Abstracts of Scientific Papers and Posters Presented at Physiatry '25

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SCIENTIFIC PAPER PRESENTATIONS

FRIDAY, FEBRUARY 28, 2025

"Urine" Control: Interdisciplinary Collaboration for Catheter Associated Urinary Tract Infection Reduction at an Inpatient Rehabilitation Institute

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OBJECTIVES: Acute inpatient rehabilitation (IPR) patients have underlying conditions and comorbidities that often require prolonged indwelling urinary catheters (IUC) which increase the risk of catheter associated urinary tract infections (CAUTI). A collaborative approach to decrease the risk of CAUTI in this setting is necessary. At a 435-bed level one trauma center, with 76 dedicated IPR beds specializing in stroke, spinal cord injury, brain injury, and general rehabilitation, a multidisciplinary team was formed to address an increase in CAUTI. The team included infection prevention (IP), clinical staff, and leadership.

DESIGN: Daily rounding with IP, clinical staff, and IPR leadership for IUC necessity and device maintenance became the cornerstone of reducing CAUTI. Identified unit champions completed monthly surveillance of IUC maintenance with peer coaching. Ongoing education on device maintenance, necessity, and diagnostic stewardship was provided to the medical, nursing, and therapy teams. Protocols were developed to exchange chronic IUC on admission to IPR. Following each CAUTI, a root cause analysis was completed with stakeholders to identify causal factors and action items to prevent reoccurrence. IP and IPR Medical Director Leadership created a unified approach to diagnostic stewardship and IUC necessity supporting the ongoing efforts of IP, nursing, and therapy.

RESULTS: Quality improvement activities were evaluated with a monthly dashboard including compliance with process measures for IUC maintenance, CAUTI rate, and urine culture rate. Recognition programs such as a "CAUTI-Catch" certification and unit milestone celebrations encouraged ongoing best practice and program participation. There was a 58 to 69% reduction in average IUC utilization rate and 25 to 42% reduction in average urine culture rate. Following full implementation of the program, the entire IPR achieved zero CAUTIs for a continuous 24 months.

CONCLUSION: With active engagement of IPR stakeholders, a 76-bed hospital-based IPR was able to achieve sustainable interventions to decrease CAUTI rates in IPR.

A Musical Virtual Reality Physical Therapy Program for Total Knee Arthroplasty Patients

Ryan Bose-Roy, BS, Lana Zheng, Aksel Sather, Gregory R. Roytman, DC, MS, Adam Winter, BS, Rummana Aslam, MD, and Daniel H. Wiznia, MD

OBJECTIVES: Improved functional outcomes from physical therapy regimens after total knee arthroplasty (TKA) are constrained by reduced patient motivation and by the shortage of available physical therapists. Musical therapy and virtual reality interventions have shown promising results in improving motivation and functional outcomes. We developed a novel virtual reality (VR) rehabilitation program designed for enjoyable and unsupervised use, allowing users to play music through knee exercises.

DESIGN: An iterative design approach was used to develop the hardware and software components of the device. User needs were identified and mapped to design specifications, which focused on ease of use and comfort.

RESULTS: A VR module was built and consisted of a wearable leg tracker comprising two sensors and a cardboard headset with a compartment holding a smartphone. The headset contained a face cushion pad and a velcro side-strap for fastening. Changes in range of motion from the femur and tibia streamed from the leg tracker to the phone, which calculated the knee angle in real time. This value was mapped to a virtual avatar, as well as to musical notes, enabling a musical scale to be played through knee flexion and extension. Users wearing the headset were immersed in a concert venue, seeing a crowd from the vantage of a musician seated on a stage, and were prompted to tap their feet on three multicolored buttons. Each button turned an instrument part for a particular song on and off, and tapping the buttons in a coordinated manner played all the instruments.

CONCLUSION: We built a functional device for a more musically immersive TKA rehabilitation experience. Future work must be done to correlate this program with measures of motivation.

A Single Center Experience of Treating an Adult Civilian Patient Population with Persistent Symptoms Post-Concussion Focusing on Co-Morbid Conditions, Multidisciplinary Treatment And Functional Outcomes.

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OBJECTIVES: Concussions are a prevalent form of mild traumatic brain injury that typically resolves within weeks, but can often result in persistent symptoms affecting an individual's quality of life. While much of the existing literature focuses on athletes, military personnel, or pediatric populations, there is a gap in understanding chronic concussions within civilian adult populations. The purpose of this study is to assess the outcomes of multidisciplinary rehabilitation on these patients.

DESIGN: This is a single-center retrospective study looking at 132 chronic concussion patients from March 2018 to April 2023. We included civilian adults over the age of 18 who were seen for persistent concussion symptoms in outpatient multidisciplinary concussion program. As part of the multidisciplinary treatment program, 55% of patients were referred to physical therapy with about 14% of patients already receiving or received PT, 10% of patients were referred to occupational therapy, 46% of patients were referred to speech therapy, and 21% of patients were referred to rehabilitation counseling. We defined functional outcomes based on a 5 point Likert Scale in the domains of back to baseline, back to school/ work, and resolution of symptoms.

