreasing the risk for societal burden associated with opiate abuse after discharge from acute rehabilitation.

Key Words: *pain, opioids, taper, protocol, acute rehabilitation*

NOTES

PM&R RESIDENT PRESENTATION



Walter Wofford, MD

Hallucinations Induced by Oral Baclofen Taper Following Intrathecal Pump Placement: A Case Report

Presenter:

Walter Wofford, MD¹

Collaborators:

Clay Guynn, DO¹, Sara Salles, DO¹, Joe Springer, PhD¹

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

Abstract Text:

The present case report describes spasticity management in a 51 year old male patient with a history of severe polytrauma with C6 ASIA D spinal cord injury. Associated spasticity was controlled with oral baclofen and dantrolene for 6 years post-injury, although the patient experienced unwanted side effects and other sub-optimal results. Subsequently, after a successful intrathecal baclofen trial, a baclofen pump was implanted at an acute care hospital neurosurgery department. He was then transferred to an acute rehabilitation hospital, where pump titration and weaning of oral medications were initiated. The patient then developed auditory and visual hallucinations. The physiatrist determined that the hallucinations were associated with withdrawal from oral baclofen despite titration of intrathecal baclofen, thus necessitating adjustment of the weaning protocol. This adjustment led to resolution of hallucinations and patient's discharge to home. Withdrawal syndromes from oral and intrathecal baclofen have been described in the literature, but the present case report is the first to describe withdrawal from oral baclofen in the context of new pump implantation.

Key words: *spasticity, baclofen withdrawal, hallucinations, rehabilitation*

NOTES

PM&R RESIDENT PRESENTATION



Raechel Percy, DO

Prevention of Friction Blisters in Outdoor Pursuits: A Systematic Review

Presenter:

Raechel Percy, DO¹

Collaborators:

Robert M. Worthing, MD², Jeremy D. Joslin, MD³

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

²Department of Physical Medicine and Rehabilitation, VAMC, Lexington, KY

³Department of Emergency Medicine, SUNY Upstate Medical University, Syracuse, NY

Abstract Text:

The purpose of this systematic review was to determine if sock, antiperspirant, or barrier strategies were effective in prevention of friction blisters in wilderness and outdoor pursuits. A search of PubMed and EMBASE was conducted. Title, abstract, and full text articles were screened by two authors using predetermined inclusion and exclusion criteria to identify prospective controlled trials investigating prevention methods for friction blisters involving the foot. Only blisters associated with wilderness and outdoor pursuits (running, hiking, marching, etc.) were considered. Extraction of a predetermined data set was accomplished using a piloted form. Confidence in effect estimates were determined utilizing the SIGN (Scottish Intercollegiate Guidelines Network) methodology checklist. Literature search resulted in 806 discrete articles. After screening, eleven studies were identified for inclusion in systematic review. Included studies investigated five sock, three antiperspirant, and three barrier strategies. Only two articles were determined to have moderate confidence in effect estimate. Clinical and methodologic diversity precluded meta-analysis. Despite the high frequency, discomfort, and associated cost there is a paucity of high quality evidence in support of socks, antiperspirants, or barriers for the prevention of friction blisters. Moderate confidence in effect estimate suggests that paper tape may be an effective form of barrier prevention.

Key Words: *blister, friction, foot, running, military personnel*

NOTES

KEYNOTE SPEAKER PRESENTATION

The Hype and Hope of Assistive and Regenerative Technology



Michael Boninger, MD

Dr. Michael Boninger is a Professor and UPMC Endowed Vice Chair for Research in the Department of Physical Medicine & Rehabilitation at the University of Pittsburgh, School of Medicine. He has joint appointments in the Departments of Bioengineering, Rehabilitation Science and Technology and the McGowan Institute of Regenerative Medicine. He is Senior Medical Director for Post-Acute Care for the Health Services Division of UPMC. He is also a physician researcher for the United States Department of Veterans Affairs. Dr. Boninger has an extensive publication record of over 220 papers. His central research focus is on enabling increased function and participation for individuals with disabilities through development and application of assistive, rehabilitative and regenerative technologies. Dr. Boninger also has extensive experience and publications related to training researchers. His students have won over 50 national awards. Dr. Boninger holds 4 United States patents and has received numerous honors, including being inducted into the National Academy of Medicine (formerly the Institute of Medicine) of the National Academy of Science.

