

University of Kentucky
Department of Physical Medicine & Rehabilitation



16th Annual Research Day
June 17th, 2004

Cardinal Hill Rehabilitation Hospital
Center of Learning Rm. CL3-CL4

PHYSICAL MEDICINE AND REHABILITATION RESEARCH DAY 2004

UNIVERSITY OF KENTUCKY
DEPARTMENT OF PHYSICAL MEDICINE AND REHABILITATION
16TH ANNUAL RESEARCH DAY AGENDA

CARDINAL HILL REHABILITATION HOSPITAL
CENTER OF LEARNING ROOMS CL3 & CL4
JUNE 17TH, 2004

08:00 AM – 08:30 AM Continental Breakfast

08:30 AM – 08:40 AM Opening Remarks: Nancy Stiles, MD

RESIDENT/STUDENT RESEARCH PRESENTATIONS

Plans

08:45 AM – 08:55 AM Kathleen Dy, MD
09:00 AM – 09:10 AM Karen Miller, MD
09:15 AM – 09:25 AM Gang Li, MD
09:30 AM – 09:40 AM Tanya Harris, MD
09:45 AM – 09:55 AM Harvey Mallory, MD
10:00 AM – 10:10 AM Shannon Bowles
10:15 AM – 10:25 AM Jennifer King

10:30 AM – 10:45 AM BREAK

Projects

10:40 AM – 10:55 AM Melinda Hayes, MD
11:00 AM – 11:10 AM Herb Villaflores, MD
11:15 AM – 11:25 AM Lyn Tindall
11:30 AM – 11:40 AM Matt Mattingly and Ryan McGuire
11:45 AM – 11:55 PM Hank White

12:00 PM – 01:00 PM LUNCH
Sponsored By Clay Fuller and Jill Phelps, RN, from Pfizer Pharmaceuticals

FEATURE SPEAKER

01:00 PM – 02:00 PM **ROBERT DEMPSEY, MD**
University of Wisconsin Hospital and Clinic
Department of Neurological Surgery
“Applying Research to a Clinical Problem: AV Malformation”

02:00 PM – 02:10 PM BREAK

POSTER PRESENTATIONS AND REVIEW

02:15 PM – 02:25 PM Markus Niederwanger, MD
02:30 PM – 02:40 PM Tamara Cranfill
02:45 PM – 02:55 PM Sarah Payton and Sheila McLean
03:00 PM – 03:10 PM Bradley Davidson
03:15 PM – 03:25 PM Amanda Guzy and Christy Napier
03:30 PM – 03:40 PM Hank White

03:45 PM – 04:15 PM Awards and Closing Remarks: Nancy Stiles, MD
Gerald Klim, DO

ROBERT J. DEMPSEY, M.D.

Dr. Dempsey received his M.D. from the University of Chicago Medical School in 1977, where he was first exposed to academic research, both in the bench laboratory and clinical field. Working on the biochemistry of diseases of the nervous system became a lifelong interest after the training received at the University of Chicago. The influence of Dr. Sean Mullen was important in his decision to pursue a career in neurological surgery. Dr. Dempsey entered into the neurosurgery residency program at the University of Michigan under the training of Dr. Richard Schneider, Dr. Glen Kindt and Dr. Julian T. Hoff. He completed his residency with a growing appreciation of the importance of the correlation of basic science research with the clinical problems of neurological surgery. A particular interest in cerebral blood flow, cerebral ischemia and ischemic brain edema was generated during these training years. In 1983, he joined the faculty at the University of Kentucky where he established a cerebrovascular practice in neurosurgery, as well as extensive clinical and basic science research programs, reflecting an interest in ischemic brain edema, the cause and treatment of atherosclerosis in carotid arteries and the biochemical events after brain injury. Dr. Dempsey became the Director of the Center of Excellence in Stroke Research of the Center on Aging at the University of Kentucky, and President of the Kentucky Neurosurgical Society, as well as Medical Director of the Cerebrovascular Laboratory. During this time, he was awarded the University of Kentucky Faculty Research Award, as well as the Master Teacher Award from the University of Kentucky School of Medicine. In 1995, Dr. Dempsey assumed the position as the Professor and Chairman of the Department of Neurological Surgery at the University of Wisconsin in Madison, where he also became Director of the Multidisciplinary Stroke Program and established the Cerebrovascular Research Laboratories. In 1998, he became the first Maucher J. Javid Endowed Professor in Neurological Surgery. He serves on numerous societies, committees and review organizations, including the Executive Committee of the Stroke Council of the American Heart Association, the Executive Committee of the Joint Section of Cardiovascular Surgery of the American Association of Neurological Surgeons and the Congress of Neurological Surgeons. His research efforts continue at this time, including the new research direction in neuroplasticity after transient cerebral ischemia. He is married to his wife, Diane, an aquatic biologist and they have two children, Kara Eileen, and Conner Patrick.

