

# Neurosurgery

## Division Details

### RESEARCH AND TRAINING DETAILS

|                                  |           |
|----------------------------------|-----------|
| Faculty                          | 7         |
| Joint Appointment Faculty        | 4         |
| Research Fellows and Post Docs   | 3         |
| Research Graduate Students       | 2         |
| Total Annual Grant Award Dollars | \$203,000 |
| Total Publications               | 31        |

### CLINICAL ACTIVITIES AND TRAINING

|                       |       |
|-----------------------|-------|
| Staff Physicians      | 7     |
| Clinical Fellows      | 1     |
| Inpatient Encounters  | 720   |
| Outpatient Encounters | 3,867 |



Row 1: J Goto, K Bierbrauer, S Vadivelu

Row 2: C Stevenson, F Mangano, J Skoch, S Crone

## Research Highlights

### Focus on Hydrocephalus

Hydrocephalus affects one in 1,000 children, with most of the cases require multiple brain surgeries. [June Goto, PhD](#), collaborating in the [Mangano lab](#), studies mouse and rat models of pediatric hydrocephalus looking for potential medicine and new diagnostic tools for this condition. The lab, along with collaborators [Kenneth Campbell, PhD](#), and [Rolf Stottmann, PhD](#), focuses on primary and motile ciliary signaling essential for proper development of neural cells and their functions. They identified a novel gene mutation affecting ciliogenesis in specific subtypes of developing neural cells leading to communicating hydrocephalus. Also, in collaboration with the [Pediatric Neuroimaging Research Center](#), and [Weihong Yuan, PhD](#), the lab investigate molecular and cellular features of white matter damage in hydrocephalus models.

### Studying our brains to improve breathing

[Dr. Steven Crone, PhD](#), heads a laboratory studying how neural circuits in our brain and spinal cord control movements such as breathing and locomotion, and how disease and injury affects them. [Dr. Crone's laboratory](#) uses unique mouse models, and a powerful physiological monitoring system, to find new ways to improve breathing in amyotrophic lateral sclerosis (ALS), spinal muscular atrophy (SMA), and spinal cord injury. In the past year, his laboratory has demonstrated the use of muscles, other than the diaphragm, called accessory respiratory muscles, during early stages of disease in a mouse model of ALS. However, these muscles stop being used for breathing at late stages of disease, despite the fact that the muscles are functional and used for other behaviors, such as grooming. Further, they have identified a neuron class in the spinal cord and brainstem that controls the activity of these muscles and shown that these neurons degenerate in ALS model mice. Research is currently underway to develop therapies to repair or replace these neurons

and assess the impact on breathing, motor function, and survival. The goal of this work is to prevent ventilator dependence, and improve the duration and quality of life of patients with neuromuscular disorders or spinal cord injury.

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## Significant Publications

Romer SH, Seedle K, Turner SM, Li J, Baccei ML, Crone SA. **Accessory respiratory muscles enhance ventilation in ALS model mice and are activated by excitatory V2a neurons.** *Exp Neurol*. 2016 Jul 25. pii: S0014-4886(16)30152-2.

In this paper, we are the first to show at early stages of disease in a mouse model of ALS, the mice use accessory respiratory muscles, but that they are not activated at late stages of disease when ventilation begins to decline. Further, we demonstrate that one particular class of neuron in the spinal cord and brainstem (the V2a class) are able to activate accessory respiratory muscles in healthy mice, but degenerate in ALS model mice. Our results suggest that therapies to prevent V2a degeneration or replace V2a neurons may improve breathing and motor function in ALS patients.