NOTES

POSTER PRESENTATIONS

<u>Presenter</u>	<u>Poster #</u>	<u>Poster Presentation Title</u>
Cecil T. Hollen, DO	1	Evaluation and Management of Residual Limb Pain and Prosthetic Restoration in a Transtibial Amputee Using an Interdisciplinary Ultrasound Guided Approach
Cheryl Carrico, MS, OT/L	2	Sensory-driven Motor Recovery in Poorly Recovered Subacute Stroke Patients
Cheryl Carrico, MS, OT/L	3	Mantra Meditation to Improve Chronically Impaired Attention after Stroke: A Planned Non-Concurrent Multiple-Baseline Across-Subjects Trial
Clay C. Guynn, DO	4	Not Your Average Concussion
Justin Huber, MD, MS	5	Detecting PFO by Doppler Insonation of a Radial Artery
Prasanth B Katta, DO	6	Combination Strategies for Chronic Pain Management and Central Nervous System Side Effects: Literature Review
Prasanth B Katta, DO	7	Neuropathic Pain in High Level Spinal Cord Injury Effectively Controlled by Spinal Cord Stimulator: A Case Study
Elizabeth Powell, MS	8	Optimal Transcranial Direct Current Stimulation Polarity for Enhancing Motor Recovery from Severe Post-Stroke Hemiparesis
Andrew Savoie, DO	9	Chemotherapy-induced Peripheral Polyneuropathy: Monochromatic Infrared Light Energy Therapy Improves Symptoms and Mobility-related Function
Emily Eicher, OCS	10	Using a Movement Program: Benefits for Children with Sensorimotor Deficits
Camille Skubik-Peplaski, PhD	11	What Makes a Master Clinician: Shifting from Novice to Expert
Namrata Raut, MD	12	Functional Improvement in Spinal Abscess Patients with Substance Abuse History
Sarah Thomas, MS	13	Brain-Machine Interface Controlled Peripheral Nerve Stimulation for Motor Rehabilitation after Spinal Cord Injury

POSTER PRESENTATIONS

<u>Presenter</u>	<u>Poster #</u>	<u>Poster Presentation Title</u>
Rajamanickam Yuvaraj, PhD	14	Towards Characterization of Movement Intention from Motor Related Cortical Potentials in Individuals with Motor Incomplete Spinal Cord Injury
Cazmon Suri, BS	15	Effects of Backpack Type on Lumbar Kinematics During Daily Activities
Lumy Sawaki, MD, PhD	16	Robot-assisted Locomotor Training after Severe Stroke: Discrete Versus Rhythmic Movement – A Randomized Controlled Trial

POSTER PRESENTATION - 1

Evaluation and Management of Residual Limb Pain and Prosthetic Restoration in a Transtibial Amputee Using an Interdisciplinary Ultrasound Guided Approach

Presenter:

Cecil T Hollen, DO¹

Collaborators:

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Abstract Text:

A middle-aged male presented for prosthetic restoration following elective transtibial amputation secondary to intractable limb pain status post crush injury in a motor vehicle accident. Residual limb pain prevented functional prosthesis use despite multiple socket constructs by three separate certified prosthetists. Comprehensive evaluation including diagnostic ultrasound identified four etiologies for functionally limiting pain: suboptimal tibial and fibular bony contour, adventitious tibial bursa formation, symptomatic fibular neuroma, and a retained staple with dynamic neuroma impingement. Following ultrasound guided fibular neuroma chemodenervation, the patient achieved a K2 functional level with maximum prosthesis wear time of 4 hours. Musculoskeletal ultrasound was subsequently utilized to address identified pathology during socket design in an interdisciplinary setting, impacting materials chosen, selection of prominent weight bearing surfaces, and suspension system. In the resulting prosthesis, the patient achieved a K3 functional level with maximum wear time of 10 hours. Residual limb pain is common and can limit prosthetic restoration. Ultrasound is an established imaging modality for the evaluation and treatment of musculoskeletal and peripheral nerve pathology. Use of indirect ultrasound for residuum measurement in computer assisted socket fabrication has been described, however its use remains limited, and resulting image quality is insufficient for the evaluation and management of musculoskeletal and peripheral nerve pathology that may contribute to residual limb pain. This case is the first to describe the use of direct musculoskeletal ultrasound to evaluate and address such pathology in prosthetic socket design.

