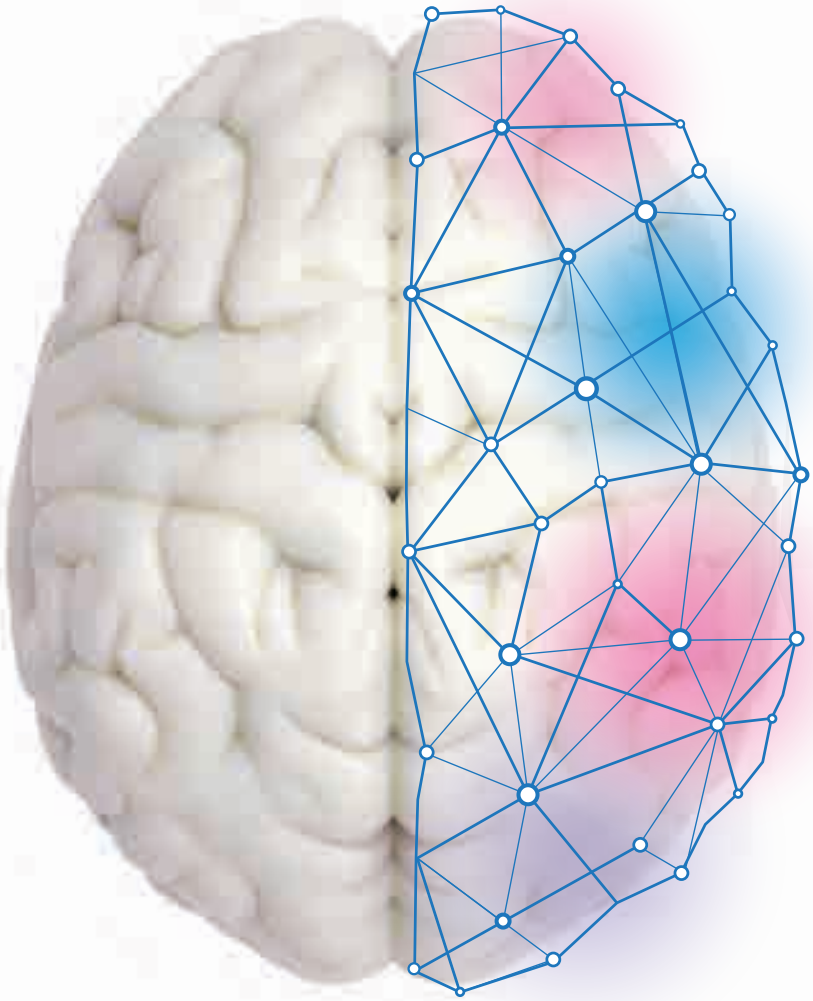
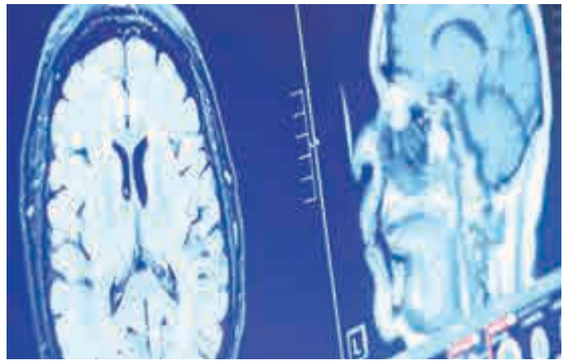
Department of Neurology

ANNUAL REPORT 2020–2022



Yale SCHOOL OF MEDICINE



The Yale Department of Neurology is a world-renowned research, teaching, and clinical center devoted to exceptional patient care; education of medical and graduate students; and neurological research. I am proud to report our continued growth in our 2020-2022 annual report.

The tireless efforts of our 138 faculty have resulted in overall percent age increases in active grants, ultimately securing a sixth-place ranking in total NIH funding in 2021 for Neurology. Once again, Neurology recruited an outstanding class of new residents, in spite of the limitations posed by COVID-19. Our clinical work also continues to expand across southern New England.

Our department has made breakthrough advances in in clinical and basic neurological research. Key accomplishments include an Alzheimer's Disease Research Award and a Human Immunology Project Consortium Grant; two separate $9 million ASAP grants to investigate Parkinson's disease; and a $22 million investigator-initiated grant from Genentech to study early immune intervention in patients with multiple sclerosis. We integrated our translational and research efforts with basic sciences across neuroscience, cell biology, and inflammation in relationship to the new Wu Tsai Institute for the study of human cognition. We also continue to expand our NIH-funded clinical trial networks: NeuroNEXT Infinity, StrokeNET Spirit, and ASPIRE, a phase III clinical trial of an anticoagulant medication.

Our faculty continue to play a pivotal role in training the next generation of neurologists. Neurology adopted a hybrid virtual and in-person education model during the pandemic, allowing for strengthened teaching and learning tools for our residents and clinical fellows. The virtual format also extended to recruitment, which resulted in more than 550 residency applications. Virtual grand rounds took advantage of the new Zoom format to host renowned speakers, both nationally and internationally. This wealth of expertise and perspectives facilitated more comprehensive discussions and proved to be an integral part of our medical education program.

Neurology continues its massive expansion in Connecticut and neighboring states. A new, multispecialty, outpatient clinic was opened in Guilford, Conn., which provides the following services: General Neurology, Headache, Stroke, Epilepsy, Memory Disorders, and Neuromuscular Medicine, including EMG. Likewise, a new infusion center was established at our ambulatory practice in Fairfield, Conn. Under the leadership of Serena Spudich, MD, MA, we also developed one of the first clinics in the country dedicated to the diagnosis and management of neurologic complications associated with COVID-19, and inpatient services have reached or surpassed pre-COVID levels. The second neurointensive care team now provides consultations to patients after cardiac arrest. A multidisciplinary neurotrauma service has been established under the leadership of Emily Gilmore, MD, and Sacit Bulent Omay, MD, and patients with brain trauma are cared for from the point of acute injury to outpatient follow-up. Our neurovascular service was split into two teams to accommodate an ever-increasing volume of acute stroke codes within Yale New Haven Hospital (YNHH) and telestrokes in one of our ten spoke hospitals.

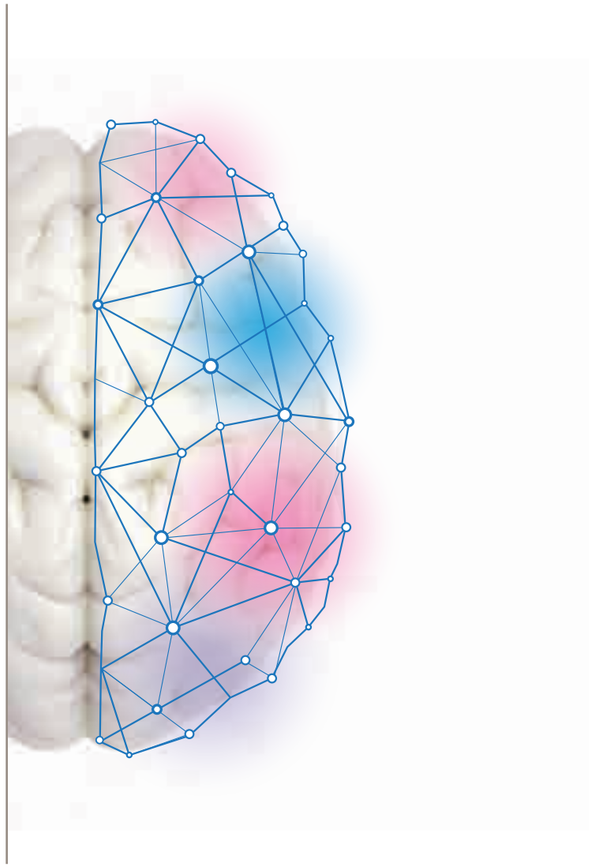
We were able to enhance the care we provide on our General Neurology service by expanding the team with two advanced practice providers. Neurology inpatient-based services are now available at five of the six YNHHS hospitals, the latest addition being the Neurology program at Bridgeport Hospital. In collaboration with Neurosurgery, an interventional stroke program has been established at Greenwich Hospital. A third interventional stroke program is being launched at Bridgeport Hospital, which recently treated its first patient.

We hope that this annual report provides a comprehensive picture of our values, dedication to our pursuit of knowledge, and compassion for the community we serve. We are grateful to every member of our department who made our work possible, and we look forward to continued success in the year ahead.

Sincerely,

David A. Hafler, MD
William S. and Lois Stiles Edgerly
Professor of Neurology and Professor of Immunobiology
Chair, Department of Neurology
Neurologist-in-Chief, Yale New Haven Hospital

CONTENTS



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VITAL STATS

3 Non-Ladder Faculty

#6 NIH Funding in Neurology ($36,189,925 Total)

103 Ladder Faculty

5% Active Grants Increased

3 Instructors

162 Total Faculty

98 Staff

32 Research Faculty

57 Postgraduate Associates & Fellows

35 Postdoctorial Associates & Fellows

25 Clinical Fellows

1 Lecturer

2 'Other' Faculty (voluntary, adjunct, visiting)

Launched *Brainwaves* newsletters and LinkedIn, Facebook, Twitter, and Instagram accounts

Yale Department of Neurology

Yale Department of Neurology

@NeurologyYale

@yale_neurology

NEW CLINICAL SITES:
New London, Bridgeport, Milford, Greenwich, Stamford, Fairfield, and Guilford

COMMITTEE FOR **DIVERSITY & INCLUSION**

Neurology faculty and trainees participated in the White Coats for Black Lives demonstration for racial justice in front of Sterling Hall of MediIcine.

IN SUMMER 2020, THE DEPARTMENT OF NEUROLOGY ESTABLISHED ITS DIVERSITY AND INCLUSION INITIATIVE IN THE WAKE OF NATIONWIDE PROTESTS AGAINST SYSTEMIC RACISM. THROUGH COMBINED EFFORTS IN EDUCATION, RECRUITMENT, AND RETENTION, AS WELL AS COMMUNITY OUTREACH, THE DEPARTMENT AIMS TO PROMOTE A DIVERSE, EQUITABLE, AND INCLUSIVE ENVIRONMENT IN WHICH ALL FACULTY, STAFF, AND TRAINEES CAN THRIVE AND FEEL VALUED.

Program Administration

The Department has appointed Reshma Narula, MD, as director of diversity, equity, and inclusion; and Vanessa Cooper, MD, as associate director for educational diversity. Narula chairs the DEI committees developing DEI-related policies and procedures. She provides resources to members of the department regarding discrimination, microaggression, harassment, and Title IX concerns as well as serve as an ombudsperson for the department. She also organizes and develops DEI training/education within the Department and support recruitment efforts. Cooper likewise supports recruitment efforts, as well as coordinate education offerings that focus on diversity and inclusion. Both serve as resources for individual issues related to DEI that involve faculty members, trainees, and staff.