Presentation

Applying Research to a Clinical Problem: AV Malformation

PM&R Resident Presentations (Plans)

The Demographics of the Spina Bifida Population in Shriners Hospital for Children in Lexington, Kentucky

Presenter: Kathleen C. Dy, MD

Collaborators: Brian Carney, MD

Departmental Affiliations: Shriners Hospital for Children, Lexington, KY
(Pediatric Orthopedic Surgery)

Background: Spina Bifida is a non-specific term used to describe malformations that can occur anywhere along the developing spine, resulting from failure of the primitive neural tube to close during early embryogenesis. The Spina Bifida Association of America reports that it is the most common, permanently disabling birth defect. It affects 0.5-1 out of 1,000 infants born in the United States. **Proposed Objectives:** To describe the demographics of the Spina Bifida population being followed at the Shriners Hospital for Children in Lexington, KY. **Patients and Methods:** An extensive literature review was performed to gather information about pertinent historical and clinical findings associated with patients with spina bifida. From this review, a database questionnaire was formulated to answer specific questions, including: general patient information, classification of lesion, maternal and birth history, radiologic tests, associated neurologic and urologic conditions, and orthopedic problems and treatments rendered. A chart review will be performed on patients being followed at the Lexington Shriners Hospital, who have had at least two visits and two range of motion examinations performed by licensed physical therapists. **Anticipated results:** Myelomeningocele is the most common type of spina bifida and will most likely be the most common form being followed in Shriners. Orthopedic problems usually include hip and knee flexion contractures, ankle and knee deformities, fractures or dislocations and scoliosis or kyphosis. Neurologic problems include Arnold Chiari malformations, hydrocephalus, the need for ventriculoperitoneal shunts and tethered cords that may require surgical release.

Key Words: *Spina Bifida; Shriners Hospital for Children in Lexington, KY; Myelomeningocele*

The Rehabilitative Needs of TAR Syndrome

Presenter: Karen Miller, MD

Collaborators: None

Departmental Affiliations: University of Kentucky, Department of Physical Medicine and Rehabilitation, Lexington, KY.

Thrombocytopenia and absent radii syndrome, or TAR syndrome, is a rare autosomal recessive genetic disorder. There are two universal manifestations of the syndrome, thrombocytopenia and upper extremity deformity. The thrombocytopenia leads to abnormalities in the clotting cascade resulting in increased risk of fatal hemorrhage. Once out of infancy, the mortality rate from hemorrhage dramatically decreased. The absent radius, which is always bilateral, produces what is commonly called “flipper arms.” This syndrome can also cause abnormalities in the cardiovascular system, renal system, and in the lower extremities. This article addresses the multiple rehabilitation needs of the patients with TAR syndrome.

Key Words: *Thrombocytopenia; TAR syndrome; upper extremity deformity*

PM&R Resident Presentations (Plans)

Recovery of Cardiovascular Control After Spinal Cord Injury

Presenter: Gang Li, MD

Collaborators: Joyce Evans, MS, James Abbas, PhD, Charles Knapp, PhD, Robert Taylor, MD, PhD, Susan McDowell, MD, David Gater, MD, David Randall, PhD, David Brown, PhD, Robert Nickerson, MD

Departmental Affiliations: University of Kentucky, Department of Physical Medicine and Rehabilitation, Lexington, KY

Problem: Blood pressure regulation is a significant problem after SCI. The problems with cardiovascular regulation in SCI patients are orthostatic hypotension (excessive blood pooling in lower extremities due to disruption in autonomic control), autonomic dysreflexia and blood pressure lability. The conventional therapy is repeated head-up tilt, but underlying adaptations are poorly understood, and this is a problem for some patients, especially in the months following injury. **Aim:** To characterize the changes in CV control that occur in the months following SCI, to develop techniques to be used in the clinical setting to assess cardiovascular function in individuals with SCI. **Methods:** Twenty-seven subjects (age 18-35) with C/T SCI of one to two week duration without contraindication for head-up tilt/monitoring devices attachment are in the study, several hemodynamic (BP/CO/SV/EF) and hormonal (epinephrine/PRA/PPP) measurements while the subject undergoes head-up tilt, using a standard tilt table, are being collected and analyzed using three factor ANOVA. A control group of eight able-bodied individuals are in the study as well.