Key Words: *chronic pain, residual limb pain, rehabilitation*

POSTER PRESENTATION - 2

Sensory-driven Motor Recovery in Poorly Recovered Subacute Stroke Patients

Presenter:

Cheryl Carrico, MS, OT/L¹

Collaborators:

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Abstract Text:

Neuroplasticity is a basis for functional recovery after stroke. A therapeutic intervention based on this mechanism is called peripheral nerve stimulation (PNS). PNS applies transcutaneous, repetitive, non-invasive, low-level electrical currents to activate cortical areas via afferent nerve pathways. PNS has been shown to upmodulate neuroplasticity and enhance movement function for people with mild-to-moderate hemiparesis after stroke. Intensive task-oriented motor training is another therapeutic intervention that can drive neuroplastic change and motor recovery in cases of mild-to-moderate hemiparesis after stroke. PNS is especially beneficial when delivered in concert with motor training, but there is an evidence gap on PNS paired with intensive task-oriented motor training in cases of severe hemiparesis after stroke (almost no active movement). Thus, the purpose of the present, randomized, sham-controlled study was to investigate whether PNS would enhance outcomes of intensive task-oriented motor training for subjects with severe hemiparesis in the subacute phase of recovery (3-12 months from stroke onset). Subjects (n=71) received 2 hours of PNS immediately prior to 3 hours of intensive, task-oriented training in 18 daily sessions (3x/week for 6 weeks). PNS condition (active versus sham) was the only independent variable. Motor performance was measured with the Fugl Meyer Assessment at baseline; after completion of the intervention period; and at 1- and 4-month follow-up evaluations. Improvement resulted for both groups. However, only the active PNS group had continued improvement evident at all longitudinal follow-ups. Furthermore, significant difference between groups favoring active PNS was evident at all longitudinal follow-up evaluations.

Key Words: *neuromodulation; occupational therapy; peripheral nerve stimulation*

POSTER PRESENTATION - 3

Mantra Meditation to Improve Chronically Impaired Attention after Stroke: A Planned Non-Concurrent Multiple-Baseline Across-Subjects Trial

Presenter:

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Collaborators:

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Abstract Text:

Impaired attention is a common problem after stroke. Only modest improvement may characterize the natural course of attentional recovery after stroke. Moreover, there is insufficient evidence that cognitive rehabilitation effectively addresses this problem. Interventions to improve impaired attention after stroke would have potentially wide-ranging benefit because attention not only affects engagement in rehabilitation but also correlates with motor recovery. Meditation could potentially serve as a therapeutic intervention after stroke because systematic self-regulation of attention—a defining characteristic of meditation—may conduce adaptive neuroplastic change in attentional substrates. In healthy volunteers, mantra meditation has been shown to modulate attentional substrates and improve performance on neuropsychological tests of attention. The planned trial will be the first to investigate the central hypothesis that mantra meditation after stroke will lead to improved performance on standardized neuropsychological tests of attention (primary outcome: Sustained Attention to Response Task; secondary outcome: Trail-Making Test). Each subject will participate in 9 sessions of intervention. The intervention is mantra meditation (chanting the syllable “um” for 30 minutes per session). Each intervention session will occur 3 times per week for 3 weeks in an outpatient neurorehabilitation research lab. In keeping with single-case research design standards, the effects of the independent variable (meditation) on the dependent variable (attention) will be replicated across at least 3 subjects (maximum n=4) in a series of AB designs to establish evidence of a functional relationship between variables. Results will lay groundwork for future studies of the mechanisms and potential benefits of meditation in clinical stroke rehabilitation.

Key Words: *cognitive rehabilitation; cognition; focused; occupational therapy; self-care occupation*

POSTER PRESENTATION - 4

Not Your Average Concussion

Presenter:

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Abstract Text:

Concussion is a common occurrence in sports. Pediatric populations face high risk for concussion due to their participation in organized sports. It is critical for physicians to recognize signs of concussion and to know when to allow patients to return to sport. Of the many signs and symptoms of concussion, diplopia is not often described in the sports medicine literature. The present case report describes the course of treatment for a male patient 13 years of age who was evaluated at a sports medicine outpatient clinic 3 days after sustaining a concussion during a basketball game. He had nausea, vomiting, and headache immediately after injury as well as diplopia the day after injury. Management included referral to ophthalmology, ocular muscle exercise prescription, eye patching, and discontinuation of all physical and school activities followed by gradual re-integration. All concussion symptoms except diplopia resolved within 2 weeks of injury. Diplopia fully resolved by 2 months post-injury, at which time he was cleared to return to full contact in basketball. This case illustrates the importance for physicians to monitor for diplopia in pediatric patients with history of concussion in order to provide appropriate treatment.