Education

Neurology's ongoing commitment to education in health disparities is demonstrated by designated Clinical Grand Rounds. Several speakers have been invited to Grand Rounds to discuss topics related to recruitment and retention of individuals from underrepresented groups; maintaining an inclusive work environment; identifying and responding to micro-aggressions; and addressing health disparities. Regularly scheduled lectures on health disparities are incorporated into the resident educational curriculum. Also, every incoming resident undergoes mandatory training in bias mitigation, and there was formal training for responding to micro-aggressions at the 2020 faculty retreat. Departmental educators have been participating in seminars through the Teaching and Learning Center that have focused on aspects of diversity and inclusion in the learning environment. A wealth of diversity resources from Yale and the City of New Haven are offered on Neurology's Diversity website.

Residency Recruitment

The Department has taken comprehensive steps to attract a diverse group of residency recruits, such as establishing a Visiting Elective Scholarship Program to enhance workforce diversity in neurology, holistic application review, and incorporation of behavior-based questions into the interview structure.

Community Outreach

The Stamp Out Stroke (SOS) community outreach initiative specifically focuses on providing stroke education to underserved communities. SOS is comprised of stroke physicians, nurses, neurology residents, and students, and its mission is to educate the New Haven and surrounding communities about stroke risk factors, warning signs, and the importance of receiving prompt care. Last year, the program held 14 outreach events, including a stroke education lecture to clients of Integrated Refugee and Immigrant Services (IRIS), a non-profit agency whose mission is to help refugees and other displaced people establish life in the United States. The residents and fellows have started to develop relationships with local middle schools, with the intention of providing educational "Lunch and Learn" sessions in the coming year.In partnership with the Yale and external New Haven community, Neurology also launched its first fundraiserin 2021 to purchase reusable water bottles for local middle schoolers whose access to drinking water was restricted due to COVID-19 safety regulations.

EDUCATION & ACADEMIC AFFAIRS

JEREMY MOELLER, *Associate Vice-Chair of Education, Neurology Residency Program Director*

Yale Neurology's educational programs have made a full transition back from the most severe restrictions of the COVID-19 pandemic. Over the last two years, we have learned much about best practices in neurology education, including leveraging the advantages of remote and asynchronous teaching while understanding the irreplaceable nature of in-person learning. Our programs are now stronger and more flexible than ever, and there continue to be tremendous opportunities for educational innovation.

Grand Rounds

Neurology Grand Rounds continues to be a cornerstone of our departmental educational offerings. We have transitioned back to primarily in-person sessions, which allows the speakers to visit with potential collaborators and learners, and increases engagement during the presentations themselves. Clinical Grand Rounds continues in a hybrid format, facilitating unique opportunities such as joint Clinical Grand Rounds sessions with the Pitié Salpêtrière University Hospital in Paris, which occur3-4 times per year.

Residency and Fellow Recruitment

The residency and fellowship recruitment process has been virtual since 2020, allowing for better equity and lower cost to applicants. To optimize the applicant experience, the department has maintained a robust website and social media presence, including video tours, resident and alumni interviews, and regular updates about the educational and social happenings from within the department. We have hosted 132 residency applicants and dozens of fellowship applicants each year, and we continue to attract the most competitive candidates in the world. The residency and fellowships have never been more diverse, and many of our former trainees stay on as faculty members, making important contributions to our department's clinical, educational, and research missions.

Resident and Fellow Education

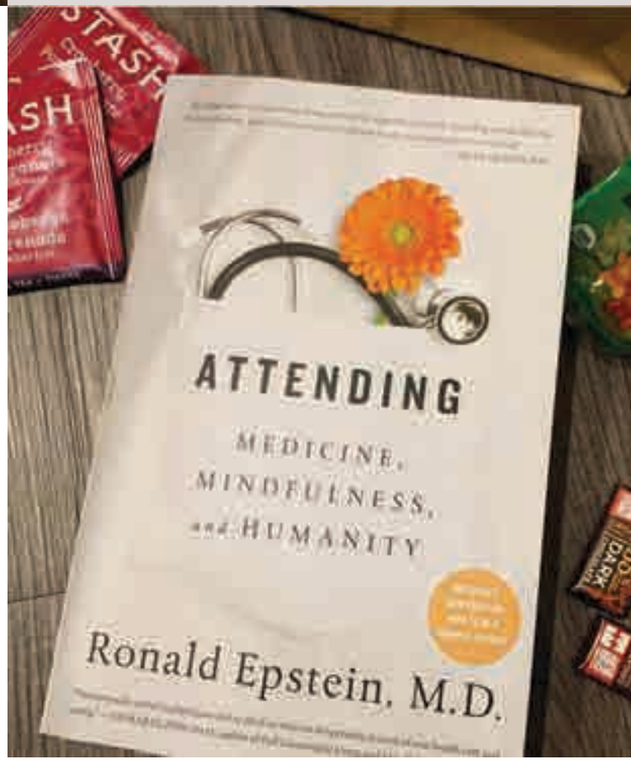
Our clinical training programs have continued to grow, with 30 residents and 25 clinical fellows. Our trainees have distinguished themselves in clinical care, research, and education. The T32 and R25 educational programs have promoted serious research careers, and clinical fellows have had the option of pursuing a master's degree in medical education. Residents and fellows have served on national committees through the American Academy of Neurology and subspecialty societies. While much of the formal education has moved back to in-person sessions, we have used the opportunity posed by the pandemic to build on our strengths in developing asynchronous learning tools, including our EEG and Movement Disorders online modules and a highly successful podcast. We have had rapid growth in our simulation programs, and we continue to innovate in learner assessment to ensure that all our graduates provide the best possible neurological care to every patient.

The socially-distanced resident class of 2023 in front of Sterling Hall of Medicine.

WELLNESS

AS A RESULT OF SPECIFIC CONCERNS RAISED IN THE CONTEXT OF THE YNHH/YM PHYSICIAN WELLNESS ACTION COLLABORATIVE SURVEY, THE DEPARTMENT HAS SINCE MADE SUBSTANTIAL CHANGES.

The Department has taken steps to assess and address concerns with respect to physician burnout. During the summer of 2017, an anonymous survey for both clinical and research faculty was implemented. The information was shared with the leadership of the Department and revealed burnout rates similar to national data (survey of the American Academy of Neurology). As recently as November 2020, further data have been obtained via the YNHH/YM Physician Wellness Action Collaborative (PWAC) survey. For example, measures have been taken to enhance clinical workflow in clinic. All faculty have been given access to voice-dictation software. We are also offering virtual scribes through the Yale Medicine initiative. A process is in place for reviewing faculty salaries on a yearly basis and verifying accordance with peer-group data. We are constantly monitoring patient-to-practitioner ratios on our inpatient services and have made necessary adjustments to staffing with advanced practice providers and fellows. We are represented on and contribute actively to the YNHH Clinician Wellness Council and Council for Resident and Fellow Well-Being. An individual has recently been selected (Jeffrey Dewey, MD, MHS) to spearhead further data collection efforts and develop evidence-based interventions to address physician well-being, including annual faculty retreats. We anticipate qualitative data collection over the next six calendar months and will continue to quantitative data from the PWAC survey to inform further changes.



General Neurology

THE DIVISION OF GENERAL NEUROLOGY EVALUATES AND TREATS ALL NEUROLOGICAL DISORDERS. THE DIVISION INCLUDES THE YALE HEADACHE CENTER, WHICH SPECIALIZES IN THE DIAGNOSIS AND TREATMENT OF HEADACHES, AND THE YALE NEUROLOGY RESIDENT CLINICS.

CHRISTOPHER H. GOTTSCHALK, MD, *clinical chief*

RESEARCH

The **Headache Medicine division** continues to pursue industry-sponsored trials of treatments for primary headache disorders. A recent trial led to the approval of a new device for acute migraine attacks (NeuroLief, Relivion). Recently added trials include monoclonal anti-CGRP therapy for cluster headache and a novel sodium-channel antagonist for trigeminal neuralgia, SUNCT and SUNA. Division members continue to publish clinical updates in advanced care of headache disorders.

- Headache in Patients with Severe Acute Respiratory Syndrome Coronavirus 2 Infection: A Narrative Review. ***Headache: The Journal of Head and Face Pain*,** 2020.

Emmanuelle Schindler, MD PhD's laboratory, in collaboration with the Biostudies Unit at the West Haven VA (Deepak D'Souza, MBBS, MD), continues studies of the psychedelic compound psilocybin, in the treatment of primary headache disorders, including migraine and cluster headache. Related studies include the compound's effects on pain perception in general and the mechanism of headache reduction.

- Exploratory Controlled Study of the Migraine-Suppressing Effects of Psilocybin. ***Neurotherapeutics*,** 2021.
- In an exploratory randomized, double-blind, placebo-controlled, cross-over study, psychoactive doses of intravenous delta-9-tetrahydrocannabinol fail to produce antinociceptive effects in healthy human volunteers. ***Psychopharmacology*,** 2020.

The multispecialty outpatient clinic located in Guilford, Conn. where General Neurology services are offered.

CLINICAL

The Yale Headache Medicine program in the division of General Neurology provides comprehensive care for the full range of primary and secondary headache disorders, including migraine, cluster headache, post-traumatic headache, idiopathic intracranial hypertension (IIH or pseudotumor cerebri), CSF leaks, trigeminal and other cranial neuralgias, etc. Our patients receive highly specialized care from experts in the fields of headache medicine, neuro-ophthalmology, neurosurgery, neuroradiology, pain medicine, and psychology.

The division offers patient-centered care, providing virtual and in-person E&M visits and infusions across our health care system, including:

- 2- and 4-bed infusion suites (New Haven, Fairfield, and Stamford)
- 3T MRI with dedicated protocols for cranial neuralgias
- Surgical options that include microvascular decompression (MVD) and Gamma Knife therapy
- Interdisciplinary care with interventional neuroradiologists, neurosurgeons, and pain specialists for patients with complex disease
- Procedures that include on-demand nerve-blocks and Botox® for chronic migraine
- Social workers and dietitians
- Access to clinical trials

LOCATIONS:

With a main hub in New Haven, the division has expanded with satellite locations in Stamford, Fairfield, Milford, Wallingford, Guilford, and New London.

We have recently introduced a concussion program across all clinical sites, offering diagnostic evaluation and treatment, neuropsychology and neuropsychiatric care, physical therapy, and social work services.

Dr. Cooper and Kimberly Siani, RN, treat a patient in the infusion suite at the Yale Physicians Building.

Dr. Gottschalk administers Botox® as a treatment for chronic headaches.

