2013 Research Annual Report

Neurology

Division Details

Division Data Summary

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<td>Inpatient Encounters</td>
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<td>Outpatient Encounters</td>
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Significant Accomplishments

**Comprehensive Neuromuscular program**

Our Comprehensive Neuromuscular Care Center continues to be a center of excellence for the coordinated care of patients with pediatric neuromuscular disorders, especially Duchenne muscular dystrophy (DMD). More than 80 percent of our DMD patients travel here from other states and nations, including some from as far as Russia and Ireland. We also have become world-class experts in caring for patients with dystrophinopathy. Meanwhile, our new "one stop" interdisciplinary neuromuscular clinic brings specialists from as many as nine different fields to one location to serve our patients with multi-system needs.

Our Research in Neuromuscular Disease

We participate in ongoing industry-sponsored clinical trials as well as in a transcriptomics and proteomics study in DMD. This has been attained through training of residents and fellows and collaboration with multiple divisions, including endocrinology, cardiology and radiology.

**Breakthrough Headache Research**

Our Headache Center, formed 16 years ago, continues to grow in the management, treatment and understanding of headaches in children, adolescents and young adults. Our multidisciplinary outpatient clinic,
acute treatment center, young adult headache program and a focused inpatient service provide the basis for the research and educational activities, including an UCNS-certified Headache Medicine fellowship. Our research highlights from the past year include an NIH-sponsored study that demonstrated significant effectiveness of cognitive behavioral therapy in a multidisciplinary care model of the treatment of chronic migraine that is comparable to pharmaceutical treatment in adults. We also are comparing the effectiveness of amitriptyline and topiramate in the prevention of pediatric and adolescent migraine (CHAMP) study with significant collaborative effort from Behavioral Medicine and Clinical Psychology, the Center for Clinical and Translation Research and the Department of Biostatistics and Clinical Trials Statistical and Data Management Center at the University of Iowa.

**Tuberous Sclerosis Program is the World's Largest**

Our Tuberous Sclerosis Program, now designated a Center of Excellence, is the largest in the world and the only one that manages every aspect of the disorder in both adults and children. We receive increasing numbers of national and international referrals because our program conducts leading-edge research while offering unique social and emotional support to patients and families, such as our TSC summer camp, the first and only one of its kind. Research conducted or led by our physicians has resulted in 15 peer-reviewed publications over the past year. We also have launched an NIH-sponsored, multisite, national study to continue to improve care for children with TSC.

**Research Highlights**

Mark Schapiro, MD

We previously showed differences in neural activation during language processing in adolescents and young adults with Down syndrome in comparison with typically developing individuals matched for chronological age. We now show that activation in the adolescents and young adults with Down syndrome differs significantly in magnitude and spatial extent when compared with both chronological and mental age-matched typically developing control groups during a story listening task. These results provide additional support for an atypical pattern of functional organization for language processing in this population.


**Movement disorder (Donald Gilbert, MD and Steve Wu, MD)**

*ADHD/ Tourette Syndrome:* We have two ongoing NIH-funded studies of motor cortex physiology as a biomarker of behavioral control impairments and of pharmacological treatment responses in ADHD.

*Neuroplasticity: Long Term Potentiation/Depression:* Dr. Steve Wu has led a series of exciting studies piloting new methods of using Transcranial Magnetic Stimulation to study long term potentiation and long term depression in motor cortex.

*Tourette Syndrome Genetics:* We are a site in a new, international, NIMH funded collaborative study of genetics of Tourette Syndrome.

*Clinical Trials in Tourette Syndrome:* We just completed a phase 2a study of a new pharmacological treatment for Tourette Syndrome, and we are participating in an ongoing study.
Tuberous Sclerosis (Darcy Krueger, MD, PhD and David Franz, MD)

The TSC Center, led by Drs. Franz and Dr. Krueger, has seen considerable expansion in both clinical care and research projects in 2013, building on similar successes of 2012. In 2013 alone, two major NIH-funded research studies and one major multicenter phase III clinical trial were officially launched. Major publications by the group included manuscripts in high-impact journals such as *Lancet, Annals of Neurology, PlosOne, and Chest*.

