

# Division of Neurology

DIVISION PROFILE	
Number of Faculty	18
Number of Staff Physicians	1
Number of Fellows	
Clinical Fellows	10
Number of Other Students (full and part-time)	28
Number of Support Personnel	50
Annual Total Grant Support (direct)	\$1,353,585
Annual Total Industry Contracts (direct)	\$73,835
Number of Peer Reviewed Publications	50
Patient Encounters	
Outpatient	15,436
Inpatient	3,338

## FACULTY LISTING

Ton J. deGrauw, MD, PhD, Professor of Pediatrics and Neurology, Director, Child Neurology  
Anna W. Byars, PhD, Associate Professor of Pediatrics and Neurology  
David N. Franz, MD, Associate Professor of Pediatrics and Neurology, Associate Director of Clinical Affairs; Director, Tuberous Sclerosis  
Donald L. Gilbert, MD, Associate Professor of Pediatrics and Neurology, Director, Tourette Syndrome and Movement Disorders Center  
Tracy A. Glauser, MD, Professor of Pediatrics and Neurology, Director, Comprehensive Epilepsy Program  
Andrew A. Hershey, MD, PhD, Associate Professor of Pediatrics and Neurology, Director, Headache Center  
Katherine D. Holland, MD, PhD, Assistant Professor of Pediatrics and Neurology  
Marielle A. Kabbouche, MD, Assistant Professor of Pediatrics and Neurology  
Lois A. Krousgrill, MD, Assistant Professor of Pediatrics and Neurology  
Diego Morita, MD, Assistant Professor of Pediatrics and Neurology  
Tonya M. Phillips, MD, Associate Professor of Pediatrics and Neurology  
Douglas F. Rose, MD, Professor of Pediatrics and Neurology, Director, Neurophysiology Laboratory; Director of EEG, EMU and MEG Center  
Mark B. Schapiro, MD, Professor of Pediatrics and Neurology, Director, Child Neurology Residency Program  
Mary E. Sutton, MD, Assistant Professor of Pediatrics and Neurology  
Charles V. Vorhees, PhD, Professor of Pediatrics  
Michael T. Williams, PhD, Research Assistant Professor of Pediatrics  
Brenda L. Wong, MD, Associate Professor of Pediatrics and Neurology, Director, Neuromuscular Program  
Jing Xiang, MD, PhD, Associate Professor of Pediatrics and Neurology, Director of MEG Research; Director of Research Training Program MEG Center

## STAFF PHYSICIAN LISTING

Tina M. Narayan, MD

## OVERVIEW

### Clinical Activities

The Division of Neurology serves the Tri-State community of the Greater Cincinnati area. In recent years we have received referrals from outside the area as the reputation of the division has grown. One-third of our patients now come from outside the Greater Cincinnati area. In addition, we see an increasing number of

patients from anywhere in the United States and abroad in our subspecialty clinics. Speciality clinics include Headache (494 new patients), Movement Disorders (457 new patients), Neuromuscular Disorders (156 new patients), Neurometabolic Disorders (38 new patients), New Onset Seizures (186 new patients), Tuberous Sclerosis (47 new patients) and Stroke (4 new patients). In addition, the Neurology division has an Intractable Epilepsy Clinic as well as an Epilepsy Surgery Program and we participate in the Neuro-oncology Program. Our out-patient clinics continue to grow and serve more patients every year. This year 3,662 new patients and 11,774 follow-up patients were seen by the Neurology division in our clinics.



*Left to Right: (1<sup>st</sup> row) D. Morita, A. Byars, M. Sutton, T. deGrauw, J. Xiang, T. Phillips, J. Vannest (2<sup>nd</sup> row) D. Rose, K. Lee, M. Schapiro, T. Glauser, K. Wesselkamper, C. Vorhees, M. Williams, A. Hershey, B. Hallinan, M. Kabbouche, D. Franz, D. Gilbert, L. Krousgrill*

The Clinical Neurophysiology Laboratory is part of the Division of Neurology where EEG (3,883), EMG (66), evoked potential (19) services are offered. The In-patient EEG Video Monitoring Unit (527 admissions) consisting of six beds is used for diagnostic purposes as well as for phase 1 and phase 2 studies for the Surgical Epilepsy Program.