PROVIDERS:

Christopher H. Gottschalk,* *MD, chief, division, general neurology; director, fellowship program, Headache & Facial Pain Center*
Nicholas Tzikas,* *MD, assistant professor, clinical neurology; co-director, headache medicine fellowship program*
Vanessa Cooper,* *MD, assistant professor, neurology associate director for educational diversity, neurology*
Tanya Bilchik,* *MD, assistant professor, neurology*
Steven Novella,* *MD, associate professor, neurology*
Sirisha Sanamandra,* *MD, assistant professor of clinical neurology*
Emmanuelle Schindler,* *MD, PhD, assistant professor, neurology medical director, Headache Center of Excellence, VA Connecticut Healthcare System-West Haven (WHVA)*

[*= *UCNS board-certified in Headache Medicine*]

FELLOWSHIP TRAINING

The Headache Medicine fellowship program expanded to two fellows in 2020–2021. We are collaborating with the WHVA Headache Center of Excellence to provide an additional clinical research year for future clinician-scientists as well.

Epilepsy + EEG

THE COMPREHENSIVE EPILEPSY CENTER PROVIDES PROMISING OPTIONS FOR MANY ADULTS AND PEDIATRIC PATIENTS WITH EPILEPSY. KNOWN FOR CLINICAL EXCELLENCE AND INNOVATIVE RESEARCH, THIS PROGRAM WAS ONE OF THE NATION'S FIRST AND HAS EVOLVED INTO ONE OF THE MOST ACTIVE AND ADVANCED IN THE WORLD.

LAWRENCE J. HIRSCH, MD, *academic chief*

PUE FAROOQUE, DO, *clinical chief*

RESEARCH

Lawrence J. Hirsch, MD, division chief, performs clinical research on brain monitoring with EEG, status epilepticus, brain stimulation for treating epilepsy, epilepsy surgery, rescue therapy for acute seizures outside the hospital, antiseizure medications and more. Hirsch is the founder and former chair of the Critical Care EEG Monitoring Research Consortium, which now includes more than 50 centers; co-chair of the medical advisory board of the NORSE Institute; P.I. for the new (2022) donor-funded international open NORSE/FIRES biorepository based at Yale; chair of the new (2022) national responsive neurostimulation research registry; and lead author of the 2021 American Clinical Neurophysiology Society guidelines on Critical Care EEG terminology. He has published more than 250 peer-reviewed publications and over 100 reviews, editorials, and book chapters. In 2021, he gave invited talks (mostly virtual) in eight countries and on five continents.

- American Clinical Neurophysiology Society's Standardized Critical Care EEG Terminology: 2021 version. ***Journal of Clinical Neurophysiology*,** 2021.
- Brief potentially ictal rhythmic discharges and paroxysmal fast activity as scalp electroencephalographic biomarkers of seizure activity and seizure onset zone. ***Epilepsia*,** 2021.
- Patient-detectable responsive neurostimulation as a seizure warning system. ***Epilepsia*,** 2021.
- Mesial temporal resection following long-term ambulatory intracranial EEG monitoring with a direct brain-responsive neurostimulation system. ***Epilepsia*,** 2020.

Hal Blumenfeld, MD, PhD, leads multidisciplinary collaborative disease-oriented neuroimaging research. He is a world expert on the mechanisms of impaired consciousness in epilepsy. His research group recently launched the START Clinical Trial (Stimulation of the Thalamus for Arousal Restoral in Temporal Lobe Epilepsy, (https://www.startepilepsy.com/), a novel multisite clinical trial supported by an NIH Brain Initiative grant to test the effectiveness of thalamic stimulation in improving consciousness in focal seizures. Blumenfeld was also awarded a new NIH R01 in 2021 (Remote effects of focal hippocampal seizures on neocortical function, NIH R01 NS066974),using animal models to investigate fundamental mechanisms of the same clinical problem—impaired consciousness in focal seizures—and to develop new translational therapeutic approaches to treating epilepsy.

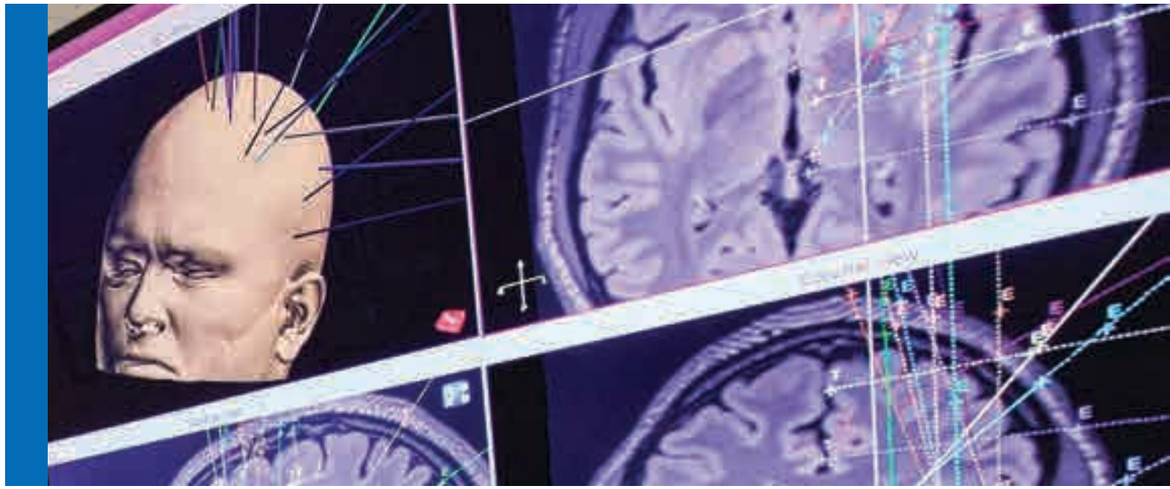
- Simulated Driving in the Epilepsy Monitoring Unit: Effects of Seizure Type, Consciousness and Motor Impairment. ***Epilepsia*,** 2021.
- The pulse: transient fMRI signal increases in subcortical arousal systems during transitions in attention. ***NeuroImage*,** 2021.
- Up and Down States of Cortical Neurons in Focal Limbic Seizures. ***Cerebral Cortex*,** 2020.
- Thalamic stimulation improves postictal cortical arousal and behavior. ***Journal of Neuroscience*,** 2020.

Hitten Zaveri, PhD, an electrical, computer, and biomedical engineer by training, directs the Computational Neurophysiology Laboratory; studies brain networks and EEG connectivity; and is involved in the development of medical devices. His current projects include the use of network analysis to locate the seizure onset area (NIH tR01 NS109062); the development of a multimodal brain probe for traumatic brain injury (NIH UG3/UH3); seizure forecasting; and the development of a brain/computer interface for brain monitoring and modulation.

- Network-Related Changes in Neurotransmitters and Seizure Propagation During Rodent Epileptogenesis. ***Neurology*,** 2021.
- Seizure prediction—ready for a new era. nature reviews ***Neurology*,** 2018.
- The roles of surgery and technology in understanding focal epilepsy and its comorbidities. ***The Lancet Neurology*,** 2018.

Imran Quraishi, MD, PhD, has co-directed the Center for Neurostimulation in Epilepsy since 2020 and studies the use of long-term ambulatory intracranial EEG as an epilepsy biomarker, as well as translational models of genetic epilepsies, including channelopathies. He is a contributing editor for *Epilepsy Currents,* the official journal of the American Epilepsy Society, and he leads our new initiative on electrics source imaging for localizing seizure foci.

- Miglustat Therapy for *SCARB2*-Associated Action Myoclonus–Renal Failure Syndrome. ***Neurology Genetics*,** 2021.
- Early detection rate changes from a brain-responsive neurostimulation system predict efficacy of newly added antiseizure medications. ***Epilepsia*,** 2020.
- Impaired motor skill learning and altered seizure susceptibility in mice with loss or gain of function of the Kcnt1 gene encoding Slack ($K_{Na}1.1$) Na+-activated K+ channels. ***Scientific Reports*,** 2020.
- An epilepsy-associated KCNT1 mutation enhances excitability of human iPSC-derived neurons by increasing Slack K_{Na} currents. ***Journal of Neuroscience*,** 2019.



Benjamin Tolchin, MD, MS, studies the outcomes and equity of health care and ethics policies and programs. Tolchin also conducts research related to the treatment of functional or psychogenic seizures. His research has been recognized with Young Investigator Awards from the American Clinical Neurophysiology Society and the American Epilepsy Society; the Rebecca Goldberg Kaufman Honor from the American Epilepsy Society; the Emerging Leaders Fellowship from the American Academy of Neurology (AAN); the 2020 Epilepsia Clinical Science Prize from the International League Against Epilepsy; and the 2021 Office of Health Equity Research (OHER) Award for Yale Research Excellence. He is a Fellow of the AAN and serves on the AAN's Guidelines Subcommittee and Ethics, Law, and Humanities Committee.

- Racial Disparities in the SOFA Score Among Patients Hospitalized with COVID-19. ***PLOS One***, 2021.
- AAN, ANA, CNS Joint Position Statement:Ethical issues in clinical research in neurology. ***Neurology***, 2020.
- Developing a Triage Protocol for the COVID-19 Pandemic: Allocating Scarce Medical Resources in a Public Health Emergency. ***Journal of Clinical Ethics***, 2020.
- Randomized controlled trial of motivational interviewing for psychogenic nonepileptic seizures. ***Epilepsia***, 2019.

Adithya Sivaraju, MD, MHA, oversees the cortical stimulation mapping program at Yale; in particular, he studies seizure onset networks by using direct cortical stimulation. He is also the director of the Post-Acute Symptomatic Seizure (PASS) clinic at Yale and a national co-investigator of a recently funded multicenter effort (PASSION – Post Acute Symptomatic Seizure Investigation and Outcome Network) to study epileptogenesis and antiseizure medication management in patients with acute brain injury.

- Factors predicting outcome after intracranial EEG evaluation in patients with medically refractory epilepsy. ***Neurology***, 2022.
- Intrastimulation discharges during electrical stimulation mapping may help identify seizure onset network. ***Brain Stimulation***, 2021.
- Beyond implantation effect? Long-term seizure reduction and freedom following intracranial monitoring without additional surgical interventions. ***Epilepsy and Behavior***, 2020.

Richard H. Mattson, MD, a legend in the world of epilepsy, came to Yale in 1967 after service in the United States Air Force Medical Service, where he and colleagues conducted the original studies establishing sleep deprivation as a useful adjunct in EEG activation. At Yale, he founded the Yale/VA Epilepsy Center and Intensive Epilepsy Monitoring Unit. It was one of the first—if not the world's first—continuous video/EEG monitoring units. Over five decades, this unit has grown into the current Yale Comprehensive Epilepsy Center. Over the next 15 years, he directed two multicenter comparative trials of anti-seizure drugs. From 1985 through 1992, he served as director of the Yale Neurology Residency Training Program. In 1990, he founded the Yale Medical School Neuroscience Clinical Clerkship and directed it for 15 years. He also served as president of the American Epilepsy Society and has received numerous awards for his work. Mattson still writes an occasional review or pertinent case report as well as mentoring epilepsy fellows.