Key Words: *Spinal cord injury; tilt table; cardiovascular regulation; orthostatic intolerance*

PM&R Resident Presentation (Plans)

The Effect of Obesity on Length of Stroke Rehabilitation Stay

Presenter: Tanya S. Harris, MD

Collaborators: None

Departmental Affiliations: University of Kentucky, Department of Physical Medicine and Rehabilitation, Lexington, KY.

One would say that it is a given that obesity severely affects morbidity and mortality in this nation. Per *Clinics in Family Practice*, “physical inactivity and obesity are significant risk factors for chronic diseases such as hypertension, stroke, thrombogenesis, breast cancer, sleep apnea, colon cancer, gallbladder disease, osteoarthritis, dyslipidemia, Type II DM, and endometrial cancer.” As numerous studies support, “excessive weight...(has been) associated with increased mortality from all causes among adults.” This is a particularly tragic realization when it has been documented that “obesity has increased in the last decade among men and women in every state, racial group, age group, and educational level in the United States” (Mokdad, JAMA, 1999).

Despite the numerous documented circumstances that obesity results in increased morbidity, particularly in a cardiovascular setting, there is relatively little research documenting stroke rehabilitation outcome in relation to obesity. Obesity is listed as an individual risk factor for stroke (Reeves, Neurology, 2002). However, as seen in my literature search with MD Consult as the search engine, there is little mention specifically of the outcome of stroke in the setting of premorbid obesity.

Through my research, I hope to elucidate the link between obesity as defined by Body Mass Index (BMI) score between 30 and 35 kg per m² and rehabilitation length of stay. I specifically use obesity as the independent factor for the reason that there will be a buffer zone (the overweight with BMI 25 to 30 kg/m²) between the tested population and the population that is weight appropriate (18-25 kg/m²). I am using BMI rather than waist to hip ratio or body fat percentage because this will be retrospective study. Rarely are these measurements listed upon admission. However, it is routine, particularly on the stroke units of Cardinal Hill Rehabilitation Hospital, that height and weight be measured during the admission process. By reviewing these prerecorded data, one can easily measure BMI and therefore be able to relate BMI to length of stay during inpatient rehabilitation. And lastly, I use length of stay of rehab as a spring board for further research to perhaps link length of stay to rehabilitation outcome.

With “there is no statistically significant difference between obese patients and weight appropriate patients in regard to rehabilitation stay,” I hope to reject it and show that obesity also extends to this situation in resulting morbidity.

Key Words: *Obesity and outcomes in rehabilitation; Obesity and rehabilitation stay; Obesity and inpatient rehabilitation; Obesity and stroke rehabilitation; Stroke risk factors; Obesity and stroke outcome*

PM&R Resident Presentation (Plans)

Customized Electrical Stimulation for Spinal Cord Injury (SCI) Rehabilitation: A Clinical Study to Evaluate Safety and Efficacy of the StimGym in Spinal Cord Injury (SCI) Rehabilitation

Presenter: Harvey Ellwood Mallory IV, MD

Collaborators: The research team from the Biodynamics Laboratory at the UK Center for Biomedical Engineering, Robert Shapiro, PhD, Tracy Martin, PT, Valerie Martin, Melvin Mei Hu, MD, PhD, Robert Nickerson, MD, and Jody Clasey, PhD

Departmental Affiliations: The Biodynamics Laboratory at the UK Center for Biomedical Engineering, Department of Physical Medicine and Rehabilitation at the University of Kentucky, Medical and Rehabilitation staff at Cardinal Hill Rehabilitation Hospital

The potential benefits of exercise to people with spinal cord injury (SCI) may be even greater than the benefits enjoyed by the able-bodied population. In addition to the health benefits, exercise may also provide a mechanism to slow or reverse many of the secondary complications of SCI; however, the exercise equipment options that are available often provide only marginal benefits.