Key Words: *brain injury, diplopia, pediatric*

POSTER PRESENTATION - 5

Detecting PFO by Doppler Insonation of a Radial Artery

Presenter:

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Collaborators:

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Abstract Text:

Patent foramen ovale (PFO) is a small hole in the muscular wall that separates the upper chambers of the heart. During fetal development, oxygenated blood from the mother bypasses the undeveloped fetal pulmonary system via a passage between right and left heart atria. Typically, this passageway closes when functioning fetal lungs drive a pressure change within the heart. However, in some instances, this shunt remains partially open resulting in a PFO. The persistence of this PFO increases the risk for serious medical complications including migraine, vision loss, and stroke. Current detection methods rely on a contrast agent coupled with echocardiography or transcranial Doppler ultrasonography. Such techniques employ relatively high-value equipment and trained specialists. This project focuses on development of an affordable and accessible tool for the outpatient clinician to identify PFO using ultrasonography of a peripheral artery, e.g. radial artery. An in vitro experiment is constructed to mimic blood circulation in a peripheral vessel. This benchtop test accommodates contrast injections, Doppler insonation, and simultaneous video capture. By simulating physiological conditions, this platform provides an artificial signal that can be conditioned and analyzed by computerized routines. Data from this benchtop setup will support software development and a potential prototype for future clinical trials.

Key Words: *peripheral artery, signal processing, ultrasonography*

POSTER PRESENTATION - 6

Combination Strategies for Chronic Pain Management and Central Nervous System Side Effects: Literature Review

Presenter:

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Collaborators:

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Abstract Text:

Literature suggests combination strategies for chronic pain management is commonly used in clinical practice. The clinicians treating chronic pain patient population with combination strategy should have constant vigilance, should perform re-evaluation, and a high level of suspicion to avoid the adverse effect. The combination analgesia for chronic pain management could be associated with central nervous system (CNS) side-effects. There are only few reviews highlighting this topic. Our review will enrich understanding of the role co-analgesia and CNS dysfunction in chronic pain population, so that these patients can be effectively managed by appropriate treatments. The aim of the study was to analyze the contemporary literature about use of combination medications for chronic pain and to identify medication combinations which increases risk for CNS side effects. This is a narrative review. The review included relevant literature identified through searches of PubMed, Cochrane, Clinical trials and EMBASE from 1960 to September 2015. Eight clinical trials and six reviews met inclusion criteria. Multiple, good quality studies demonstrate the superior efficacy of combination strategy of two medications for chronic pain management. However, the number of available studies for any one specific combination is limited, trial size and duration of treatment are small. So this precludes the recommendation of any one specific drug combination for any type of chronic pain management.

Key Words: *pharmacological management, opioid, controlled substances*

POSTER PRESENTATION - 7

Neuropathic Pain in High Level Spinal Cord Injury Effectively Controlled by Spinal Cord Stimulator: A Case Study

Presenter:

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Collaborators:

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Abstract Text:

Neuropathic pain is common in individuals with spinal cord injury (SCI). To date, studies recommend non-interventional pain management in these patients, with limited literature suggesting use of spinal cord stimulator (SCS) to treat neuropathic pain. This case illustrates the effects of a spinal cord stimulator for treatment of neuropathic pain in a patient with SCI. 57 year old male with C4-American-Spinal-Injury-Association (ASIA) classification-C SCI secondary to fall from a truck platform in 2009 resulting in spastic tetraplegia and severe neuropathic pain. An intrathecal baclofen pump was placed in 2012 for spasticity management. Patient complained of right lower extremity chronic neuropathic pain (RLECNP) that persisted from his initial injury. Conservative therapies addressing RLECNP failed including gabapentin, pregabalin, amitriptyline, buprenorphine, a transcutaneous electrical nerve stimulation unit, oxycodone/acetaminophen and intrathecal baclofen pump with baclofen and bupivacaine. The patient found relief with a SCS trial and underwent subsequent implantation in 2014 to control his pain. Ultimately, his RLECNP was well controlled with small gabapentin dose and all opiate medications were discontinued. This case suggests the need to explore use of SCS in the treatment of neuropathic pain. The novel use of SCS to address this pain after failure of non-interventional modalities would greatly improve patient quality of life.