- Anti-Seizure Medications" in Understanding Epilepsy: A Study Guide for the Boards (New York: Cambridge University Press, 2020).
- Misperceptions on the chance of seizure freedom with antiseizure medications after two failed trials. ***Epilepsia***, 2020.

Christopher Benjamin, PhD completes cognitive neuropsychological evaluations of our epilepsy patients. His research focuses on improving the lives of patients with epilepsy. He has published frequently cited articles describing and validating new ways of mapping the brain's language and visual systems using MRI. His contributions have been recognized through grants from the National Academy of Neuropsychology, the American Academy of Neuropsychology, and the Yale Center for Clinical Investigation. His ongoing projects focus on standardizing a multilingual battery for language mapping; improving training in clinical fMRI, and clarifying how training in language fMRI currently takes place and can be improved.

- Cognitive Biomarkers in the Clinic: Lessons From Presurgical fMRI. ***Journal of Clinical Neurophysiology (invited review)***, 2022.
- Electrical cortical stimulation can impair production of the alphabet without impairing counting. ***Epilepsy & Behavior Reports***, 2021.
- Gerstmann Syndrome Deconstructed by Cortical Stimulation. ***Neurology***, 2021.
- Tumor location and reduction in functional MRI estimates of language laterality. ***Journal of Neurosurgery***, 2021.

Dr. Hirsch and Eyiyemisi Damisah, MD

Hamada Hamid Altalib, DO, MPH directs the Epilepsy Clinical Outcomes Research program. He has a particular interest in quality of life and neuropsychiatric outcomes as well as neurology health services from a population perspective. He directs the VA Connecticut Epilepsy Center of Excellence and is the Clinical Informatics Lead on the National Neurology Network Adequacy for VA Community Care program. He is also the Research Informatics Lead on the Human Epilepsy Project, a multicenter prospective cohort study. Altalib is the primary investigator of a national veterans functional seizures cohort study and a co-investigator on several post-traumatic epilepsy cohort studies.

- Multimodal quality of life assessment in post-9/11 veterans with epilepsy: Impact of drug resistance, traumatic brain injury, and comorbidity. ***Neurology***, 2022.
- Epilepsy quality performance in a national sample of neurologists and primary care providers: Characterizing trends in acute and chronic care management. ***Epilepsy & Behavior***, 2021.
- Suicide and Seizures: A National Cohort Study in Veterans. ***Neurology: Clinical Practice***, 2021.
- Managing Functional Neurological Disorders: Protocol of a Cohort Study on Psychogenic Non-Epileptic Seizures Study. ***Neuropsychiatric Disease and Treatment***, 2019.

David King-Stephens, MD, is an experienced clinician and clinical researcher with special interest in epilepsy surgery, intracranial EEG, responsive neurostimulation for epilepsy, and seizure forecasting. He has recently received funding to perform research using low-intensity focused ultrasound as a non-invasive treatment for refractory seizures and epilepsy.

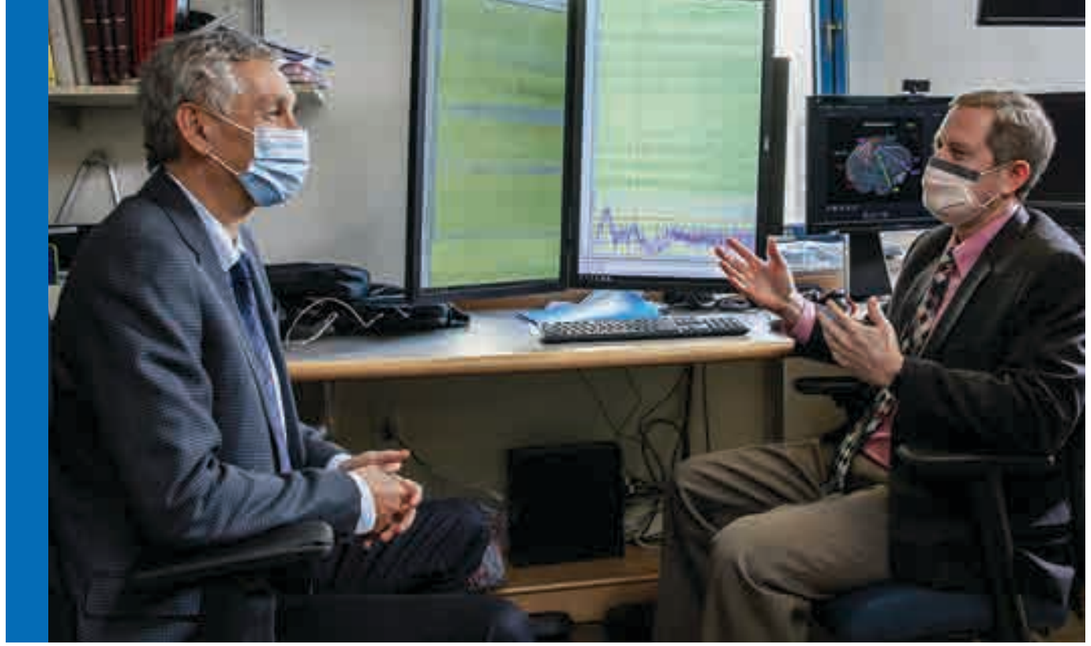
- Forecasting seizure risk in adults with focal epilepsy: a development and validation study. ***Lancet Neurology***, 2021.
- Intracranial Recordings Demonstrate Both Cortical and Medial Temporal Lobe Engagement in Visual Search in Humans. ***Journal of Cognitive Neuroscience***, 2021.
- Burden of disease in patients with a history of status epilepticus and their caregivers. **Epilepsy & Behavior**, 2020.

Jeremy Moeller, MS, MSc, researches various aspects of medical education, with a specific interest in assessment and the role of technology in neurology education. Moeller started and maintains the wildly popular Neurology Exam Prep Podcast, and developed a set of instructional videos on EEG interpretation that have been viewedmore than 1 million times on YouTube. The set is used as part of the core curriculum in several neurology residency programs across the country. Moeller is co-chair of the American Epilepsy Society's Assessments and Examinations Committee, which is responsible for the Epilepsy Fellows In-ServiceTraining Examination (EpiFITE) and the Epilepsy self-assessment examinations (SAE).

- Thriving in Neurology Residency: An Appreciative Inquiry Approach. ***Neurology***, 2022.
- Core Entrustable Professional Activities for Entering Residency Pilot. Entrustment Decision-Making in the Core EPAs: Results of a Multi-Institutional Study. ***Association of American Medical Colleges***, 2021.
- Funding the Educational Mission in Neurology. ***Neurology***, 2021.
- Multi-Residency Implementation of an Online Movement Disorders Curriculum Based on Real Patient Videos. ***Tremor and Other Hyperkinetic Movements***, 2021.

Pue Farooque, DO, conducts research in epilepsy surgery, evaluating surgical outcomes and specifically predictors of outcomes. Farooque has served on the American Epilepsy Society (AES) Fellows & Jr. Investigators Professional Development Committee, chairing the How to Negotiate session for fellows at past AES meetings.

- Management of patients with medically intractable epilepsy and anterior temporal lobe encephaloceles. ***Journal of Neuorsurgery***, 2021.
- Beyond implantation effect? Long-term seizure reduction and freedom following intracranial monitoring without additional surgical interventions. ***Epilepsy & Behavior***, 2020.
- Association of Seizure Spread with Surgical Failure in Epilepsy. ***JAMA Neurology***, 2019.



Drs. Hirsch and King-Stephens read and analyze an EEG.

Aline Herlopian, MD, studies pharmacokinetics, pharmacodynamics, and interactions of purified formulation of cannabidiol in patients with and without clobazam and other antiseizure medications. She is completing a textbook intended for residents, fellows, and junior faculty, with the goal of expanding knowledge of epilepsy surgery. For the past two years, she has been presenting and chairing symposia during the annual ACNS meetings.

- Electroencephalographic changes in purified pharmaceutical cannabidiol therapy. ***Epilepsy & Behavior***, 2022.
- Measuring expertise in identifying interictal epileptiform discharges. ***Epileptic Disorders***, 2022.
- Hemisphere-Dependent Ictal Tachycardia Versus Ictal Bradycardia in a Critically Ill Patient. ***Journal of Clininical Neurophysiology***, 2021.
- Imaging of Neuromodulation and Surgical Interventions for Epilepsy. ***American Journal of Neuroradiology***, 2021.

Ognen A. Petroff, MD, researches cerebral metabolism including changes in GABA and glutamate metabolism involved in the development of human epilepsy by using magnetic resonance spectroscopic imaging and multimodal (EEG, stereo-EEG, intracranial microdialysis) criticalcare monitoring applied to patients with status epilepticus and stroke. Petroff is a fellow of the American Academy of Neurology (AAN), the American Clinical Neurophysiology Society (ACNS), the American Epilepsy Society (AES) and the American Neurological Association (ANA).

- Deep Versus Lobar Intraparenchymal Hemorrhage: Seizures, Hyperexcitable Patterns, and Clinical Outcomes. ***Critical Care Medicine***, 2020.
- Elevated homocarnosine and GABA in subject on isoniazid as assessed through 1H MRS at 7T. ***Analytical Biochemistry***, 2020.

CLINICAL

Each year, we continue to care for more than 4,000 patients with epilepsy or possible epilepsy via our outpatient services in New Haven, Guilford, and Stamford, with plans to expand to North Haven and Greenwich very soon. Our EEG services include routine outpatient EEGs; home video/EEG monitoring; inpatient video/EEG/EKG/O2 monitoring in both the ICUs and in our adult (eight beds) and pediatric (three beds) epilepsy monitoring units with 24/7 live monitoring for safety; and advanced automated seizure detection and trending to aid review and timely recognition of important changes in brain activity. We perform more than 5,000 prolonged (more than 12 hours) video/EEG studies each year, with this volume continuing to grow. We now provide EEG services throughout most network hospitals, recently expanding to Greenwich, Bridgeport, and L&M Hospitals. We rolled out the use of new, rapid EEG technology, allowing interpretable EEG in six minutes, at most of these sites as well. This technology has been used more than 300 times at YNHHS. We also offer evoked potentials (somatosensory, visual, and auditory) and participate in multiple clinical trials of medications and devices.

We continue to offer every type of epilepsy treatment, from medications and dietary treatments (with a full-time epilepsy dietitian) to traditional resective surgery and neuromodulation, including vagus nerve stimulation, brain-responsive neurostimulation, and deep brain stimulation. We offer minimally invasive epilepsy surgery evaluations, including the use of robotically placed depth electrodes (also known as stereo EEG), and minimally invasive treatments as laser ablations. We continue to be a Level 4 Comprehensive Epilepsy Center (the highest level), and we offer specialized services in psychiatry, neuropsychology, social work, nutrition, and all other aspects of caring for people with epilepsy. We work very closely with our colleagues in neurosurgery, pediatric neurology, neuroradiology, psychology, and psychiatry.