Functional Neuromuscular Stimulation (FNS) is a technology where electrical stimulation pulses are delivered to the paralyzed muscles, thereby eliciting muscle contractions. As a modality, FNS has been used primarily for cycle ergometry, where stimulation of paralyzed muscle acts to propel a stationary exercise bicycle. Although cycle ergometry activates the large muscles of the lower extremities and provides an aerobic workout, it does not provide substantial limb loading. The device to be tested in this study, the *StimGym*, employs a closed chain, load bearing exercise movement, which may lead to benefits including increases in muscle mass, strength, and endurance, and potentially an increase (or reduction in the rate of loss) of bone mineral density.

The proposed study is a continuation of a pilot study in which feasibility of the *StimGym*'s adaptive control algorithm was demonstrated. In the proposed study, the experiments performed in the pilot study will be extended to a clinical trial in which ten SCI subjects will complete *StimGym* exercise sessions three times per week for twelve weeks. Additionally, studies will be performed to further characterize the *StimGym* motion (in able-bodied and SCI populations) and to document the body composition and anthropometric outcomes that result from the exercise protocol.

Key Words: *Spinal cord injury; Exercise; Functional Neuromuscular Stimulation; FNS*

Student Presentations (Plans)

A Controlled Study of the Effect of Music Therapy on Memory and Cognition in Persons 65 Years and Older who Have Experienced a Stroke

Presenter: Shannon L. Bowles, MME, NMT, MT-BC

Departmental Affiliations: Ph.D. Program in Gerontology at UK /Graduate Center for Gerontology

Research shows that music therapy can benefit the older adult population, including those with medical and neurological disorders. The benefits of music therapy to meet the social and emotional needs of people with Alzheimer's disease and other types of dementia are well documented in the music therapy literature. It has been shown that music can provide therapeutic benefits at all stages of the dementia disease process and has been used successfully to improve self-esteem; increase social awareness, participation and communication; increase and improve mobility; lessen the symptoms of depression; and decrease aggressive behavior and wandering. Additionally, several studies have investigated the benefits of music therapy for persons with stroke-related impairments. Research has indicated that music therapy can significantly improve gait and functional ability, aid in speech, and improve hand grasp strength. However, few studies specifically and quantitatively address the changes in cognitive functioning and memory that can result from stroke. Moreover, they do not exclusively address the issue of those aged 65 and older and do not implement neuropsychological tests to measure the effectiveness of music therapy interventions. This pilot study investigation, in preparation for dissertation, seeks to examine the effect of music therapy on memory and cognition in persons aged 65 and older who have experienced a stroke. Memory and cognition will be specifically measured by using various standardized neuropsychological assessments. It is anticipated that the study will validate the effectiveness of music therapy to improve cognitive function and memory of older adults who have experienced a stroke.

Key Words: *Music therapy, stroke rehabilitation, memory, cognition, neuropsychological assessments*

Student Presentations (Plans)

Cognitive, Physical and Perceptual Outcomes After Spaced Retrieval Training in Individuals with early Probably Alzheimer's Disease Taking Aricept

Presenter: Jennifer Hamrick-King

Collaborators: Nancy Stiles, MD, Frederick Schmitt, PhD, Heather Wright, PhD, Daniel Richardson, PhD and John Watkins, PhD (Doctoral committee)

Departmental Affiliations: UK Gerontology PhD Program

Alzheimer's disease (AD) currently affects around 4.5 million people in the United States alone (Hebert et al., 2003). Current pharmaceutical AD therapies offer patients some hope in delaying disease progression, but other non-pharmaceutical therapies are often not highlighted. The proposed research will implement the Food and Drug Administration (FDA) approved Alzheimer drug donepezil, Aricept [Pfizer], along with two cognitive training techniques, spaced retrieval and errorless learning, that have shown improvements in mild to moderate Alzheimer's disease populations. Outcome measures will focus on cognitive and physical functioning changes, activities of daily living (ADLs), and instrumental activities of daily living (IADLs), as well as changes in perceptions of memory loss. Very few studies have implemented the spaced-retrieval + errorless learning combination method on such a select and controlled population. The specific theoretical underpinnings for memory interventions when applying to a dementia population lie in the division of memory systems into explicit, versus implicit, memory. Implicit memory, or memory that enables information to be learned without awareness, appears to be relatively preserved early in the disease process as shown by studies involving increased naming speed, as well as learning of motor skills. This research proposal encompasses a biopsychosocial model for AD intervention. A biopsychosocial model for disease encompasses disease pathology, as well as taking into consideration psychological concerns, social contexts, and culture for the creation and implementation of treatment and health care options (Engle, 1977).