Key Words: *chronic pain, interventional pain management, tetraplegia*

POSTER PRESENTATION - 8

Optimal Transcranial Direct Current Stimulation Polarity for Enhancing Motor Recovery from Severe Post-Stroke Hemiparesis

Presenter:

Elizabeth Powell, MS¹

Collaborators:

Cheryl Carrico¹, Kenneth Chelette¹, Laurie Nichols², Lumy Sawaki, PhD, MD^{1,2}

Departmental Affiliations:

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Abstract Text:

Transcranial direct current stimulation (tDCS) has been shown to enhance outcomes of motor training for subjects with mild to moderate post-stroke motor deficit. To determine which tDCS configuration optimizes motor training in cases of severe post-stroke hemiparesis (≤ 19 out of 60, Fugl-Meyer Assessment (FMA) upper extremity motor score), this study randomized 26 subjects to 1 of 4 conditions: 1) "anodal" (anodal tDCS to the ipsilesional motor cortex); 2) "cathodal" (cathodal tDCS to the contralesional motor cortex); 3) "dual" (anodal tDCS to the ipsilesional motor cortex and cathodal tDCS to the contralesional motor cortex); or 4) "sham" tDCS. In 10 sessions total, each on a consecutive weekday, tDCS preceded 3 hours of intensive, task-oriented motor training. Outcome measures included FMA and Action Research Arm Test (ARAT). Evaluations took place at baseline, post-intervention, and 1-month follow-up. Pre-post FMA improvement was significant for "anodal," "cathodal," and "sham"; and 1-month follow-up was significant for "sham." There were no significant differences between groups on FMA at post or at 1-month follow-up. Pre-post ARAT improvement was significant for "cathodal"; and 1-month follow-up was significant for "cathodal" and "sham." There were no significant differences between groups on ARAT at post; however, at 1-month follow-up, "cathodal" was significantly better than all other groups. In sum, cathodal tDCS may optimize motor training for people with severe post-stroke hemiparesis. Larger studies are recommended to substantiate these preliminary results.

Key Words: *neuromodulation, neuroplasticity, upper extremity, stroke*

POSTER PRESENTATION - 9

Chemotherapy-induced Peripheral Polyneuropathy: Monochromatic Infrared Light Energy Therapy Improves Symptoms and Mobility-related Function

Presenter:

Andrew Savoie, DO¹

Collaborators:

Sara Shahid Salles, DO¹

Departmental Affiliations:

¹Department of Physical Medicine and Rehabilitation, University of Kentucky, Lexington, KY

Abstract Text:

Case Diagnosis: Bilateral lower extremity peripheral neuropathy secondary to chemotherapy

Case Description: 69-year-old male presented with history of stage IIA adenocarcinoma of the rectum status post neoadjuvant capecitabine and radiation therapy followed by surgical resection and then postoperative oxaliplatin and capecitabine. He was seen at Survivorship Clinic and referred to us for evaluation of bilateral lower extremity paresthesias and neuropathic pain. He was treated conservatively but continued to experience paresthesias in a stocking-glove distribution of the lower extremities, left greater than right. We referred him to physical therapy for monochromatic infrared light energy therapy (Anodyne) and generalized mobility therapies.

Patient underwent thirteen physical therapy (PT) sessions in total and received Anodyne therapy to his bilateral feet during twelve. After three sessions he reported subjective improvement in pain and numbness, at which point duration of therapy was increased from 15 minutes to 35 minutes. His functional progress was measured with Single Leg Stance times (right leg 5s to 23s, left leg 6s to 25s) and 5 time sit to stand (22s with upper extremity assist to 12s with no upper extremity assist).

Discussion: Chemotherapy-induced peripheral neuropathy due to oxaliplatin has been described in two distinct patterns: a transient, acute syndrome and a dose-limiting, cumulative neuropathy that typically resolves within 6-12 months of therapy discontinuation. Capecitabine has also been shown to induce peripheral neuropathy in some cases, however symptoms are milder and occur less frequently. Use of Anodyne therapy has been shown to improve some symptoms of peripheral neuropathy and is approved for use in temporarily increasing circulation and reducing pain. In this case, Anodyne therapy used in conjunction with PT improved function and symptoms of chronic pain and paresthesias due to chemotherapy-induced peripheral neuropathy.

Conclusions: Monochromatic infrared light therapy is an available therapy modality that may improve symptoms of chemotherapy-induced peripheral neuropathy and paresthesias.