RESULTS: After completing the multidisciplinary concussion program, about 82% of patients had at least modest improvement (somewhat achieved or better) in getting back to baseline, about 65% had at least modest improvement in getting back to work/ school, and about 74% had at least modest improvement in getting back to hobbies. Overall, 82% of patients had at least modest improvement in symptom resolution.

CONCLUSION: Despite chronicity of concussion symptoms, multidisciplinary care and rehabilitation can lead to resolution of symptoms, improved outcomes and return to work/school in a majority of patients.

Accelerating UTI Diagnosis and Treatment: Real-Time bacterial NADH conversion as a biomarker for Urine Bacterial Growth in SCI/D

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OBJECTIVES: Urinary tract infection (UTI) is the most common infection among individuals with neurogenic lower urinary tract dysfunction (NLUTD)[2–8]. Among people with NLUTD, UTI diagnosis relies on symptoms and bacterial growth by standard urine culture (SUC). However, SUC takes up to 72 hours and misses 90% of bacterial and 50% of uropathogens[9-10]. The JidduÔ analyzer, is a microfluidic system designed to provide point-of-care bacterial activity and pooled antimicrobial susceptibility testing (AST) results by optically measuring urobiome metabolism (bacterial NADH conversion to NAD+) with relative fluorescence units (RFU). OBJECTIVES: Compare the sensitivity and specificity of: (1) NADH conversion (in RFUs) to SUC-based colony forming units (CFU) for quantification of bacterial load; and (2) JidduÔ pooled ASTs and SUC-based ASTs. Additionally, we aim to determine the relationship between urinary symptoms to NADH conversion and SUC CFUs.

DESIGN: This is a cross-sectional study of n = 289 with NLUTD due to SCI/D who use different bladder methods voiders (V, n = 126), intermittent catheterization (IC, n = 108) or indwelling catheter (IDC, n = 55). Presence/absence of symptoms was collected using bladder management-specific Urinary Symptoms Questionnaire for Neurogenic Bladder (USQNB).[1] Urine sampling was by clean catch (voiders) or

other top subspecialty interests shifted slightly. Interest in pediatric rehabilitation increased the most, suggesting the value of a PM&R Fair in exposing medical students to lesser known PM&R subspecialties.

Impact of Parity on the Angle of the First Pedal Ray Relative to the Midline of the Foot

Paige Whitman, BS, Christine Harper, PHD, and Patricia Kramer, PHD

OBJECTIVES: Pregnancy leads to structural and hormonal changes that impact foot morphology, including increased foot length and flattening of the pedal architecture, which can impact mobility and risk of injury. Previous research has demonstrated that females have a larger angle of the first pedal ray than males, which was suggested to be potentially related to parity. Here we compare variation in the first pedal ray angle between nulliparous and multiparous individuals to investigate the impact of pregnancy on this angle.

DESIGN: Previously collected, de-identified non-weight-bearing CT scans from the New Mexico Decedent Image Database (n = 16) of healthy individuals (8 nulliparous, 8 multiparous) were accessed. Landmarks were placed on the proximal and distal ends of the first metatarsal and third metatarsal in Avizo Lite 9.0.1. The vectors between these landmarks represented the first ray and midline of the foot, respectively, and the angle between the two axes was calculated in MATLAB. Wilcoxon Rank Sum tests were used to test for differences in the angle of the first ray between nulliparous and multiparous individuals.

RESULTS: The angle of the first ray relative to the midline ranged from 6.9 to 10.6 degrees with an average of 9.5 degrees for multiparous, and 2.3 to 14.2 degrees with an average of 7.9 degrees for nulliparous. While this difference was not statistically significant ($p = 0.23$), these pilot data suggest a difference between the two groups.

CONCLUSIONS: The impact of pregnancy on pedal architecture needs to be better characterized, and this research is a first step that identifies that the first pedal ray angle may differ between nulliparous and multiparous individuals. Our results are preliminary, however, and future research with a larger sample size should be conducted to fully understand if parity impacts first ray angle.

Impact of Stroke and Spasticity on Quality of Life – An Online Study Conducted Among Patients and Caregivers Living in the United States of America

Monica Verduzco-Gutierrez, MD, Emilie Pain, MSC, Jonathan Bouchard, and Amandeep Mann

OBJECTIVES: Stroke is the second-leading cause of death and the third-leading cause of death and disability combined worldwide. Hemiparesis and spasticity are common co-occurring consequences of strokes. This observational survey aimed to give patients and their caregivers the opportunity to express their experience about post stroke spasticity and its impact on quality of life (QoL).

DESIGN: US data were collected via the online patient platform Carenity by Else Care from July to November 2023. Online surveys were completed by adults who suffered a stroke with hemiparesis in the previous 12 months, or their caregiver when relevant, and recorded into an electronic case report form. Survey questionnaires had 4 parts: screener; sociodemographic and medical profile; patient journey with stroke and spasticity; and impact of stroke on patients' QoL. QoL was assessed using a shortened version of the Stroke-Specific Quality of Life Scale (SS-QoL).