### Education

The Pediatric Neurology Residency offers three positions per year. In addition, we offer Fellowships in Neurodevelopmental Disabilities, Epilepsy, Clinical Neurophysiology, Neuropharmacology, Headache and Neuromuscular Disease.

Twenty-eight medical students, residents and fellows of other disciplines rotated through the Neurology Service during this past year.

Several of the neurologists and neuroscientists are invited speakers at national and international scientific meetings for their expertise in neurological disorders, neuropharmacology or neurotoxicology.

### Research

Drs. Glauser and Morita study metabolism and toxicity of anti-epileptic drugs. Dr. Glauser continues his study of childhood absence epilepsy as the leader of a multi-center study.

Drs. Byars and Schapiro study language development in patients with stroke, epilepsy and Down's syndrome using fMRI and other imaging techniques in collaboration with the Imaging Research Center at CCHMC.

Multiple faculty members are involved with the study of blood genomics in a variety of neurological disorders in children.

Dr. Wong continues her clinical study in Duchenne Muscular Dystrophy.

Dr. Franz reported a breakthrough on new treatment strategies in patients with tuberous sclerosis.

Drs. Hershey and Kabbouche continue their clinical studies in patients with migraine.

Drs. Vorhees and Williams study developmental interactions of methamphetamine and stress in animal models.

Dr. Gilbert studies motor cortex physiology in Tourette syndrome and ADHD using transcranial magnetic stimulation.

## HIGHLIGHTS

### Movement Disorders Program

The Movement Disorders Program is directed by Dr. Donald Gilbert. He sees patients with Tourette syndrome and other tic disorders as well as patients with chorea, athetosis and dystonia. The program sees an increasing number of patients from multiple states in the region for second opinions. In the past year, Dr. Gilbert, in collaboration with neurologists and neurosurgeons at the University of Cincinnati College of Medicine, started a new functional neurosurgery program where several patients have been treated with pallidotomy and deep brain stimulator implantation. Dr. Gilbert is on the Medical Advisory Board of the Tourette Syndrome Association. His research focuses on transcranial magnetic stimulation in patients with Tourette syndrome. He was part of the group that identified the first gene mutations (SLITRK1) in Tourette syndrome.

### Neuromuscular Program

The Neuromuscular Comprehensive Care Center/Muscular Dystrophy Association (MDA) clinic has established itself as the first interdisciplinary pediatric neuromuscular clinic in the country for the care of patients with pediatric neuromuscular diseases, in particular Duchenne muscular dystrophy (DMD) and Spinal Muscular Atrophy. The Neuromuscular team of specialists under the directorship of the pediatric neuromuscular specialist, Dr. Brenda Wong, provides coordinated holistic care of these patients and families. The center was recognized by Parent Project Muscular Dystrophy, the family support group for Duchenne muscular dystrophy in July 2006 for its efforts to improve the care of children with Duchenne muscular dystrophy.

The center is actively involved in clinical research in the various aspects of Duchenne muscular dystrophy and spinal muscular atrophy, including close collaboration with other pediatric neuromuscular centers, cardiologists and pulmonologists. There is also ongoing basic science research involving the mdx mouse, the animal model for DMD.

Through its comprehensive program of clinical and research activities, the neuromuscular program provides in-depth training of medical students, pediatric residents, neurology residents and neurophysiology fellows.