Key Words: *chronic pain, chemotherapy-induced neuropathy, rehabilitation*

POSTER PRESENTATION - 10

Using a Movement Program: Benefits for Children with Sensorimotor Deficits

Presenter:

Emily Eicher, OTS¹

Collaborators:

Sara Durham¹, Emily Coleman¹, Camille Skubik-Peplaski, PhD, OTR/L, BCP, FAOTA¹
Shirley Peganoff-O'Brien, PhD, OTR/L, FAOTA¹, Anne Fleischer, PhD, MPH, OT/L, CLT-LANA¹

Departmental Affiliations:

¹Department of Occupational Science and Occupational Therapy, Eastern Kentucky University

Abstract Text:

The aim of this mixed-method study was to discover how an 8 session movement program, utilizing principles of sensory integration and dance, effects motor and sensory outcomes for children with sensorimotor impairments as well as to understand caregivers' aspirations for their children. Participants' sensory function was assessed prior to intervention using the Child Sensory Profile 2. Pre and post testing was performed using the following assessments: Bruininks-Oseretsky Test of Motor Proficiency, Pediatric Evaluation of Disability Inventory, Child Occupational Self-Assessment. Semi-structured interviews were utilized to explore parents' experiences of raising a child with sensorimotor impairments and their expectations for leisure participation. The analysis demonstrated the change in motor performance to be statistically significant, suggesting that the program was successful in improving praxis skills for the participants. The Pediatric Evaluation of Disability Inventory and the Child Occupational Self-Assessment assessments yielded no statistically significant findings, but changes were observed that were supported by the interview data. Five themes emerged from the semi-structured interviews, illustrating that the use of an integrated movement program with consideration of family-centered care can be used to improve motor coordination and self-confidence. Although these preliminary findings show positive results, further research is needed.

Key Words: *sensorimotor deficits, motor coordination, occupation-based, leisure*

POSTER PRESENTATION - 11

What Makes a Master Clinician: Shifting from Novice to Expert

Presenter:

Camille Skubik-Peplaski, PhD OTR/L BCP FAOTA¹

Collaborators:

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Abstract Text:

Occupational therapists make choices daily about the selection of client interventions. These decisions can be based on the therapist's experience but therapy outcomes depend on application of critical thinking and clinical reasoning. Critical thinking involves assessing clinical situations, solving problems and seeking relevant sources of information. It is also equated with "out-of-the-box" thinking, challenging status quo and striving to reach client potential. Clinical reasoning is the process that clinicians "plan, direct, perform, and reflect on client care". Mattingly and Fleming (1994) considered clinical reasoning to be thinking in different forms, including how the therapist views the client, the client's impairments and how the therapist prioritizes the client's risks that interfere with occupational performance. Welch (2008) reviewed several studies that described the skills of expert healthcare providers and found that master practitioners displayed certain characteristics that if taught, could help novice therapists acquire the skills needed to become an expert practitioner. Through training and understanding how master clinicians develop critical thinking and clinical reasoning skills, novices were quicker to evolve into expert practitioners. Promoting master clinician behaviors ultimately increases the value of the occupational therapy profession, enhances client outcomes, improves therapist satisfaction by developing partnerships with clients, and improves therapy outcomes, with occupation-based practice at the center. The purpose of this qualitative study is to: 1) identify characteristics of a master clinician 2) determine how the master clinician uses clinical reasoning and critical thinking skills to enhance therapy outcomes, 3) explore how a master clinician creates value for occupational therapy profession.

Key Words: *master clinician, critical thinking, clinical reasoning, novice, occupational therapy*

POSTER PRESENTATION - 12

Functional Improvement in Spinal Abscess Patients with Substance Abuse History

Presenter:

Namrata Raut, MD¹

Collaborators:

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Abstract Text:

Objective: Studies have shown that recently the incidence of spinal epidural abscess (SEA) has risen due to increasing intravenous (IV) substance abuse (SA). The purpose of this study is to compare functional improvement after acute inpatient rehabilitation in SEA patients with a history of IVSA to SEA patients without IVSA.

Design: Retrospective review

Methods: 28 SEA patients from 01/2012 to 9/2015 (45-month period), divided into 2 groups: 13 with IVSA and 15 without IVSA were investigated. Both groups received acute inpatient rehabilitation at a free-standing rehabilitation hospital. Functional performance was defined by total Functional Independence Measure (FIM) scores as well as motor and cognitive subset scores.