Key Words: *Alzheimer's disease, combination therapy, cognitive perceptions*

PM&R Resident Presentations (Projects)

X-linked Hypophosphatemic Rickets in Children: Gender-Associated Response of Calcitriol and Phosphate Supplementation on Linear Growth

Presenter: Melinda Hayes, MD

Collaborators: Richard J. Mier, MD

Departmental Affiliations: University of Kentucky, Physical Medicine and Rehabilitation, Shriners Hospital for Children

Problem: X-linked hypophosphatemia (XLH) is the syndrome of hereditary vitamin D-resistant rickets characterized by short stature, leg bowing and long bone changes. The current standard-of-care for children is calcitriol [1,25 (OH)₂ D₃] and phosphate supplementation, a regimen repeatedly shown to positively affect linear growth. Although the degree of serum phosphate depression is comparable in boys and girls, severity of clinical symptoms generally has been thought to be less severe in girls than in boys. Limited studies have shown improvement in height disproportionately greater in girls than in boys in response to medical management. **Hypothesis:** In children with XLH treated with calcitriol and phosphate supplementation, statistical significance exists between height-for-age z-scores of girls versus boys. **Methods:** The clinical records of 20 children (10 boys, 10 girls) diagnosed with XLH who were treated and followed for at least 36 months were examined retrospectively. Patients were divided by gender and age-matched. Data collected included age at onset of treatment, duration of treatment (to-date), height-for-age z-score at onset of treatment, current height-for-age z-score, type(s) of treatment, and complications of treatment. **Relevance:** Reproducible evidence that gender affects linear growth in response to medical treatment for XLH may guide future treatment strategies.

Key Words: X-linked hypophosphatemia; Rickets; Calcitriol; Phosphate

The Importance of Physician Attire

Presenter: Herbert B. Villaflores, MD

Collaborators: Randal Schleenbaker, MD

Departmental Affiliations: University of Kentucky
Department of Physical Medicine and Rehabilitation

Introduction: In the current medical climate, patient (consumer) opinion in health care is gaining importance. The patient's initial impression of the treating physician often sets the tone for patient trust and confidence. Physician appearance may influence that level of trust and confidence. Are the white coat, necktie or name badge key elements of the physician's attire considered by the patient to be important? **Hypothesis:** Patients consider it important for their treating physician to wear a white coat, necktie or name badge. **Methods:** A survey was developed to evaluate six elements in the physician's appearance. The questionnaires were distributed to an adult outpatient population. Each element is rated on a 4-point scale from strongly agree to strongly disagree, based on the patient's perception of importance. Mean responses for each element will be compared. **Results, Discussion and Conclusion:** TBA.

Key Words: Physician attire

Student Presentations (Projects)

Elder Abuse: The Needs and Roles of Speech-Language Pathologists

Presenter: Lyn Tindall, M.S., CCC-SLP, Doctoral student in the Rehabilitation Sciences Doctoral Program

Collaborators: Ruth Huebner, PhD

Departmental Affiliations: University of Kentucky, Eastern KY University, Physical Medicine and Rehabilitation, Department of Veterans Affairs Medical Center, Lexington, KY

Elders are the fastest growing population in America. Addressing the needs of this growing population is one of the greatest opportunities faced by speech-language pathologists (SLP). Elder abuse is an unfortunate adversity faced by this population, but the rate of elder abuse is underestimated and sadly not often addressed. Speech-language pathologists serving elders can have a pivotal role in identifying and managing the risk for abuse. To do this, SLPs need to understand the risks and symptoms of abuse in the population they are likely to serve. In this study, administrative data on more than 1300 abused elders in an entire state agency were stratified to compare patterns of abuse among a high functioning (HFG) and a low functioning group (LFG). The prevalence of abuse was higher among the low functioning group. The LFG was more likely to experience self or caregiver neglect rather than physical or partner abuse. Regardless of functional level, victims of elder abuse rarely reported the abuse. The role of the SLP is explored in relation to these findings.