RESULTS: Of 283 survey respondents (78.1% patients; 21.9% caregivers), 54.8% were male; mean age was 49.6 years; mean age at first stroke was 47.0 years. Half of respondents had their social life impacted by their physical condition; 81.9% reported some trouble to total inability to do daily work around the house; 48% did not receive or would have liked to receive more information regarding spasticity. The overall mean SS-QoL score was 2.5 (ranging from 0 - the worst possible QoL - to 5 - the best possible QoL). Respondents from the caregiver group also reported having a more severe impact of stroke on their lives compared to respondents from the patient group. Their physical condition interfered more severely with their social life and they were more likely to feel like a burden to their families.

CONCLUSIONS: These survey-based outcomes from patients and caregivers in a real-world setting corroborate an important impact of stroke and its related spasticity on quality of life.

Impact of T1 Slope-Cervical Lordosis Discrepancy on Sagittal Vertical Axis and Patient-Reported Outcomes Following Posterior Cervical Fusion: A Multi-Center Retrospective Analysis

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OBJECTIVES: 1) Evaluate whether a TS-CL discrepancy greater than 17° predicts a cSVA greater than 4 cm in patients undergoing mutli-level posterior cervical fusion for stenosis and myelopathy, 2) investigate if an SVA > 4 cm correlates with higher patient-reported outcomes.

DESIGN: A retrospective analysis was conducted on a multi-center database including 356 patients who underwent posterior cervical fusion involving a minimum of three levels for stenosis and myelopathy. Inclusion criteria required the surgical level to be caudal to C7 and a minimum follow-up period of two years.

RESULTS: The cohort had a mean age of 63 ± 12 years, with 52.6% being male and a mean BMI of 28.7 ± 6.4. The most frequently treated levels were C3-C7 (42.3%). A significant correlation was observed between TS-CL discrepancy greater than 17° and cSVA greater than 4 cm ($r = 0.71$). Specifically, 72.6% of patients with TS-CL > 17° exhibited an SVA > 4 cm. Furthermore, patients with SVA > 4 cm reported higher mean pain scores (VAS = 4.6 ± 2.9 vs. 3.6 ± 1.6, $p > 0.05$) and disability scores (ODI = 43.2 ± 23.6 vs. 36.6 ± 18.2, $p > 0.05$) compared to those with lower SVAs.

CONCLUSIONS: The findings substantiate that a TS-CL discrepancy greater than 17° is associated with an increased cSVA exceeding 4 cm in patients undergoing mutli-level posterior cervical fusion. Moreover, patients with higher SVA demonstrated poorer outcomes in terms of pain and disability, as indicated by VAS and ODI scores. These results underscore the importance of preoperative evaluation of TS-CL discrepancy to optimize surgical planning and enhance postoperative outcomes related to spinal alignment and patient-reported quality of life.

Impact of Targeted Educational Interventions on Robotic Exoskeleton Adoption in Malaysia's Rehabilitation Practices

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OBJECTIVES: Despite policy support, the adoption of robotic exoskeletons in Malaysia's rehabilitation practices remains limited. This study explores the impact of targeted educational interventions on facilitating robotic exoskeleton adoption among rehabilitation therapists in Malaysia.

DESIGN: The study employed an action research methodology, incorporating pre- and post-intervention surveys adapted from the Technology Acceptance Model (TAM), along with qualitative feedback. The interventions included an educational webinar on the benefits of robotic exoskeletons and training support. Data were collected from 62 rehabilitation therapists across four hospitals in Malaysia. Key variables assessed were Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Intention to Use (ITU). Quantitative analyses were conducted using paired t-tests and Pearson correlation, while qualitative feedback was analyzed thematically.

RESULTS: Post-educational intervention, significant improvements were observed: mean PU increased from 3.88 to 4.11 ($p = 0.003$), mean PEOU from 3.44 to 3.90 ($p < 0.001$), and mean ITU from 3.83 to 4.06 ($p = 0.006$). PU and ITU showed a strong positive correlation ($r = 0.769$, < 0.001), and similarly, PEOU and ITU ($r = 0.667$, $p < 0.001$). Qualitative feedback emphasized the need for practical training and hands-on experience.

CONCLUSIONS: Targeted educational interventions significantly enhance rehabilitation therapists' acceptance and readiness to adopt robotic exoskeletons in Malaysia. By addressing training gaps and providing practical experience, these interventions help bridge the gap between policy and practice, contributing to improved patient care and operational efficiency in clinical settings.

Increased Bladder Complications in Persons with Spinal Cord Disorders and Post-Acute Sequelae of COVID-19: A retrospective review

Brian M. Jordan, DO, and Christina V. Oleson, MD

OBJECTIVES: Complications of bladder function and related changes in bladder management are well established among persons with chronic spinal cord injury and disorders(SCI/D). Bladder complications have also been observed in persons