Epilepsy (Tracy Glauser, MD; Todd Arthur, MD; Hans Greiner, MD; Barb Hallinan, MD; Katherine Holland, MD; Sejal Jain, MD; Diego Morita, MD; Douglas Rose, MD; Shannon Standridge, MD; Jeff Tenney, MD; Cameron Thomas, MD)

The Comprehensive Epilepsy Center discoveries ranged the entire spectrum from clinical trials results through epilepsy surgical evaluation techniques to animal models of epileptogenesis. In the ongoing NIH funded Childhood Absence epilepsy study, 12-month outcome data from the double blind portion of the study confirmed that ethosuximide is the optimal initial empirical monotherapy for CAE and established this study as the first randomized controlled trial meeting International League Against Epilepsy criteria for class I evidence for any type of generalized seizure in adults or children. In addition, this study reported the EEG characteristics of untreated Childhood Absence Epilepsy along with the associations between specific EEG findings and baseline measure of attention and short term outcome. The surgical epilepsy team identified that ictal high-frequency oscillations are commonly seen with intracranial EEG and have localizing value. Complete resection of the high-frequency oscillations region was a favorable prognostic indicator for surgical outcome. Lastly, using a transgenic mouse model, the epilepsy basic scientists discovered that deletion of PTEN from postnatally generated dentate granule cells led to hyperactivation of the mTOR pathway and subsequent spontaneous seizures, confirming that these abnormal dentate granule cells can cause epilepsy.

**Division Publications**


Faculty, Staff, and Trainees

**Faculty Members**

- **Andrew Hershey, MD, PhD**, Professor
  - **Leadership** Division Director; Director Headache Center
  - **Research Interests** Migraine, blood genomics

- **Todd Arthur, MD**, Assistant Professor
  - **Research Interests** Brain concussion
Anna W Byars, PhD, Associate Professor
  Research Interests Cognitive effects of epilepsy

James Collins, MD, PhD, Assistant Professor
  Research Interests Congenital Muscular Dystrophy; Neuromuscular Disease

David Franz, MD, Professor
  Leadership Director Tuberous Sclerosis program
  Research Interests Tuberous sclerosis

Donald Gilbert, MD, Professor
  Leadership Director Movement Disorders program; Director Neurology Residency Program
  Research Interests Tourette syndrome, Transcranial Magnetic Stimulation (TMS)

Tracy A Glauser, MD, Professor
  Leadership Director Comprehensive Epilepsy program
  Research Interests Epilepsy, pharmacology

Hansel Greiner, MD, Assistant Professor
  Research Interests Epilepsy

Barbara Hallinan, MD, PhD, Assistant Professor
  Research Interests CSF steroid profiles

Katherine Holland-Bouley, MD, PhD, Associate Professor
  Research Interests Ion channels and epilepsy

Sejal Jain, MD, Assistant Professor
  Research Interests Epilepsy, sleep

Marielle A Kabbouche, MD, Associate Professor
  Research Interests Migraine

Darren Kadis, PhD, Assistant Professor
  Research Interests Neuroimaging and MEG of language

Darcy Krueger, MD, PhD, Associate Professor
  Research Interests Tuberous Sclerosis

Diego Morita, MD, Assistant Professor
  Research Interests Epilepsy, pharmacology

Hope O’Brien, MD, Assistant Professor
  Research Interests Headaches

Douglas Rose, MD, Professor
  Leadership Director, MEG lab
  Research Interests Magneto-Encephalography (MEG)

Mark Schapiro, MD, Professor
  Research Interests Neurodevelopmental disorders

Matthew Skelton, PhD, Assistant Professor
  Research Interests Neurobehavioral and neurometabolic
Shannon Standridge, DO, Assistant Professor
  Research Interests Outcomes study, epilepsy

Mary Sutton, MD, Associate Professor
  Research Interests Neuro-oncology

Jeffrey Tenney, MD, PhD, Assistant Professor
  Research Interests Neurophysiology and genesis of absence epilepsy