LOCATIONS:
New Haven, Stamford, Guilford, and North Haven.

CLINICAL TRIALS:
We offer patient participation in several clinical trials, including, medications and devices.

Monitor watchers keep a close eye on more than 20 screens at a time on the CAVE/EMU.

CLINICAL PROVIDERS:

Lawrence J. Hirsch, *MD, chief, division of epilepsy and EEG; professor, neurology; co-director, Yale Comprehensive Epilepsy Center; co-director, Critical Care EEG Monitoring Program, program director, clinical neurophysiology fellowship; co-program director for critical care EEG fellowship*

Pue Farooque, *DO, associate professor, neurology; program director, epilepsy and seizures fellowship; medical director, epilepsy*

Aline Herlopian, *MD, assistant professor, neurology*

David King-Stephens, *MD, professor, clinical neurology; co-director, Center for Neurostimulation in Epilepsy*

Imran Quraishi, *MD, PhD, assistant professor, neurology; co-director, Center for Neurostimulation in Epilepsy*

Adithya Sivaraju, *MD, MHA, associate professor term, neurology; director, Post-Acute Symptomatic Seizure (PASS) clinic*

Jeremy Moeller, *MD, MSc, associate professor, neurology; neurology residency program director; associate vice-chair of education; departmental program director, Master of Health Science degree in medical education.*

Hal Blumenfeld, *MD, PhD, the Mark Loughridge and Michele Williams Professor of Neurology and Professor of Neuroscience and of Neurosurgery; director, Yale Clinical Neurosciences Imaging Center (CNIC)*

Richard H. Mattson, *MD, professor emeritus, neurology; director emeritus, Yale Comprehensive Epilepsy Center; adjunct professor, nursing; co-chair and advisor, J. Kiffin Penry Epilepsy MiniFellowships*

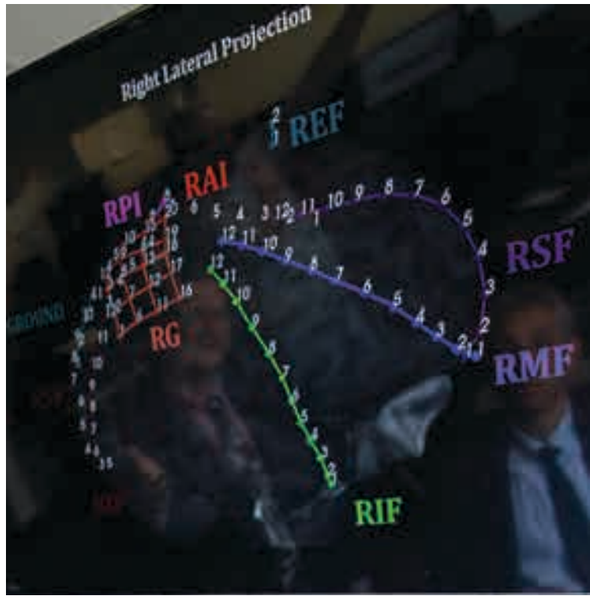
Hamada H. Altalib, *DO, MPH, associate professor, neurology and psychiatry; track director, health informatics, online executive MPH program*

Benjamin Tolchin, *MD, MS, assistant professor, neurology; inaugural director, Yale New Haven Center for Clinical Ethics*

Ognen A. Petroff, *MD, associate professor, neurology; medical director of EEG, Yale New Haven Hospital*

Christopher Benjamin, *PhD, assistant professor, neurology, neurosurgery, psychology, and radiology & biomedical imaging*

Sung-Min Park, *MD, PhD, assistant professor, neurology*



FELLOWSHIP TRAINING

In addition to teaching EEG and epilepsy care to neurology residents, we continue to train five epilepsy fellows each year. Dr. Farooque is the overall fellowship director (five fellows) and the program director of the ACGME epilepsy fellowship (two fellows). Dr. Hirsch continues to be program director of the clinical neurophysiology fellowship (two fellows). He continues to co-direct the nation's longest-running critical care EEG fellowship (one fellow) with Emily Gilmore, MD.

Movement Disorders

THE MOVEMENT DISORDERS DIVISION COMPRISES PHYSICIANS AND SCIENTISTS DEDICATED TO THE RECOGNITION, EVALUATION, TREATMENT, AND UNDERSTANDING OF THE FULL RANGE OF HYPOKINETIC AND HYPERKINETIC MOVEMENT DISORDERS.

VERONICA SANTINI, MD, *clinical chief*

RESEARCH

- The Yale School of Medicine has the unique and thrilling opportunity to maintain three scientific research programs funded by the Aligning Science Across Parkinson's (ASAP) Initiative. This initiative aims to accelerate discovery in Parkinson's disease (PD) by supporting collaborative teams. The three lead investigators of these programs include:

- The **Zhang Lab** investigates the underlying causes of inflammatory neurologic diseases, including Parkinson's disease.

  - Single-cell transcriptomic and proteomic analysis of Parkinson's disease Brains. ***BioRxiv***, 2022.

The **Zhang** and **Hafler Labs** arel investigating the immune system's role in the initiation and progression of the disease process in PD. Recent reports have provided early, provocative evidence that in addition to the immune system's potential for amplifying degeneration, a T cell-mediated autoimmune process may be involved in initiating pathology specific to PD. Since PD has a strong association with the HLA-DR haplotype that is commonly seen in autoimmune disease—as well as recent findings of autoimmunity to α-synuclein and the role of the microbiome in disease models—the lab maintains the hypothesis that PD is initiated by an autoimmune event in at least a subset of patients. The lab will further investigate the hypothesis that progression of PD pathology is initiated and/or abetted by an autoimmune process involving α-synuclein-specific T cell activation triggered by gut microbiome dysbiosis, followed by neuro-immune interactions that establish PD in the brain. To address this hypothesis, the lab will integrate neuroimmunology, single cell genomics, mouse models, and microbiome approaches. Investigators will examine whether T cell-mediated autoimmunity initiates the neurodegeneration process in PD, and whether these early immunological processes converge on classic archetypes of neurodegeneration. This work will produce whether map (the "interactome") of the neuro-immune interactions that are perturbed in PD, identifying rationale targets for clinical trials, and therefore paving the way to the development of new treatments.

- The **DeCamilli Lab** focuses on mechanisms underlying the dynamics and traffic of intracellular membranes, with emphasis on membrane transport reactions involved in neurotransmission.

  Pietro De Camilli, MD, is the John Klingenstein Professor of Neuroscience and Professor of Cell Biology, investigator of the Howard Hughes Medical Institute; director of the Program in Cellular Neuroscience, Neurodegeneration and Repair; and director of the Kavli Institute of Neuroscience at the Yale School of Medicine.

  The De Camilli Lab will use the tools of cell biology to elucidate the function of the many identified genes that cause or increase the risk of PD as well as the mechanisms through which their mutations lead to disease. Among the mutations that cause or increase susceptibility to PD, some are known or thought to impair the function of endo-lysosomes or mitochondria. Although these mutations may promote disease via independent mechanisms, growing evidence points to important cross-talks between endo-lysosomes and mitochondria, with effects on bioenergetics, mitochondria quality control, and innate immunity. Investigators will use a multidisciplinary approach to investigate the cell biology of selected PD-associated genes that act in the endocytic pathway and lysosomes. These include the genes encoding synaptojanin 1, *LRRK2* and *VPS13C*. The lab will define how their dysfunction leads to PD, with an emphasis on testing the hypothesis that disruption of mechanisms linking the endocytic system to the physiology of mitochondria may have a pathogenetic role. By identifying cellular processes whose dysfunction confers PD vulnerability, the research will support translation of PD genetics into new opportunities for therapeutic interventions.

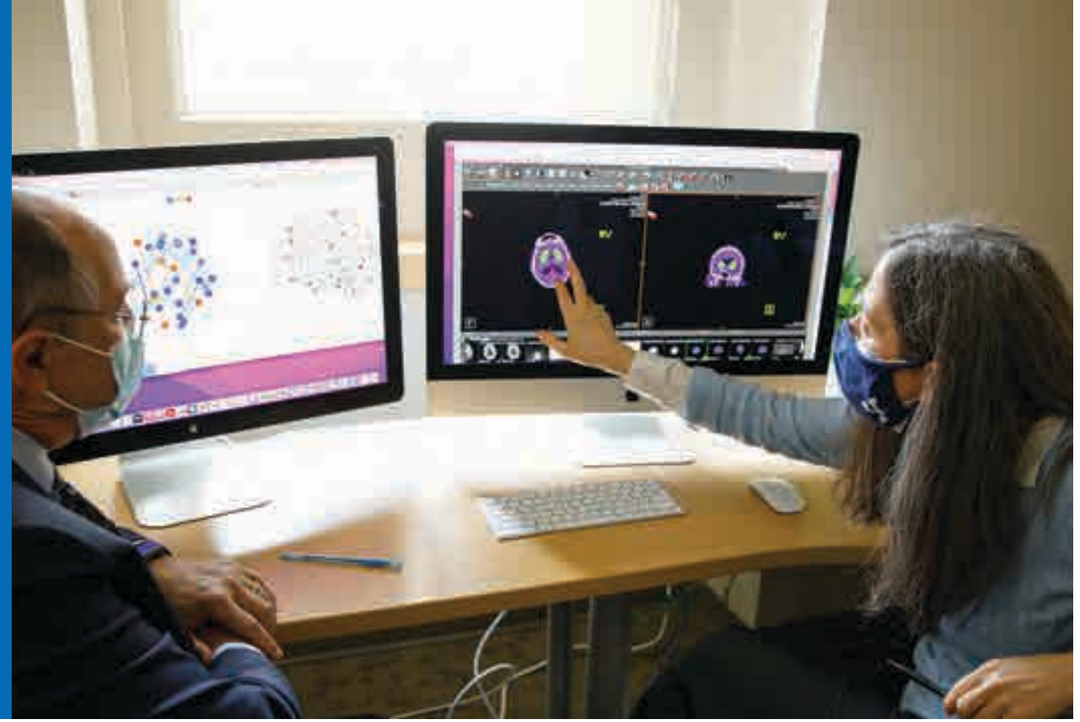
- The **Biederer Lab** focuses on the cognitive impairments of Parkinson's disease by exploring the vulnerability of cell types and circuits in the neocortex.

  - Synapse-Selective Control of Cortical Maturation and Plasticity by Parvalbumin-Autonomous Action of SynCAM 1. ***Cell Reports***, 2019.

  Thomas Biederer, PhD is associate professor of neurology.