Results: A 2 (SubstanceUse) X 2 (rehabilitation status) mixed design analysis of variance (ANOVA) for all patients for total, motor, or cognitive FIM scores did not demonstrate any significant interactions. However, significant main effects for rehabilitation status at admission versus discharge were found for total FIM scores (F [1, 1] = 50.162, P = <0.05; discharge (73.43 ± 13.97) versus admission (46.96± 13.96)), FIM motor scores (F [1, 1] = 44.26, P = <0.05; discharge (43.50± 11.64) versus admission (22.76 ± 11.64)), and FIM cognitive scores (F [1, 1] = 17.85, P = <0.05); discharge (29.94± 5.08) versus admission (24.2 ± 5.08)). Length of stay: IVSA was 22.6 days and no IVSA was 21 days; Morphine equivalents: IVSA 113.75 and no IVSA 93.8; Level of abscess: IVSA: Cervical-38.46%, Thoracic-53.84%, Lumbar-7.6% whereas for no IVSA: Cervical-13.3%, Thoracic-66.6%, Lumbar-2.0%; Age: IVSA patients were younger, only 30.7% were above 40 years whereas with no IVSA group 80% patients were above 40 years of age.

Conclusions: Effective acute inpatient rehabilitation in SEA substance abuse patients improves functional recovery similar to non-substance abuse patients. Future studies investigating quality of life, functional improvement and patient satisfaction over a longer period of time in spinal abscess patients are warranted. Additionally, studies should look at whether patients' substance abuse problems are addressed while they are in acute inpatient rehabilitation or during outpatient visits.

Key Words: *rehabilitation, spinal cord injury, functional independence measure, length of stay*

POSTER PRESENTATION - 13

Brain-Machine Interface Controlled Peripheral Nerve Stimulation for Motor Rehabilitation after Spinal Cord Injury

Presenter:

Sarah Thomas, MS¹

Collaborators:

Christopher Schildt¹, Yuvaraj Rajamanickam¹, Elizabeth Powell, MS², Sara Salles, DO², Lumy Sawaki, MD, PhD², Sridhar Sunderam, PhD¹

Departmental Affiliations:

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Abstract Text:

Development of increasingly efficient motor rehabilitative techniques for spinal cord injury (SCI) patients would add to the ease and quality of motor rehabilitation available. Experiments pairing transcranial magnetic stimulation (TMS) with peripheral nerve stimulation (PNS) have shown a timing-dependent effect on motor evoked potential (MEP) amplitude. This suggests that PNS applied in a closed-loop manner could improve motor function through positive reinforcement. A brain-machine interface (BMI) was developed to apply afferent PNS in response to motor intent related electroencephalogram (EEG) features. In this ongoing study, conducted with IRB approval, nine of ten subjects with incomplete cervical spinal cord injuries each received twelve sessions of BMI-driven closed-loop PNS while engaged in an interactive cue-driven hand grip task with one subject dropping out after seven sessions. Subjects with PNS occurring before force onset (n=6) had mean changes in maximum voluntary contraction (MVC) force of 63±23% and 33±21%, mean TMS motor map volume changes of 1.6±0.6 and 2.2±2.3, and mean resting motor threshold (RMT) changes of -4.50±9.42 and -0.50±1.12 for the left and right hand, respectively. In contrast, subjects with PNS occurring after force onset (n = 4) had mean MVC changes of -6.0±7.7% and 4.7±18%, mean TMS motor map volume changes of -1.3±1.2 and 0.2±0.8, and mean RMT changes of 12.75±15.17 and 9.75±9.42 for the left and right hand, respectively. While these results come from a small sample in an ongoing study, they suggest that closed-loop protocols with fine control of PNS timing could be a valuable adjunct to physiotherapy in the rehabilitation of patients with SCI.

Key Words: *brain-machine interface, motor rehabilitation, spinal cord injury, peripheral nerve stimulation*

POSTER PRESENTATION - 14

Towards Characterization of Movement Intention from Motor Related Cortical Potentials in Individuals with Motor Incomplete Spinal Cord Injury

Presenter:

Rajamanickam Yuvaraj, PhD¹

Collaborators:

Sarah Thomas, BS¹, Elizabeth Powell, MS², Dillon Huffman, BS¹, Sara Salles, DO², Lumy Sawaki, MD, PhD², Sridhar Sunderam, PhD¹

Departmental Affiliations:

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Abstract Text:

Objective: In recent years, movement-related cortical potentials (MRCPs) have received increased attention in brain-machine interface (BMI) applications. Here, the ability to detect and characterize MRCPs from electroencephalogram (EEG) data recorded as part of an ongoing clinical study involving patients with spinal cord injury (SCI) was investigated.