Key Words: Elder abuse; functional decline; speech pathology

A Systematic Review of Clinical Evaluation and MRI Data to Assess the Performance of Specific Diagnostic Tools in the Evaluation of Posterior Medial Meniscal Lesions Confirmed Through Arthroscopy

Presenters: Matt Mattingly and Ryan McGuire

Collaborators: Dr. Terry Malone, Dr. Darren Johnson, Dr. Scott Mair

Departmental Affiliations: University of Kentucky, Physical Therapy

This study examined the effectiveness of MRI and clinical examination for suspected intrasubstance lesions of the posterior horn of the medial meniscus, in order to improve diagnostic accuracy and patient outcomes for this specific lesion. Twenty subjects who had a clinical exam and MRI, with Grade II signal changes, and subsequent arthroscopy for suspected intrasubstance lesions were included in this study. All subjects were examined and had arthroscopic exploration performed by the same orthopaedic physician at the same clinic. Results indicate that the overall values for accuracy, positive predictive value, negative predictive value, sensitivity and specificity for clinical examination was 65%, 92.3%, 14.3%, 66.7% and 50% respectively. The overall values for accuracy, positive predictive value, negative predictive value, sensitivity and specificity for MRI of the posterior horn of the medial meniscus was 85%, 94.1%, 33.3%, 88.9% and 50% respectively. Kappa coefficients indicated a non-significant (.05), low level of agreement between MRI and arthroscopic results and clinical examination and arthroscopic results. The authors concluded that intrasubstance tears can be symptomatic and can be represented by Grade II signal changes on MRI, and therefore MRI is a valuable diagnostic tool in the assessment of this specific lesion. Furthermore, a skilled and experienced clinician conducting all aspects of meniscal examination, and in possession of an MRI indicating a Grade II signal change in the posterior horn of the medial meniscus, must extensively probe and explore the meniscus before assigning the discrepancy to faulty MRI.

Key Words: Posterior horn medial meniscal lesions, Grade II MRI, accuracy of diagnostics

Student Presentations (Projects)

Using Three-dimensional Motion Analysis to Quantify Quadriceps Spasticity: A Pilot Study

Presenter: Hank White, MSPT

Collaborators: Augsburger S, Oeffinger D, Bowman A, Queen S, Edester B, Tylkowski C.

Departmental Affiliations: Shriners Hospital for Children, Lexington, KY; Department of Rehabilitation Sciences, University of Kentucky; Department of Kinesiology and Health Promotion, University of Kentucky.

Introduction: The Wartenberg pendulum test provides a quantitative measure of quadriceps spasticity. Prior studies using the pendulum test were based on subjective or single plane measurements. Because of the added potential for knee motion in the frontal and transverse planes, this study used three-dimensional motion analysis to capture knee motion in three planes during the pendulum test in children with a primary diagnosis of cerebral palsy (CP) and able-bodied children. **Methods:** Subjects (between 10 and 18 years old) included five able-bodied children and four children with the primary diagnosis of CP (spastic diplegia, GMFCS level II). Each subject was positioned in sitting with the knee in maximum extension and instructed to let the leg swing freely when released. Knee motions were measured using the standard Cleveland Clinic market set, surface EMG (muscle activity) and a three-dimensional analysis of variance (ANOVA) assessed differences among the means of area under the curve. Statistical comparison of means (paired t-test) revealed for children with CP, the knee demonstrated a smaller amount of first swing knee excursion (35 vs. 95 degrees), less total motion in all three planes and a slower peak angular velocity (137 vs. 284 deg/sec) compared to able-bodied subjects ($p < .05$). **Conclusions:** The data from this pilot study indicated during the pendulum test the knee of subjects with primary diagnosis of CP demonstrated smaller motions (in all three planes) at a slower velocity compared to the able-bodied subjects. **Acknowledgment:** Funded by Kosair charities

Key Words: *Spasticity assessment, motion analysis, cerebral palsy and Wartenberg pendulum test*

PM&R Resident Presentations (Posters)

Physiologic Bowlegs and Weight: Is there a Relationship?

Presenter: Markus Niederwanger, MD

Collaborators: Richard Mier, MD

Departmental Affiliations: University of Kentucky, Department of Physical Medicine and Rehabilitation, Shriners Hospital for Children, Lexington, KY.