  The Biederer Lab seeks to understand cognitive impairments in PD by elucidating the vulnerability of cell types and circuits in the neocortex that underline disease pathogenesis. With a strong interdisciplinary team in place, Biederer will lead efforts to clarify these mechanisms by defining network pathology progression through longitudinal using, in vivo imaging of neuronal activity and analysis of synaptic dysfunction, mapping gene expression patterns that mark vulnerable and protected cell types; and by using mathematical modeling to synthesize the roles of cellular, synaptic, and network vulnerabilities in the progression of pathology, predicting and experimentally validating network manipulations to correct aberrant cortical function. These experiments will determine to what extent PD progressively causes cognitive deficits through damage to vulnerable neurons and synapses and disruption of cortical network connectivity, These findings will reveal new avenues to ameliorate cognitive decline in PD.

Dr. Patel leads the hospital-based botulinum toxin practices of the department. As the primary neurologist of our DBS program, he works closely with the multidisciplinary team to guide evaluations and care within our health system and the region.



Dr. Tinaz (R) is passionate about investigating novel, evidence-based interventions that improve quality of life in Parkinson's disease. Dr. Cedarbaum (L) has extensive experience as a movement disorders specialist and clinical investigator who focuses on development of novel clinical outcome measures and biomarkers, including digital health technologies and development of new treatments for movement disorders.

The Movement Disorders division is also proud of the remarkable ongoing work in the following labs:

The **Tinaz Lab** focuses on the investigation of motor, behavioral, and cognitive dysfunction in movement disorders to identify novel therapeutic targets, biomarkers of disease progression, and brain-behavior changes using multimodal neuroimaging techniques.

- Neurofeedback-guided kinesthetic motor imagery training in Parkinson's disease: Randomized trial. ***NeuroImage: Clinical*****,** 2022.
- Distinct neural circuits are associated with subclinical neuropsychiatric symptoms in Parkinson's disease. ***Journal of the Neurological Sciences*****,** 2021.
- Robust bayesian analysis of early-stage Parkinson's disease progression using DaTscan images. ***IEEE Transactions on Medical Imaging*****,** 2021.
- Synaptic changes in Parkinson disease assessed with in vivo imaging. ***Annals of Neurology*****,** 2020.

Sule Tinaz, MD, PhD, is assistant professor of neurology and a clinician-scientist with multiple NIH funded grants whose research contributes to a mechanistic understanding of the neurodegenerative process in Parkinson's disease and to the development of promising novel therapeutics. Using MRI and network analyses, she demonstrates the structural and functional changes in specific brain networks and elucidates their relation to disease severity and to motor and non-motor symptoms in Parkinson's disease, while developing non-pharmacological interventions for symptom control, disease modification, and neuroprotection. Working closely with collaborators across Yale and in the community, Tinaz unifies PD research to further the benefit of her work on the quality of life of patients with Parkinson's disease.

The **Bamford Lab** focuses on the mechanisms underlying synaptic function and plasticity in the basal ganglia of genetically modified mice.

- Localising movement disorders in childhood. ***The Lancet Child & Adolescent Health*****,** 2019.
- The Striatum's Role in Executing Rational and Irrational Economic Behaviors. ***The Neuroscientist*****,** 2019.

Nigel Bamford, MD, is an associate professor of pediatrics and neurology; associate professor of cellular and molecular physiology and director of the Pediatric Movement Disorders Clinic. Bamford uses optical, electrophysiological, biochemical, and behavioral experiments to investigate the mechanisms underlying synaptic function and plasticity in the basal ganglia of genetically modified mice. Recent research has been focused on to the impact of dopamine deficiency and excess on striatal function. His experiments have demonstrated that motor and cognitive functions depend on the coordinated interactions between dopamine and acetylcholine at striatal synapses. These results suggest that pharmacological treatments which stabilize the expression of hyperpolarization-activated cation channels may improve acetylcholine-dopamine reciprocity and motor function in Parkinson's disease. The mechanisms discovered may encode rational and irrational behaviors; underlie a variety of movement disorders; and influence responses to stress.

The **Chandra Lab** focuses on synaptic dysfunction in neurodegenerative diseases.

- Single-cell transcriptomic and proteomic analysis of Parkinson's disease Brains. ***BioRxiv*****,** 2022.
- Identification of substrates of palmitoyl protein thioesterase 1 highlights roles of depalmitoylation in disulfide bond formation and synaptic function. ***PLOS Biology*****,** 2022.
- α-Synuclein facilitates clathrin assembly in synaptic vesicle endocytosis. ***BioRxiv*****,** 2020.
- Hsp110 mitigates α-synuclein pathology in vivo. ***Proceedings of the National Academy of Sciences of the United States of America*****,** 2019.

Sreeganga Chandra, PhD is an associate professor of neurology and neuroscience. Chandra investigates familial genes for Parkinson's disease. A recent focus of the lab is endolysosomal genes and how they influence synapse function and lead to neurodegeneration. Her lab uses a variety of approaches to investigate these questions in mouse models and stem cell-derived neurons.

Dr. Cedarbaum

CLINICAL

The Yale movement disorders program has a distinguished group of faculty who provide care to children and adults with the most complex movement disorders, including Parkinson's disease, atypical parkinsonian disorders, tic disorders, ataxia, Wilson disease, Huntington's disease, and complex genetic syndromes. The program provides comprehensive treatment options, from complementary supportive care to advanced therapeutics. In the last year, our specialists have provided advanced chemo denervation therapies for approximately 900 patients with dystonia, spasticity, hemifacial spasm, tremor, sialorrhea, and hyperhidrosis. Likewise, together with our functional neurosurgeons, our comprehensive deep brain stimulation (DBS) program serves much of the state of Connecticut with the provision of multiple devices and advanced programming techniques. Optimal care is provided through specialized disease centers with a multidisciplinary approach. Amar Patel, MD, provides neurologic care as part of the Wilson Disease Center of Excellence (one of only seven nationwide), while Brian Koo, MD, directs the Yale Center for Restless Legs Syndrome, (one of 10 RLS Foundation Quality Care Centers nationwide), serving patients with severe, refractory RLS with a large referral basis.

New leadership in the division brings an expansion of the tripartite mission of the movement disorders division. As the new clinical chief of the division and the inaugural director of the Comprehensive Parkinson Disease Care Center, Santini brings her expertise in multidisciplinary care together with her understanding of autonomic dysfunction in movement disorders. She will transform the care of Parkinson's disease patients with integrated comprehensive management approach and simultaneous expansion of research leading to disease modification, while training the next generation of movement disorders specialists.

LOCATIONS: The division provides care to the local community at Yale New Haven, Guilford, and Greenwich, with expansion planned at the end of this year to our North Haven campus.

CLINICAL TRIALS: The division combines its basic science, translational, and clinical research missions, working towards biomarker discovery, identifying markers of disease progression, and evaluating behavioral and pharmacologic interventions in movement disorders.

PROVIDERS:

Veronica E. Santini, MD, MA, *clinical division chief, movement disorders; inaugural director, Yale Comprehensive Parkinson Disease Care Center; associate professor, neurology*

Nigel Bamford, MD, *associate professor, pediatrics and neurology; associate professor of cellular and molecular physiology; director, Pediatric Movement Disorders Clinic; chief, section of pediatric neurology*

Sule Tinaz, MD, PhD, *assistant professor, neurology*

Amar Patel, MD, *assistant professor, neurology; director, Botulinum Toxin Clinic*

Sara Schaefer, MD, MHS, *assistant professor, neurology; associate program director, neurology*

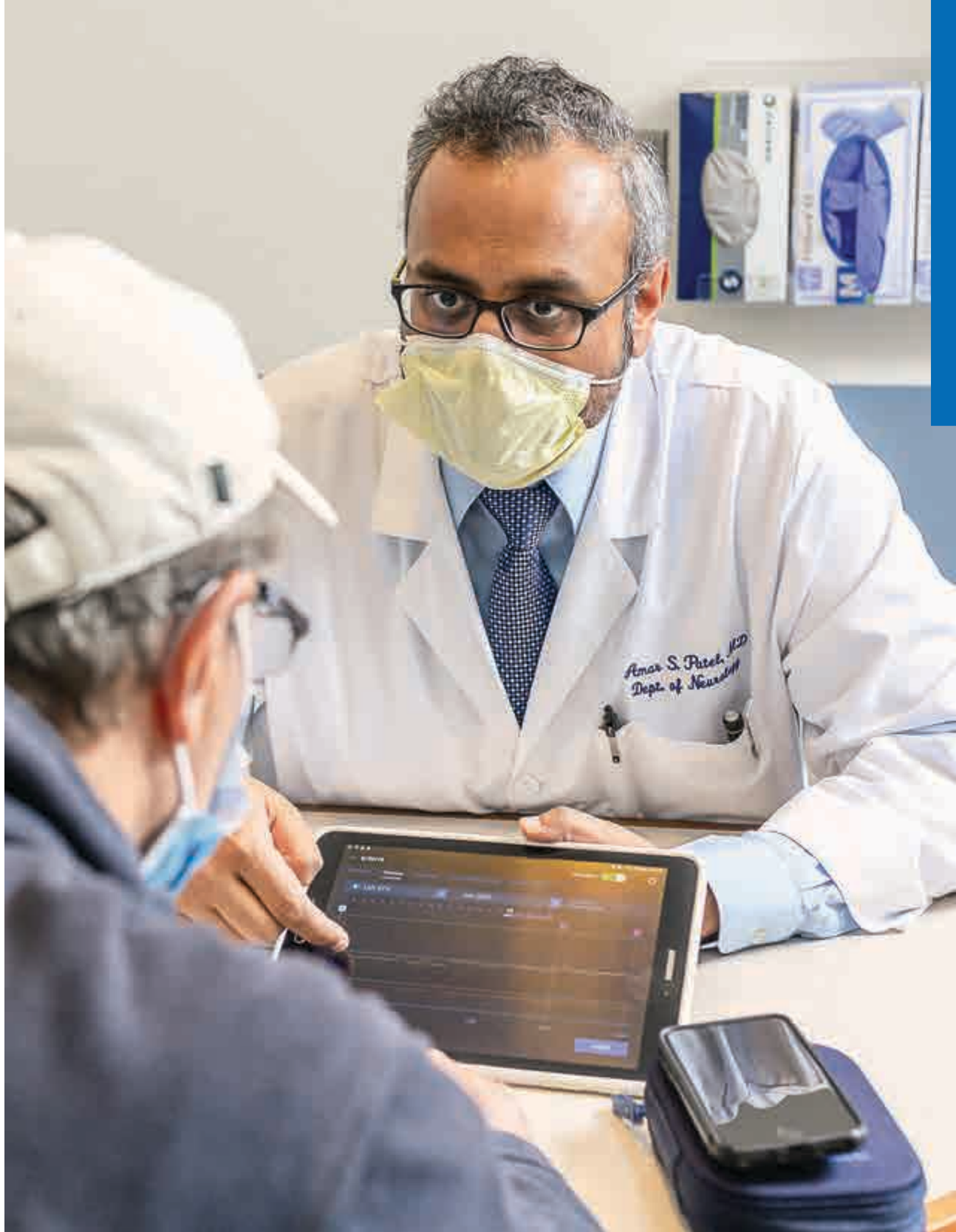
Alice Rusk, MD, *assistant professor, neurology*

Brian Koo, MD, *associate professor, neurology; director, Yale Center for Restless Legs Syndrome; director, Sleep Laboratory of the VA Connecticut Healthcare System*

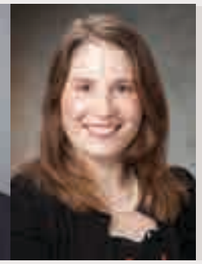
Jesse Cedarbaum, MD, *professor adjunct, neurology*

FELLOWSHIP TRAINING

The movement disorders fellowship has increased recruitment for its two-year clinical and scholarly program, which is individually tailored to each fellow. In addition to extensive training in common and rare movement disorders and advanced therapies, the fellowship incorporated training in pediatric and autonomic nervous system disorders; vocal cord dysfunction; electromyography; and neurocognition.