Approach: With prior institutional approval and informed consent, sensorimotor EEG signals from central and parietal regions of the scalp were recorded in four SCI patients with impaired hand function. Subjects engaged in an interactive cue-driven hand grip task for twelve sessions over four weeks. Each session consisted of 10 runs—five on each hand—of 20 cue-triggered hand grip movements. To compute MRCPs, the signals were common average referenced (CAR) and bandpass-filtered from 0.1-4 Hz. The onset of each executed movement was determined from grip force measured continuously using a hand dynamometer. The corresponding EEG signals from 2s before to 1s after movement onset were extracted and taken to represent the MRCP.

Results: It was seen that a typical MRCP departs from the baseline, shows a progressive increase in slope, and reaches peak negativity at the time of movement onset. In all four subjects, who happened to be right hand dominant, MRCP negativity was most prominent on C3 in the left hemisphere (i.e., right hand area) regardless of the hand used for the task. These preliminary results suggest the feasibility of using the MRCP as a marker of movement intent in individuals with SCI.

Key Words: *brain machine interfaces, EEG, MRCP, movement intention, motor rehabilitation, spinal cord injury.*

POSTER PRESENTATION - 15

Effects of Backpack Type on Lumbar Kinematics During Daily Activities

Presenter:

Cazmon Suri, BS¹

Collaborators:

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Departmental Affiliations:

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Abstract Text:

In the United States, lower back pain (LBP) ranks as the fifth most prevalent reason for physician visits. In many cases, adults who have chronic back pain also experienced back pain as a youth. Due to the already established role of large loads in risk for lower back injury and LBP, ergonomic features in backpacks have been advertised to help reduce such risks. However, to the best of our knowledge, no research has investigated the biomechanical differences in the lower back when carrying an ergonomic backpack vs. a normal backpack. The objective of this study was to investigate such differences through measures of lower back kinematics. The kinematics were recorded during several activities of daily living for forty gender-balanced participants (students ages 18 to 22) with no history of LBP. Each participant completed several tasks of daily activities with one of three types of carrying options (i.e., no backpack, normal backpack, or ergonomic backpack). The tasks included two range of motion tests (i.e., self-selected and fast paces), walking and jogging on a treadmill for thirty seconds, and stairs ascending and descending. The range of motion in the lumbar region of the spine was investigated using body kinematic data collected with accelerometers placed on the lower extremities as well as the sternum of the subject.

Key Words: *lower back pain, backpack, ergonomics*

POSTER PRESENTATION - 16

Robot-assisted Locomotor Training after Severe Stroke: Discrete Versus Rhythmic Movement – a Randomized Controlled Trial

Presenter:

Lumy Sawaki, MD, PhD¹

Collaborators:

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Abstract Text:

Background and Purpose: Robot-assisted locomotor training on a bodyweight-supported treadmill (LT-BWST) is a rehabilitation intervention that compels repetitive practice of gait movements. Rhythmic movements are generated primarily by spinal circuits. Discrete movements are more complex and are generated by cortical areas in conjunction with spinal mechanisms.

Objective: Compare the effects of discrete versus rhythmic movements in robot-assisted LT-BWST for individuals with chronic, severe gait deficit after stroke.

Methods: Subjects (n=18) were randomized to receive 30 sessions (5 days a week) of either discrete or rhythmic robot-assisted LT-BWST in an inpatient setting. Outcome measures included Functional Ambulation Category (FAC; primary), Time Up and Go (TUG), 6-minute walk test (6MWT), 10 meter walk test (10MWT), Berg Balance Scale (BBS), and Fugl-Meyer Assessment (FMA) at baseline and post-intervention.

Results: The discrete group had statistically significant improvement on FAC (1st quartile, 3rd quartile; p=0.004), 6MWT (95% CI, 1.8-49.0; p=0.040), BBS (95% CI, 7.4-14.8; p<0.0001), TUG (95% CI, -79.1 – 5.0; p<0.0030), and FMA (95% CI, 24.1-45.1; p<0.0001). The rhythmic group had statistically significant difference on BBS (95% CI, 1.5-10.5; p=0.02).

Conclusions: In initial stages of robot-assisted LT-BWST for people with severe post-stroke gait deficit, targeting discrete movement may yield greater benefit than targeting rhythmic movement.

Key Words: *cerebral vascular accident, lower limb, neurorehabilitation, neuroplasticity, physical therapy, motor training, walking*

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