Cameron Thomas, MD, Assistant Professor
  Research Interests Neonatal neurology

Jennifer Vannest, PhD, Associate Professor
  Research Interests Speech and language development

Charles Vorhees, PhD, Professor
  Leadership Director Animal Neurobehavior Core
  Research Interests Drugs/toxicants and brain development

Kristen Wesselkamper, MD, Assistant Professor
  Research Interests Improvement science

Michael Williams, PhD, Associate Professor
  Research Interests Drugs/toxicants and brain development

Brenda Wong, MD, Professor
  Leadership Director Neuromuscular program
  Research Interests Duchenne's Muscular Dystrophy, Spinal Muscular Atrophy

Steve Wu, MD, Assistant Professor
  Research Interests Movement Disorder; Transcranial Magnetic Stimulation (TMS)

Jing Xiang, MD, PhD, Associate Professor
  Leadership Director MEG Research program
  Research Interests MEG

Joint Appointment Faculty Members

  Michael Miles, PhD, Professor (Pathology)

Clinical Staff Members

  Jamie Capal, MD,
    Neurodevelopment and neurobehavior

  Irina Rybalsky, MD,
    Duchenne's Muscular Dystrophy

Trainees

  Ravindra Arya, MD, DM, PGYX, All India Institute of Medical Sciences
  Haneul Lee, MD, PGYV, Yonsei University
  Nina Natarajan, MD, PGYV, University of Cincinnati
  Sarah Weatherspoon, MD, PGYV, University of Texas Southwestern
  Katrina Peariso, MD, PGYV, University of New Mexico
Thomas Dye, MD, PGYV, St. Louis University
Tanishia Williams, MD, PGYV, University of Medicine & Dentistry of New Jersey
Gewalin Aungaroon, MD, PGYIV, Faculty of Medicine Ramathibodi
Dror Kraus, MD, PGYIV, Hebrew University
Michael Oldham, MD, PGYIV, George Washington University
Cuixia Tian, MD, PGYIV, Medical Center of Fudan University
Vinita Knight, MD, PGYIII, Eastern Virginia Medical School
Kelly Kremer, MD, PGYIII, University of Cincinnati
Michael Sweeney, MD, PGYIII, Medical College of Wisconsin
Marissa Vawter, MD, PGYIII, Indiana University

Division Collaboration

Human Genetics; Neurosurgery; Neuroradiology; Psychology/Neuropsychology; Developmental Pediatrics; Psychiatry » Drs. T.A. Burrow, Derek Neilson, Taoshang Huang, Dr. E. Air, Dr. K. Cecil, Dr. B. Lejeune, Dr. C. Erickson, and Dr. E. Harris
Movement Disorders Clinic/Tourette's Disorder Clinic

Neurosurgery; Anesthesia; Bioinformatics; Radiology » Dr. F. Mangano, Dr. S. Danzer, Dr. J. Pestian, and Drs. J. Leach, M. Gelfand
Comprehensive Epilepsy Program

Pulmonary Medicine; Nephrology; Plastic Surgery; Radiology; Neurosurgery; Cardiology; Human Genetics; Psychiatry; Genetics; DDBP » Drs. L. Young, F. McCormack, Dr. C. Gordon, Drs. M. Care, J. Leach, Drs. K. Crone, M. Care, S. Serai, W. Yuan, Dr. T. Knilans, Dr. B. Schorry, Dr. D. Nelson, Dr. E. Schorry, and Drs. D. Murray, N. Bing; B. Kent
Tuberous Sclerosis Program

Behavioral Medicine and Clinical Psychology; Hematology » Drs. S. Powers, A Lynch-Jordan, L. Crosby, S. Slater and Drs. Karen Kalinyak, Charles Quinn
Headache Center