### Tuberous Sclerosis Program

In the past year the Tuberous Sclerosis Clinic (TSC) continued to expand and enhance its services to patients and families throughout the United States and the world. Approximately 450 adults and children with TSC are now followed at CCHMC, making ours the largest TSC clinic in the world. The CCHMC TSC program is also unique in that it provides truly multidisciplinary on-site coordinated care involving several medical specialties, (pulmonology, nephrology, psychiatry, genetics, cardiology, ophthalmology, neurology, neuroradiology, social work, dentistry, neurosurgery), overseen by a clinic coordinator and two nurse practitioners. Our expertise has been enlisted not only in the care of patients throughout the world, but also to aid in the creation of and enhancement of services at TSCs in Sydney, Australia, Auckland, New Zealand, Berlin and throughout the Federal Republic of Germany, as well as in Lithuania, Italy, Greece, Poland, and the UK. This culminated in Dr. Franz receiving the Manuel R. Gomez Award from the TS Alliance for scientific and humanitarian efforts to find a cure for TSC while improving the lives of those affected.

With regard to research, our group completed the first ever therapeutic trial in TSC, involving the use of rapamycin for angiomyolipomas, funded by the National Cancer Institute, TS Alliance, and LAM Foundation. The effect of rapamycin in causing regression of astrocytomas in TSC was published in *Annals of Neurology*. New trials involving the mTOR inhibitor RAD001 (everolimus) for angiomyolipomas, lymphangiomyomatosis, giant cell astrocytoma, and epilepsy, began or are under development. We also received NCI

funding to participate in a multi-center trial of rapamycin for AML's. Fruitful collaborations with Dr. George Thomas of the University of Cincinnati's Genome Research Institute, Dr. Pier Paolo Pandolfi of Memorial Sloan Kettering Institute and Dr. David Kwiatkowski of Harvard Medical School continue to evaluate the genetic mechanisms of TSC.

## TRAINING

Marc DiSabella MD	PGY III	Cooper University Hospital
Pierre Fequiere MD	PGY III	Long Island College Hospital
Steve Wu MD	PGY III	Cincinnati Children's Hospital
Madeline Chadehumbe MD	PGY IV	Michigan State University
Darcy Krueger MD, PhD	PGY IV	Cincinnati Children's Hospital
Holly Dudley-Harrell MD	PGY IV	Cincinnati Children's Hospital
Barbara Hallinan MD, PhD	PGY V	Cincinnati Children's Hospital
Kristen Wesselkamper MD	PGY VI	Cincinnati Children's Hospital
Todd Arthur MD	PGY VII	West Virginia University Hospital
Argirious Dinopoulos MD	PGY IX	University of Athens

## GRANTS, CONTRACTS AND INDUSTRY AGREEMENTS

Grant and Contract Awards	Annual Direct/Project Period	Direct
<b>deGrauw, A</b>		
Childhood Epilepsy: Factors Affecting Adaptation		
National Institutes of Health (Indiana University-Purdue University Indianapolis subcontract)		
R37 NS 022416	05/19/00 – 4/30/07	\$77,152/\$516,744
<b>Franz, D</b>		
Multi-center Clinical Trials for TSC & Related Disorders (per patient)		
National Institutes of Health (Brigham & Women's Hospital subcontract)		
R01 CA 107164	03/01/05 – 02/28/08	\$28,637/\$52,512
<b>Gilbert, D</b>		
Effectiveness of Multi-Drug Treatments in Tourette's		
National Institutes of Health		
K23 NS 041920	08/15/01 – 07/31/06	\$115,750/\$578,750
<b>Glauser, T</b>		
Childhood Absence Epilepsy Rx, PK-PD Pharmacogenetics		
National Institutes of Health		
U01 NS 045911	09/30/03 – 10/31/08	\$0/\$14,846,498
<b>Hershey, A</b>		
Genomics of Pediatric Headache Disorder		
National Institutes of Health		
R01 NS 045752	07/15/03 – 06/30/07	\$237,500/\$950,000
<b>Vorhees, C</b>		
Developmental Effects of Methamphetamine-Like Stimulant		
National Institutes of Health		
R01 DA 006733	04/01/05 – 03/31/10	\$195,300/\$1,000,000
Training Program in Teratology		
National Institutes of Health		
T32 ES 007051	07/01/02 – 06/30/07	\$249,156/\$1,123,248
Effects of Neonatal MDMA on Brain and Behavior		
National Institutes of Health		
R01 DA 021394	04/01/06 – 03/31/11	\$200,000/\$1,000,000