Neurocritical Care and Emergency Neurology



THIS DIVISION IS A MULTIDISCIPLINARY TEAM DEDICATED TO IMPROVING THE LIVES OF PATIENTS AND FAMILIES SUFFERING FROM ACUTE NEUROLOGICAL INJURY. THE YALE NEUROSCIENCES INTENSIVE CARE UNIT'S GOAL IS TO DELIVER EXCEPTIONAL CLINICAL CARE AND CUTT ING-EDGE CLINICAL RESEARCH TO EVERY PATIENT IN ORDER TO BE COME ONE OF THE LEADING ACUTE NEUROSCIENCE CENTERS IN THE WORLD.

KEVIN SHETH, MD *academic chief*

EMILY J. GILMORE, MD, *clinical chief*

RESEARCH

The **Sheth Lab** develops translational targets and prevention/acute treatment strategies for neurovascular disease by using collaboration in basic science, innovative technologies, and clinical trial platforms.

- Portable, bedside, low-field magnetic resonance imaging for evaluation of intracerebral hemorrhage. ***Nature Communications*****,** 2021.
- Association of surgical hematoma evacuation vs conservative treatment with functional outcome in patients with cerebellar hemorrhage. ***JAMA*****,** 2019.
- Oral anticoagulation and functional outcome after intracerebral hemorrhage. ***Annals of Neurology*****,** 2017.
- Safety and efficacy of intravenous glyburide on brain swelling after large hemispheric infarction (GAMES-RP): a randomized, double-blind, placebo-controlled phase 2 trial. ***Lancet Neurology*****,** 2016.

Kevin Sheth, MD, is vice chair for clinical & translational research in the Departments of Neurology & Neurosurgery as well as chief of neurocritical care & emergency neurology. Sheth has initiated and developed several innovative therapeutic platforms for patients with neurovascular disease in the areas of prevention and acute treatment. Sheth has more than 300 publications in the fields of stroke, neurotechnology, and clinical trials. He has been elected to membership in the American Society of Clinical Investigation and received the American Heart Association Stroke Research Mentoring Award" and add a period at the end of the sentence.

The **Gilmore Lab** uses advanced invasive and noninvasive technology—including continuous EEG—to identify signatures of metabolic stress, aimed at obtaining patient-derived thresholds of bioenergetic failure, with a particular focus on traumatic brain injury (TBI). Her lab's central task is the development of targeted interventions with the potential to prevent secondary neuronal injury and improve outcomes across a wide range of acute brain injuries.

- Nonepileptic Electroencephalographic Correlates of Episodic Increases in Intracranial Pressure. ***Journal of Clinical Neurophysiology*****,** 2022.
- Early head CT in post-cardiac arrest patients: A helpful tool or contributor to self-fulfilling prophecy? ***Resuscitation*****,** 2021.
- Deep versus lobar intraparenchymal hemorrhage: Seizures, hyperexcitable patterns and clinical outcomes. ***Critical Care Medicine*****,** 2020.
- Impact of COVID-19 Pandemic on Continuous EEG Utilization. ***Journal of Clinical Neurophysiology*****,** 2020
- Electro-clinical characteristics and prognostic significance of post anoxic myoclonus. **Resuscitation,** 2018.
- Acute brain failure in severe sepsis: a prospective study in the medical intensive care unit utilizing continuous EEG monitoring. ***Intensive Care Medicine*****,** 2015.

Emily Gilmore, MD, MS, is medical director of the neurosciences intensive care unit, fellowship director of neurocritical care and co-director of neurotrauma. Gilmore has built a comprehensive, multidisciplinary program to address a continuum of care needs, from the acute setting through rehabilitation and recovery. She has made Yale a leading center for advanced multimodal monitoring, exceptional clinical care, and cutting-edge research.

David Y. Hwang, MD, is interested in improving support for families of neurointensive care patients, particularly regarding goals-of-care decision making. In 2021, he received the Grevnick Family Award for Ethics for this work from the Society of Critical Care Medicine and was selected as a participant in the American Academy of Neurology (AAN) Transforming Leaders Program. He served as co-editor of a new book from Cambridge University Press, *Shared Decision Making in Adult Critical Care* (2021).

- Adapting a Traumatic Brain Injury Goals-of-Care Decision Aid for Critically Ill Patients to Intracerebral Hemorrhage and Hemispheric Acute Ischemic Stroke. ***Critical Care Explorations***, 2021.
- Predictors of family dissatisfaction with support during neurocritical care shared decision making. ***Neurocritical Care*****,** 2021.
- Predictors of surrogate decision makers selecting life-sustaining therapy for severe acute brain injury patients: an analysis of US population survey data. ***Neurocritical Care*****,** 2021.
- The initial impact of the COVID-19 pandemic on ICU family engagement: lessons learned from an international collaborative of 27 ICUs. ***Critical Care Explorations*****,** 2021.

David Y. Hwang, MD, is an associate professor of neurology. Hwang became the director of mentorship for the Department of Neurology in late 2020. In this role, David supports the Office of the Chair by advising faculty across all divisions regarding appointment and promotion processes and career development resources. Hwang also finished a two-year term as chair of the AAN's Critical Care and Emergency Neurology Section and served on the executive committee of the Neurocritical Care Society in 2021.

The **Falcone Lab** integrates clinical, genomic and neuroimaging data to identify novel pathways and therapeutic targets related to in cerebrovascular disease, brain health, and aging.

- Genetically Determined Low-Density Lipoprotein Cholesterol and Risk of Subarachnoid Hemorrhage. ***Annals of Neurology***, 2021
- Genetically Elevated LDL Associates with Lower Risk of Intracerebral Hemorrhage. ***Annals of Neurology***, 2020.
- Association of Intensive Blood Pressure Reduction With Risk of Hematoma Expansion in Patients With Deep Intracerebral Hemorrhage. ***JAMA Neurology***, 2019.
- 17p12 Influences Hematoma Volume and Outcome in Spontaneous Intracerebral Hemorrhage. ***Stroke*****,** 2018.

Guido Falcone, MD, ScD, is an assistant professor of neurology and director of clinical research in neurocritical care. Falcone is internationally recognized for his expertise in population genetics, and has won numerous awards for his work in genetic epidemiology as it pertains to acute brain injury. He leads the Yale Longitudinal Study of Acute Brain Injury for the division of Neurocritical Care and Emergency Neurology.

Dr. Gilmore (R) fills a number of research, clinical, and education roles at Yale.

The **Petersen Lab** utilizes neuromonitoring methods and bedside data processing technology to develop personalized treatments and improve outcomes following acute neurologic injury.

- Blood Pressure Trajectory Groups and Outcome After Endovascular Thrombectomy: A Multicenter Study. ***Stroke***, 2021.
- Fixed Compared With Autoregulation-Oriented Blood Pressure Thresholds After Mechanical Thrombectomy for Ischemic Stroke. **Stroke,** 2020.
- Association of Personalized Blood Pressure Targets With Hemorrhagic Transformation and Functional Outcome After Endovascular Stroke Therapy. **JAMA Neurology,** 2019.
- Decreases in Blood Pressure During Thrombectomy Are Associated With Larger Infarct Volumes and Worse Functional Outcome. **Stroke,** 2019.

Nils Petersen, MD, PhD, is an associate professor and director of the Yale Cerebrovascular Lab (YCVL). Dr. Petersen's clinical and research interests lie in using novel neuromonitoring modalities to understand blood flow regulation. Through working with colleagues in Neurology, Neurosurgery, and Neuroradiology, he helped to build the infrastructure for continuous cerebrovascular autoregulatory monitoring in critically ill neurovascular patients.

The **Beekman Lab** uses multimodality monitoring to identify novel physiologic biomarkers and individualized treatment approaches to improve outcomes in cardiac arrest.

- Early head CT in post-cardiac arrest patients: A helpful tool or contributor to self-fulfilling prophecy? ***Resuscitation***, 2021.
- Neuromonitoring After Cardiac Arrest: Can Twenty-First Century Medicine Personalize Post Cardiac Arrest Care? ***Neurologic Clinics***, 2021.

Rachel Beekman, MD, is an assistant professor. Beekman's lab focuses on the evaluation of optimal blood pressure goals after cardiac arrest with the use of near-infrared spectroscopy for continuous autoregulation monitoring, for which she was awarded an institutional KL2 that began in March 2022. She also has an industry-sponsored award, and is collaborating with the Yale Positron Emission Tomography (PET) Research Center to better understand changes in synaptic density in patients who survive cardiac arrest.

The **Kim Lab** focuses on investigation of early EEG and MRI biomarkers, using computational methods to improve prediction of short- and long-term complications after such severe acute brain injuries as subarachnoid hemorrhage, brain trauma, and ischemic stroke.

- Combining Transcranial Doppler and EEG Data to Predict Delayed Cerebral Ischemia After Subarachnoid Hemorrhage. ***Neurology***, 2021
- High epileptiform discharge burden predicts delayed cerebral ischemia after subarachnoid hemorrhage. ***Clinical Neurophysiology***, 2021
- Development of Expert-Level Automated Detection of Epileptiform Discharges during Electroencephalography Interpretation. ***JAMA Neurology***, 2019.
- Epileptiform activity in traumatic brain injury predicts post-traumatic epilepsy. ***Annals of Neurology***, 2018.

Yale scientists partnered with medical device company Hyperfine to develop a portable MRI. The cost-efficient device delivers rapid, accurate diagnoses of brain abnormalities in a wide range of clinical settings.