Cardiology; Developmental and Behavioral Pediatrics; Nutrition; Human Genetics; Gastroenterology; Endocrinology; Orthopedics; Speech Therapy; Rehabilitative Medicine; Pulmonary; Physical Therapy; Pathology; Pediatric Surgery; Anesthesia & Palliative Care; Pain Services; Social Services; Translational Research; Nephrology » Drs. J. Towbin, JL Jefferies, R. Spicer, L. Cripe, Dr. D. Schonfeld, B. Godshall, D. Boutwell, M. Walker genetic counselor, Drs. A Kaul, N. Yazigi, A. Miethke, Drs. M. Rutter, S. Rose, Drs. J. McCarthy, V. Jain, P. Sturm, J. Linck, Dr. M. McMahon, Drs. R. Amin, H. Sawnani, J. Crisalli, A. McCormick, M. McGuire, Drs. L. Miles, K. Bove, Drs. R. Brown, T. Inge, Dr. N. Weidner, M. Meyer, Dr. K. Goldschneider, L. Demosthenes, Dr. J. Molkentin, and Dr. E. Jackson
Comprehensive Neuromuscular Center

Sport Medicine; Physical Medicine & Rehabilitation » Drs. J. Divine, N. Edwards, M. Shaffer and B. Kurowski
Concussion Clinic

Neonatology & Pulmonary Biology; Cardiology; Hematology » Drs. B. Haberman, T. Cahill, S. Merhar, N. Monangi, Drs. B. Marino, J. Anderson, and Dr. D. Adams, A. Hammill
Neonatal Follow-up Clinic

Pulmonary » Drs. N. Simakajornboon, M. Ednick, J. Crisalli, H. Sawnani, G. McPhail
Sleep Clinic
Human Genetics; Allergy & Immunology; Anesthesiology; Developmental Biology; Experimental Hematology; Psychiatry; General & Thoracic Surgery; Endocrinology; Neurosurgery; Neuroimaging Research Consortium; Pulmonary Biology » Drs. G. Grabowski, Y. Sun, T. Huang, R. Stottmann, Drs. M. Rothenberg, H. Zhu, Dr. S. Danzer, A. Lepke, Drs. K. Campbell, M. Nafafuku, Drs. R. Waclaw, L. Ehrman, D. Pan, N. Ratner, Dr.C. Erickson; T. Schaefer, Dr. M. Helmrath, Dr. T. Nakamura, Dr. F. Mangano, Dr. W. Yuan, and Dr. J. Bridges

Neurobehavioral Animal Core (Vorhees and Williams lab)

Rehabilitative Medicine » Drs. D. Pruitt, L. Michaud

Pediatric Demyelinating Disease Clinic

Speech Pathology; Pediatric Neuroimaging Research Consortium; Biomedical Informatics; Radiology; Biostatistics & Epidemiology; Heart Institute Research/Heart Institute Neurodevelopmental Clinic; Pulmonary; Autism Speaks; Human Genetics » Dr. E. Redle, Drs. S. Holland, V. Schmithorst, Dr. M. Wagner, Dr. J. Tkach, S. Holland, G. Lee, Dr. M Altaye, Dr. B. Marino, Dr. R. Amin; Keith McConnell - Sr. Biomedical Engineer, Dr. D. Murray, and Dr. E. Schorry

Neuroimaging of Childhood Apraxia of Speech,

Cincinnati MR Imaging of Neural Development-(C-MIND study)

Gastroenterology and Nutrition; Pathology; Neurosurgery » Drs. R. Kohli, S. Xanthakos, Dr. L. Miles, and Dr. F. Mangano

Mitochondrial & Pathological Studies in Epilepsy Surgery/Evaluation of Coenzyme Q10 as a biomarker in liver disease

Child & Adolescent Psychiatry; Physical Medicine & Rehabilitation » Dr. E. Harris and Dr. J. Vargus-Adams

MEG Research

Grants, Contracts, and Industry Agreements

Grant and Contract Awards

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<td>Early Biomarkers of Autism Spectrum Disorders in Infants with Tuberous Sclerosis</td>
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<td>Potential EEG Biomarkers and Antiepileptogenic Strategies for Epilepsy in TSC</td>
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## Training Grant in Teratology

**National Institutes of Health**

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