Weber-Byars, A		
Functional Language Organization in Childhood Stroke National Institutes of Health K23 NS 045019	04/15/02 – 03/31/07	\$142,010/\$675,994
Williams, M		
Developmental Interactions of Methamphetamine and Stress National Institutes of Health K01 DA 014629	04/01/02 – 03/31/07	\$108,080/\$534,899
Current Year Direct		\$1,353,585
<b>Industry Contracts</b>		
Gilbert, D		
Lilly Research Laboratories		\$10,975
Glaser, T		
UCB Pharma, Inc.		\$26,016
Hershey, A		
Johnson & Johnson		\$1,540
Holland-Bouley, K		
UCB Pharma, Inc.		\$25,025
Wong, B		
PTC Therapeutics		\$10,279
Current Year Direct Receipts		\$73,835
<b>TOTAL</b>		<b>\$1,427,420</b>

## PUBLICATIONS

1. Plante E, Schmithorst VJ, Holland SK, Byars AW. Sex differences in the activation of language cortex during childhood. *Neuropsychologia* 2006;44(7):1210-21.
2. Szaflarski JP, Holland SK, Schmithorst VJ, Byars AW. fMRI study of language lateralization in children and adults. *Hum Brain Mapp* 2006;27(3):202-12.
3. Szaflarski JP, Schmithorst VJ, Altaye M, Byars AW, Ret J, Plante E, Holland SK. A longitudinal functional magnetic resonance imaging study of language development in children 5 to 11 years old. *Ann Neurol* 2006;59(5):796-807.
4. Jones MD, Ryan M, Miles MV, Tang PH, Fakhoury TA, Degrauw TJ, Baumann RJ. Stability of salivary concentrations of the newer antiepileptic drugs in the postal system. *Ther Drug Monit* 2005;27(5):576-9.
5. Dinopoulos A, Cecil KM, Schapiro MB, Papadimitriou A, Hadjigeorgiou GM, Wong B, deGrauw T, Egelhoff JC. Brain MRI and proton MRS findings in infants and children with respiratory chain defects. *Neuropediatrics* 2005;36(5):290-301.
6. Dinopoulos A, Matsubara Y, Kure S. Atypical variants of nonketotic hyperglycinemia. *Mol Genet Metab* 2005;86(1-2):61-9.
7. Dinopoulos A, Smeitink J, ter Laak H. Unusual features of mitochondrial degeneration in skeletal muscle of patients with nuclear complex I mutation. *Acta Neuropathol (Berl)* 2005;110(2):199-202.
8. Kure S, Kato K, Dinopoulos A, Gail C, DeGrauw TJ, Christodoulou J, Bzduch V, Kalmanchey R, Fekete G, Trojovský A, Plecko B, Breningstall G, Tohyama J, Aoki Y, Matsubara Y. Comprehensive mutation analysis of GLDC, AMT, and GCSH in nonketotic hyperglycinemia. *Hum Mutat* 2006;27(4):343-52.