Background: Physiologic bowing is a consequence of normal growth and development. Blount's disease (infantile tibia vara) can be difficult to differentiate from physiologic bowing. Obesity is a risk factor for Blount's disease. **Purpose:** To evaluate if there is a relationship between physiologic bowlegs and weight. **Methods:** Retrospective review of all cases diagnosed with "physiologic bowlegs" or "genu varum" at the Shriners Hospital in Lexington from 1995 to 2000. Inclusion criteria were age six months to three years and exclusion of non-physiologic bowing. Z-scores were calculated for weight-for-stature, weight-for-age, and stature-for-age. Paired t-test and ANOVA methods were used for statistical analysis. **Results:** Eighty-six cases were in the database. Seventy-five met the inclusion criteria. Eight cases were excluded because weight or stature was not recorded, and three cases were excluded due to the diagnosis of non-physiologic bowlegs during the follow-up period (one case was diagnosed with X-linked-hypophosphatemia and two with Blount's disease on follow-up). Forty-five were male, 30 female, mean age was 19 months (6 to 35 months), and mean height 81.7 cm (68 to 105 cm). Z-scores for weight-for-stature and for weight-for-age were significantly increased compared to the reference pediatric population ($p < 0.0001$), z-score for stature-for-age was not statistically significantly different ($p = 0.63$). **Conclusion:** Children with physiologic bowlegs had significantly increased weight-for-stature in this retrospective study. **Discussion:** There are no risk factors reported for physiologic bowlegs in the literature. This study raises the question of an association between increased weight-for-stature and physiologic bowlegs. Three cases originally diagnosed with physiologic bowlegs were later diagnosed with non-physiologic causes for bowlegs.

Key Words: *Bowlegs; weight-for-stature*

Student Presentations (Posters)

A Program for Providing Follow-up Services to Persons with Mild Traumatic Brain Injury

Presenters: Tamara Cranfill

Collaborators: Sandy A. Starch, Robert C. Marshall, Colleen Karow

Departmental Affiliations: University of Kentucky, Department of Rehab Sciences

(See poster on the next page)

Development of a Multi-Media CD-ROM Entitled “Hydrotherapy for the Physical Therapist.”

Presenters: Sarah Payton and Sheila McLean

Collaborators: Professor Debbie Kelly and Professor Tony English

Departmental Affiliations: Department of Health Sciences at the University of Kentucky.

Background and purpose: Interactive multimedia as a learning tool has been used in a wide variety of settings and with many different users. Its benefits include ease of use, convenience, cost effectiveness, and an opportunity for self-assessment. The purpose of this project was to develop a CD-ROM to be used as a learning tool for teaching and reviewing the practice of hydrotherapy in the field of physical therapy. **Methods:** A review of the literature was performed to find information regarding the use of computers for educational purposes and supporting the use of a CD-ROM as a learning tool. Video footage was taken at local hydrotherapy facilities to be incorporated into Microsoft PowerPoint to create the CD. An alpha test and beta test were given to thirteen physical therapy students to allow critiquing and provide suggestions for editing the CD-ROM. Audio was recorded and other necessary changes were made to the project. **Results:** The majority responded “agree” or “strongly agree” to all aspects of the alpha test and beta test. All comments were considered when making the final adjustments to the CD-ROM. **Discussion and conclusion:** Computer aided instruction has been shown to be effective in teaching students of various disciplines. One drawback to this type of learning is that it requires some basic computer skills to operate the program. However, due to the wide utilization of computers today, this drawback will become increasingly less problematic. This study supports the use of a CD-ROM as a learning tool for graduate students.

Key Words: Hydrotherapy, CD-ROM, multimedia

Student Presentations (Posters)