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## Division Publications

1. Abbasi F, S, Skoch J, Avila M, Patel A, Sattarov K, Walter C, Baaj A. **Instability in Thoracolumbar Trauma: Is a New Definition Warranted?** *Clin Spine Surg*. 2015.
2. Akbari SH, Limbrick DD, Jr., McKinstry RC, Altaye M, Ragan DK, Yuan W, Mangano FT, Holland SK, Shimony JS. **Periventricular Hyperintensity in Children with Hydrocephalus.** *Pediatr Radiol*. 2015; 45:1189-97.
3. Avila M, Skoch J, Fennell V, Palejwala S, Walter C, Kim S, Baaj A. **Combined Posterior Hemistectomies and Stabilization with Lateral Thoracotomy for En Bloc Resection of Thoracic Paraspinal Primary Bone Tumors: Technical Note.** *J Neurosurg Spine*. 2016; 24:223-27.
4. Avila MJ, Skoch J, Sattarov K, Abbasi Fard S, Patel A, Walter CM, Baaj AA. **Posterior Longitudinal Ligament Resection or Preservation in Anterior Cervical Decompression Surgery.** *J Clin Neurosci*. 2015; 22:1088-90.
5. Avila MJ, Walter CM, Skoch J, Abbasifard S, Patel AS, Sattarov K, Baaj AA. **Fusion after Intradural Spine Tumor Resection in Adults: A Review of Evidence and Practices.** *Clin Neurol Neurosurg*. 2015; 138:169-73.
6. Cohen K, Glass B, Greiner H, Holland-Bouley K, Standridge S, Arya R, Faist R, Morita D, Mangano F, Connolly B. **Methodological Issues in Predicting Pediatric Epilepsy Surgery Candidates through Natural Language Processing and Machine Learning.** pmc/PMC4876984. *Biomed Inform Insights*. 2016; 8:11-18.
7. Corcoran B, Linscott LL, Leach JL, Vadivelu S. **Application of Normative Occipital Condyle-C1 Interval Measurements to Detect Atlanto-Occipital Injury in Children.** *AJNR Am J Neuroradiol*. 2016; 37:958-62.
8. Davis J, Kreppel A, Brady R, Jones B, Stevenson C, Fouladi M, Hummel T. **Nocardia Farcinica Meningitis Masquerading as Central Nervous System Metastasis in a Child with Cerebellar Pilocytic Astrocytoma.** *J Pediatr Hematol Oncol*. 2015; 37:482-85.
9. Enikov E, Edes G, Skoch J, Anton R. **Application of Gmr Sensors to Liquid Flow Sensing.** *J Microelectromech Sys*. 2015; 24:914-21.
10. Enikov ET, Szabo Z, Anton R, Skoch J, Sheen W. **Engineering Innovation in Biomedical Nanotechnology.** *Proceedings of the ASME International Mechanical Engineering Congress and Exposition, 2015*. 2016; 5:1-8.
11. Fard SA, Patel AS, Avila MJ, Sattarov KV, Walter CM, Skoch J, Baaj AA. **Anatomic Considerations of the Anterior Upper Cervical Spine During Decompression and Instrumentation: A Cadaveric Based Study.** *J Clin Neurosci*. 2015; 22:1810-5.