9. Collins JJ, Tudor C, Leonard JM, Chuck G, Franz DN. Levetiracetam as adjunctive antiepileptic therapy for patients with tuberous sclerosis complex: a retrospective open-label trial. *J Child Neurol* 2006;21(1):53-7.
10. Franz DN, Leonard J, Tudor C, Chuck G, Care M, Sethuraman G, Dinopoulos A, Thomas G, Crone KR. Rapamycin causes regression of astrocytomas in tuberous sclerosis complex. *Ann Neurol* 2006;59(3):490-8.
11. Tinkle BT, Schorry EK, Franz DN, Crone KR, Saal HM. Epidemiology of hemimegalencephaly: a case series and review. *Am J Med Genet A* 2005;139(3):204-11.
12. Abelson JF, Kwan KY, O'Roak BJ, Baek DY, Stillman AA, Morgan TM, Mathews CA, Pauls DL, Rasin MR, Gunel M, Davis NR, Ercan-Sencicek AG, Guez DH, Spertus JA, Leckman JF, Dure LSt, Kurlan R, Singer HS, Gilbert DL, Farhi A, Louvi A, Lifton RP, Sestan N, State MW. Sequence variants in SLITRK1 are associated with Tourette's syndrome. *Science* 2005;310(5746):317-20.
13. Allen AJ, Kurlan RM, Gilbert DL, Coffey BJ, Linder SL, Lewis DW, Winner PK, Dunn DW, Dure LS, Sallee FR, Milton DR, Mintz MI, Ricardi RK, Erenberg G, Layton LL, Feldman PD, Kelsey DK, Spencer TJ. Atomoxetine treatment in children and adolescents with ADHD and comorbid tic disorders. *Neurology* 2005;65(12):1941-9.
14. Gilbert DL. Motor cortex inhibitory function in Tourette syndrome, attention deficit disorder, and obsessive compulsive disorder: studies using transcranial magnetic stimulation. *Adv Neurol* 2006;99:107-14.
15. Gilbert DL, Buncher CR. Assessment of scientific and ethical issues in two randomized clinical trial designs for patients with Tourette's syndrome: a model for studies of multiple neuropsychiatric diagnoses. *J Neuropsychiatry Clin Neurosci* 2005;17(3):324-32.
16. Gilbert DL, Ridel KR, Sallee FR, Zhang J, Lipps TD, Wassermann EM. Comparison of the inhibitory and excitatory effects of ADHD medications methylphenidate and atomoxetine on motor cortex. *Neuropsychopharmacology* 2006;31(2):442-9.
17. Merhar SL, Gilbert DL. Clinical (video) findings and cerebrospinal fluid neurotransmitters in 2 children with severe chronic bilirubin encephalopathy, including a former preterm infant without marked hyperbilirubinemia VIDEO. *Pediatrics* 2005;116(5):1226-30.
18. Ridel KR, Leslie ND, Gilbert DL. An updated review of the long-term neurological effects of galactosemia. *Pediatr Neurol* 2005;33(3):153-61.
19. Arroyo S, Dodson WE, Privitera MD, Glauser TA, Naritoku DK, Dlugos DJ, Wang S, Schwabe SK, Twyman RE. Randomized dose-controlled study of topiramate as first-line therapy in epilepsy. *Acta Neurol Scand* 2005;112(4):214-22.
20. Dent CL, Spaeth JP, Jones BV, Schwartz SM, Glauser TA, Hallinan B, Pearl JM, Houry PR, Kurth CD. Brain magnetic resonance imaging abnormalities after the Norwood procedure using regional cerebral perfusion. *J Thorac Cardiovasc Surg* 2005;130(6):1523-30.
21. Dent CL, Spaeth JP, Jones BV, Schwartz SM, Glauser TA, Hallinan B, Pearl JM, Houry PR, Kurth CD. Brain magnetic resonance imaging abnormalities after the Norwood procedure using regional cerebral perfusion. *J Thorac Cardiovasc Surg* 2006;131(1):190-7.
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23. Glauser TA, Ayala R, Elterman RD, Mitchell WG, Van Orman CB, Gauer LJ, Lu Z. Double-blind placebo-controlled trial of adjunctive levetiracetam in pediatric partial seizures. *Neurology* 2006;66(11):1654-60.
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25. Hershey AD. Treatment of pediatric and adolescent headaches. *Curr Treat Options Neurol* 2005;7(6):459-67.

26. Hershey AD. What is the impact, prevalence, disability, and quality of life of pediatric headache? *Curr Pain Headache Rep* 2005;9(5):341-4.
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30. Kabbouche MA, Linder SL. Management of migraine in children and adolescents in the emergency department and inpatient setting. *Curr Pain Headache Rep* 2005;9(5):363-7.
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46. El-Bohy AA, Wong BL. The diagnosis of muscular dystrophy. *Pediatr Ann* 2005;34(7):525-30.
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