Russian Stimulation and the Fatiguing Effects on Knee Extensors

Presenter: Bradley J. Davidson

Collaborators: Anthony Vertalino, Evan Hall

Departmental Affiliations: University of Kentucky, Physical Therapy

The purpose of this study was to examine whether fatigue occurred from high amplitude neuromuscular electrical stimulation to the knee extensors. Subjects performed functional hop tests and performance was assessed based on either time or jump height. Thirty-two physical therapy students at the University of Kentucky (16 women and 16 men) participated in this study. Twenty-eight students participated in two trials each of a six-meter timed hop and single leg vertical hop test for dominant and non-dominant lower extremities before and after receiving "Russian" electrical stimulation. Of these twenty-eight students, fourteen did not receive stimulation (sham group) and fourteen received stimulation (stim group). Two of the last four subjects, not participating in functional hop tests, were evaluated by obtaining isokinetic data before and after receiving high amplitude electrical stimulation. The other two were used as a control. No significant difference was found between the stim and sham groups for either the vertical jump ($p=.2649$) or the timed 6M hop ($p=.9857$). The following results can be suggested from this study: a 10/50/10 regimen of Russian electrical stimulation was not found to be significant in producing fatigue; functional hop tests are safe to perform immediately following Russian Stimulation; and functional testing remains consistent with isokinetic findings.

Correspondence Between Thickness of Articular Cartilage in the Femur on MR Images and in Anatomical Sections

Presenter: Amanda Guzy and Christy Napier

Collaborators: Peter Hardy, PhD and Anne Harrison, PT, PhD

Departmental Affiliations: University of Kentucky Rehabilitation Sciences

Purpose: MR imaging (MRI) may be a valuable and sensitive tool for examination of individuals with knee osteoarthritis. The purpose of this study is to find the correspondence between the thickness of articular cartilage in the femur and tibia on MR images and in photographs of anatomical sections. This would add to the validity of using MRI to evaluate individuals with osteoarthritis. **Methods:** Four cadaver knees were attached to a jig that would allow the knees to be held securely while they were being imaged. This would produce 64 sagittal images. Muscle and fat were removed from around the knee joint and the joint was disarticulated. The separated tibia and femur were taken to the morgue and using a bandsaw the bones were sectioned at appropriate intervals and then photographed. The images were then digitized and put into the same image-processing computer as the MR images. Marks were made at different places around the cartilage and the software computed the thickness at those points. **Results:** A correlational graph of the photograph thickness vs. MRI thickness was made to get the correlational value. The overall R^2 value was 0.76. The knee was divided into three sections and graphed as pictured. The R^2 value for the lateral section was 0.80, the middle group was 0.59, and for the medial group was 0.83. **Conclusion:** The findings contributed positively to the validity of using MRI in examining patients with osteoarthritis.

Key Words: MRI, osteoarthritis, anatomical sections, knee

Student Presentations (Posters)

A Pilot Study to Quantify Hamstring Spasticity Using Three-Dimensional Motion Analysis

Presenter: Hank White, MSPT

Collaborators: Augsburger S, Oeffinger D, Bowman A, Edester B, Tylkowski C

Departmental Affiliations: Shriners Hospital for Children, Lexington, KY; Department of Rehabilitation Sciences, University of Kentucky; Department of Kinesiology and Health Promotion, University of Kentucky

Introduction: The purpose of this study is to present a new measure of hamstring spasticity by comparing the results of a freely extending knee (measured by motion analysis) between children with a primary diagnosis of cerebral palsy (CP) and able-bodied children. **Methods:** A prospective pilot study was performed with five able-bodied individuals and four individuals with the primary diagnosis of CP, spastic diplegia. Inclusion criteria were children between 10 and 18 years old. Children with CP who have undergone any spasticity reducing intervention were excluded. Informed consent and IRB approval were obtained. Subjects were positioned in prone with the knee flexed and instructed to let the leg fall into extension. Data were collected using a Motion Analysis Corporation Real Time System (Motion Analysis Corporation, Santa Rosa, CA), the Cleveland Clinic market set and surface EMG. Analysis of pilot data revealed this was an appropriate sample size for statistical analysis. **Results:** An analysis of variance (ANOVA) assessed differences among the means. Statistical comparison of means (paired t-test) between able-bodied children and children diagnosed with cerebral palsy, were performed. In children diagnosed with CP, the knee demonstrated a smaller amount of total knee excursion (67 vs. 88 degrees), and slower peak angular velocity (239 vs. 295 deg/sec) ($p < .05$) compared to able-bodied subject's knee. **Conclusion:** This study illustrates that objective data collected using three-dimensional motion analysis can be used to assess tone-spasticity of the hamstrings. **Acknowledgments:** Funding for this project was provided by Kosair charities, Louisville, KY.

Key Words: *Spasticity assessment, motion analysis and cerebral palsy*

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Cardinal Hill Rehabilitation Hospital



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