12. Gallek MJ, Skoch J, Ansay T, Behbahani M, Mount D, Manziello A, Witte M, Bernas M, Labiner DM, Weinand ME. **Cortical Gene Expression: Prognostic Value for Seizure Outcome Following Temporal Lobectomy and Amygdalohippocampectomy.** *Neurogenetics*. 2016;1-8.
13. Greiner H, Horn P, Tenney J, Arya R, Jain S, Holland K, Leach J, Miles L, Rose D, Fujiwara H, Mangano F. **Should Spikes on Post-Resection Ecog Guide Pediatric Epilepsy Surgery?** *Epilepsy Res*. 2016; 122:73-78.
14. Greiner HM, Horn PS, Tenney JR, Arya R, Jain SV, Holland KD, Leach JL, Miles L, Rose DF, Fujiwara H, Mangano FT. **Preresection Intraoperative Electrocorticography (Ecog) Abnormalities Predict Seizure-Onset Zone and Outcome in Pediatric Epilepsy Surgery.** *Epilepsia*. 2016; 57:582-9.
15. Hu Z, Wang Y, Huang F, Chen R, Li C, Wang F, Goto J, Kwiatkowski D, Wdzieczak-Bakala J, Tu P. **Brain-Expressed X-Linked 2 Is Pivotal for Hyperactive Mechanistic Target of Rapamycin (Mtor)-Mediated Tumorigenesis.** *J Biol Chem*. 2015; 290:25756-65.
16. Hummel TR, Salloum R, Drissi R, Kumar S, Sobo M, Goldman S, Pai A, Leach J, Lane A, Pruitt D, Sutton M, Chow LM, Grimme L, Doughman R, Backus L, Miles L, Stevenson C, Fouladi M, DeWire M. **A Pilot Study of Bevacizumab-Based Therapy in Patients with Newly Diagnosed High-Grade Gliomas and Diffuse Intrinsic Pontine Gliomas.** *J Neurooncol*. 2016; 127:53-61.
17. Kosnik-Infinger L, Carroll C, Greiner H, Leach J, Mangano FT. **Management of Cerebral Cavernous Malformations in the Pediatric Population: A Literature Review and Case Illustrations.** *J Neurosurg Sci*. 2015; 59:283-94.
18. Leach JL, Awwad R, Greiner HM, Vannest JJ, Miles L, Mangano FT. **Mesial Temporal Lobe Morphology in Intractable Pediatric Epilepsy: So-Called Hippocampal Malrotation, Associated Findings, and Relevance to Presurgical Assessment.** *J Neurosurg Pediatr*. 2016; 17:683-93.
19. Mangano FT, Altaye M, McKinstry RC, Shimony JS, Powell SK, Phillips JM, Barnard H, Limbrick DD, Jr., Holland SK, Jones BV, Dodd J, Simpson S, Mercer D, Rajagopal A, Bidwell S, Yuan W. **Diffusion Tensor Imaging Study of Pediatric Patients with Congenital Hydrocephalus: 1-Year Postsurgical Outcomes.** *J Neurosurg Pediatr*. 2016; 18:306-19.
20. Merhar SL, Kline-Fath BM, Nathan AT, Melton KR, Bierbrauer KS. **Identification and Management of Neonatal Skull Fractures.** *J Perinatol*. 2016; 36:640-2.
21. Miles L, Greiner HM, Mangano FT, Horn PS, Leach JL, Miles MV. **Cytochrome C Oxidase Deficit Is Associated with the Seizure Onset Zone in Young Patients with Focal Cortical Dysplasia Type II.** *Metab Brain Dis*. 2015; 30:1151-60.
22. Nagaraj UD, Peiro JL, Bierbrauer KS, Kline-Fath BM. **Evaluation of Subependymal Gray Matter Heterotopias on Fetal MRI.** *AJNR Am J Neuroradiol*. 2016; 37:720-5.
23. Prabhakar S, Zhang X, Goto J, Han S, Lai C, Bronson R, Sena-Estevés M, Ramesh V, Stemmer-Rachamimov A, Kwiatkowski DJ, Breakefield XO. **Survival Benefit and Phenotypic Improvement by Hamartin Gene Therapy in a Tuberous Sclerosis Mouse Brain Model.** *Neurobiol Dis*. 2015; 82:22-31.
24. Radhakrishnan R, Leach JL, Mangano FT, Gelfand MJ, Rozhkov L, Miles L, Greiner HM. **Prospective Detection of Cortical Dysplasia on Clinical MRI in Pediatric Intractable Epilepsy.** *Pediatr Radiol*. 2016; 46:1430-8.
25. Smith P, Linscott LL, Vadivelu S, Zhang B, Leach JL. **Normal Development and Measurements of the Occipital Condyle-C1 Interval in Children and Young Adults.** *AJNR Am J Neuroradiol*. 2016; 37:952-7.
26. Stetson N, Vadivelu S, Li JY, Setton A, Chalif DJ. **Angiographic Evidence of a Purely Pial Bihemispheric Intracranial Hemangiopericytoma.** *Case Rep Neurol Med*. 2016; 2016:5245078.
27. Vadivelu S, Esernio-Jenssen D, Rekate HL, Narayan RK, Mittler MA, Schneider SJ. **Delay in Arrival to Care in Perpetrator-Identified Nonaccidental Head Trauma: Observations and Outcomes.** *World Neurosurg*. 2015; 84:1340-6.
28. Watson JR, Gainer CF, Martirosyan N, Skoch J, Lemole GM, Jr., Anton R, Romanowski M. **Augmented Microscopy: Real-Time Overlay of Bright-Field and near-Infrared Fluorescence Images.** *J Biomed Opt*. 2015; 20:106002.

29. Zoccali C, Skoch J, Patel AS, Walter CM, Avila MJ, Martirosyan NL, Demitri S, Baaj AA. [The Surgical Anatomy of the Lumbosacroiliac Triangle: A Cadaveric Study](#). *World Neurosurg*. 2016; 88:36-40.

30. Zoccali C, Skoch J, Patel AS, Walter CM, Maykowski P, Baaj AA. [Residual Neurological Function after Sacral Root Resection During En-Bloc Sacrectomy: A Systematic Review](#). *Eur Spine J*. 2016:1-7.

31. Zoccali C, Skoch J, Walter CM, Torabi M, Borgstrom M, Baaj AA. [The Tokuhashi Score: Effectiveness and Pitfalls](#). *Eur Spine J*. 2016; 25:673-8.

## Grants, Contracts, and Industry Agreements

### Annual Grant Award Dollars

| Investigator                     | Title                                                                                          | Sponsor                   | ID                | Dates                  | Amount    |
|----------------------------------|------------------------------------------------------------------------------------------------|---------------------------|-------------------|------------------------|-----------|
| Karin Bierbrauer, MD             | Park-Reeves Syringomyelia Research Consortium                                                  | Washington University     | PRSR - Bierbrauer | 3/22/2012 - 3/31/2017  | \$20,000  |
| Jun Nakamura, PHD                | Molecular Characterization and Pre-clinical Trial in a Novel Model of Congenital Hydrocephalus | Hydrocephalus Association | Hydrocepha - Goto | 12/1/2015 - 11/30/2016 | \$50,000  |
| Timothy Vogel, MD                | Role of Neural Progenitor Cells in the Development of Neonatal Hydrocephalus                   | Hydrocephalus Association | HA - Vogel        | 9/1/2013 - 2/29/2016   | \$133,000 |
| Total Annual Grant Award Dollars |                                                                                                |                           |                   |                        | \$203,000 |