Jennifer A. Kim, MD, PhD, is an assistant professor. Kim's lab focuses on the use new novel computational methods of critical care electroencephalography and neuroimaging to predict neurodeterioration in patients at high risk of additional injury. She has received multiple grant awards, including a K23, an AAN Clinical Research Training Scholarship, an AHA post-doctoral award, an R25, a NeuroNEXT fellowship, a Bee Foundation award, and a Swebilius Foundation award. She is also co-investigator on R01 and UG3 awards.

The **Magid-Bernstein Lab** studies the role of inflammation in patients following hemorrhagic stroke via profiling inflammatory cells and markers within cerebrospinal fluid through collaborations with basic science labs.

- Impacts of ABO-incompatible platelet transfusions on platelet recovery and outcomes after intracerebral hemorrhage. ***Blood***, 2021.
- Red blood cell transfusions and outcomes after intracerebral hemorrhage. ***Journal of Stroke and Cerebrovascular Disease***, 2020.
- Low hemoglobin and hematoma expansion after intracerebral hemorrhage. ***Neurology***, 2019.
- Human CD39+ T_{reg} cells express Th-17 associated surface markers and suppress IL-17 via a STAT3-dependent mechanism. ***Journal of Interferon and Cytokine Research***, 2017.

Jessica Magid-Bernstein, MD, PhD, is an assistant professor of neurology. Magid-Bernstein's lab, under the mentorship of Lauren Sansing, MD, MS, and Kevin Sheth, MD, focuses on translational investigation of inflammation in hemorrhagic stroke. This work combines her PhD studies in immunology with her clinical knowledge gained from training. She has recently been awarded the Neurocritical Care Society Research Training Fellowship Grant.

The **Prust Lab** studies neurocritical illness and stroke in the context of global health, working to identify scalable, cost-effective interventions to curb morbidity and mortality from neurologic emergencies in resource-limited settings.

- Aspiration Pneumonia in Adults Hospitalized With Stroke at a Large Academic Hospital in Zambia. ***Neurology: Clinical Practice***, 2021.
- Inpatient Management of Acute Stroke of Unknown Type in Resource-Limited Settings. ***Stroke***, 2022.

Morgan L. Prust, MD, is an assistant professor of neurology. Prust is a neurointensivist with extensive experience caring for underserved patients with neurologic illness in Zambia. Inspired by that experience, he is interested in characterizing the epidemiology of neurocritical illness in low- and middle-income countries; optimizing systems of care in resource-limited settings to improve outcomes of neurologic emergencies; and fostering collaborations to implement data-driven clinical innovations at scale across a range of global health contexts.

CLINICAL

The Yale Neurocritical Care and Emergency Neurology program provides comprehensive care for a variety of acute neurologic and neurosurgical disorders, including: intracerebral hemorrhage, acute ischemic stroke, subarachnoid hemorrhage, traumatic brain and spinal cord injuries, status epilepticus, encephalitis, and cardiac arrest. The program also provides care for the most complex pre-and post-operative neurosurgical patients. We offer specialized, multidisciplinary care with 10 neurocritical care faculty, world-class neuroscience critical care nursing, a robust team of advanced practice providers, and various levels of trainees, including dedicated neurocritical care fellows. Our experts collaborate with specialists in the fields of vascular neurology, interventional neurosurgery, neuroradiology, emergency medicine, trauma surgery, pulmonary critical care, and cardiology to deliver exceptional individualized care coupled with opportunities to participate in clinical trials at the forefront of the field. Through Y-Access and our telehealth programs, our division offers urgent evaluation and transfer of patients requiring the most sophisticated care that the state of Connecticut has to offer. The division has optimized patient-centered care with our state-of-the-art neurosciences ICU, which includes:

- 19-bed unit
- Portable CT and MRI
- Advanced invasive and noninvasive neuromonitoring with continuous EEG, electrocorticography, ICP, brain tissue oxygen, microdialysis, cerebral blood flow, and autoregulatory indices
- Integrated care with neurosurgery
- Collaborative multidisciplinary care with the departments of vascular neurology, general neurology, trauma surgery, emergency medicine, pulmonary critical care, and cardiology
- Opportunities to participate in cutting-edge clinical trials across the continuum of care
- Dedicated PT, OT, and SLP services
- Specialized social workers and care managers who facilitate optimal rehabilitation placement and discharge services
- Patient educators and access to family support groups

LOCATIONS: Our central facility is our neurosciences ICU at the York Street campus.

CLINICAL TRIALS: The division continues to expand its work with multiple NIH-funded grants and pharmaceutical trials.

PROVIDERS:

Kevin Sheth, MD, *professor, neurology and neurosurgery; executive director of the NNCTU and vice chair for clinical & translational research in the departments of neurology & neurosurgery; chief of neurocritical care & emergency neurology*

Emily Gilmore, MD, MS, *associate professor, neurology medical director, neurosciences intensive care unit; fellowship director, neurocritical care; co-director, neurotrauma*

David Y. Hwang, MD, *associate professor, neurology*

Guido Falcone, MD, *associate professor, neurology staff neurointensivist; director, clinical research in neurocritical care; training director, the "Yale AHA/Bugher Center of Research Excellence in Hemorrhagic Stroke Prevention & Treatment*

Nils Petersen, MD, PhD, *associate professor, neurology staff neurointensivist, neuroscience intensive care unit; director, of the Yale Cerebrovascular Lab (YCVL)*

Rachel Beekman, MD, *assistant professor, neurology*

Jennifer A. Kim, MD, PhD, *assistant professor, neurology*

Jessica Magid-Bernstein, MD, PhD, *assistant professor, neurology*

Morgan L. Prust, MD, *assistant professor, neurology affiliated faculty, Yale Institute for Global Health*

The Yale Neurosciences Intensive Care Unit joins forces with many of other disciplines at Yale to deliver world-renowned clinical care.

FELLOWSHIP TRAINING

The Neurocritical Care fellowship is a comprehensive, two-year program designed to graduate clinicians who excel in both critical care medicine and emergency neurology. Our trainees take advantage of the scholarly environment that Yale offers, contributing to research, educational, and quality improvement projects. Our fellows have a high success rate for their first-choice post-training placement, whether an additional fellowship (i.e., vascular neurology or critical care EEG) or a faculty position. The program has expanded from one fellow in 2014 to six in 2021.

Neurodegenerative Disorders

THE INCREASING PREVALENCE OF NEURODEGENERATIVE DISEASES AROUND THE WORLD MEANS THAT MANY ALL OF US HAVE LOVED ONES WHO ARE EITHER PATIENTS OR BEAR THE BURDEN OF CARE FOR AFFLICTED INDIVIDUALS. YALE'S DEPARTMENT OF NEUROLOGY FEATURES SEVERAL PROGRAMS FOCUSED ON COMBATING NEURODEGENERATION AND FACILITATING NEURAL REPAIR, ON THE CLINICAL AND RESEARCH FRONTS.

STEPHEN STRITTMATTER, MD, PhD, *academic chief*

RESEARCH

The Fesharaki Lab, in collaboration with David Matuskey, MD, examines the synaptic density and neurobehavioral symptoms in patients with behavioral variant frontotemporal dementia (bvFTD).

- PET Imaging of Synaptic Density: Challenges and Opportunities of Synaptic Vesicle Glycoprotein 2A PET in Small Animal Imagin. ***Frontiers in Neuroscience***, 2022.
- A Case of Possible Chronic Traumatic Encephalopathy and Alzheimer's Disease in an Ex-Football Player. ***The Neurologist***, 2021.
- Coronavirus 2019 and neurodegenerative disease: what will the future bring? ***Current Opinion in Psychiatry***, 2021.
- Fyn kinase inhibition reduces protein aggregation, increases synapse density and improves memory in transgenic and traumatic Tauopathy. ***Acta Neuropathologica Communications***, 2020.

Arman Fesharaki-Zadeh, MD, PhD, is an assistant professor of neurology and psychiatry.
His main area of research is the long-term sequelae of traumatic brain injury and chronic traumatic encephalopathy using preclinical models. He is one of the founding members of the Yale Concussion Program, which continues its clinical development. His other area of research involves studying synaptic density alterations in behavioral variant frontotemporal dementia (bvFTD), using PET brain imaging.

The Fredericks Lab uses multimodal neuroimaging to understand the relationship between pathology and connectivity in Alzheimer's disease.

- Association of CSF Biomarkers with Hippocampal-Dependent Memory in Preclinical Alzheimer Disease. ***Neurology***, 2021.
- Tau PET imaging with 18F-PI-2620 in aging and neurodegenerative diseases. ***European Journal of Nuclear Medicine and Molecular Imaging***, 2020.
- Intrinsic connectivity networks in posterior cortical atrophy: A role for the pulvinar? ***Neuroimage: Clinical***, 2019.
- Early affective changes and increased connectivity in preclinical Alzheimer's disease. ***Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring***, 2018.

Carolyn A. Fredericks, MD, is the Henry F. McCance Scholar in Neurodegeneration at Yale University and an assistant professor of neurology. Fredericks's research focuses on preclinical Alzheimer's disease and on less common Alzheimer's variants, using advanced imaging tools to better understand how Alzheimer's disease progresses through functional networks in the brain. She is a member of Yale's Clinical Neurosciences Imaging Center (CNIC); serves on the Alzheimer's Association's State Medical Scientific Advisory Council and the Yale Alzheimer's Disease Research Center's Clinical Core; and is affiliated with the Yale Interdisciplinary Neurosciences Program (Graduate School of Arts & Sciences).
Her work is funded by the Alzheimer's Association, the National Institute on Aging (National Institutes of Health), and the McCance Foundation.

The Grutzendler Lab studies cell-cell interactions in neurodegeneration/glial-vascular biology/translational neuroscience/intravital microscopy.

- Astrocytes and microglia play orchestrated roles and respect phagocytic territories during neuronal corpse removal in vivo. ***Science Advances***, 2020.
- Lifelong cortical myelin plasticity and age-related degeneration in the live mammalian brain. ***Nature Neuroscience***, 2018.
- TREM2 Haplodeficiency in Mice and Humans Impairs the Microglia Barrier Function Leading to Decreased Amyloid Compaction and Severe Axonal Dystrophy. ***Neuron***, 2016.
- Angiophagy prevents early embolus washout but recanalizes microvessels through embolus extravasation. ***Science Translational Medicine***, 2014.

Jaime Grutzendler, MD, is the Dr. Harry M. Zimmerman and Dr. Nicholas and Viola Spinelli Professor of Neurology and Neuroscience; vice-chair for research in neurology; and director of the Center for Experimental Neuroimaging at the Yale School of Medicine. Grutzendler's clinical interests focus on neurodegenerative disorders, with special emphasis on such dementias as Alzheimer's disease. He also leads a research laboratory focused on understanding brain function and the cellular basis of neurological diseases. He specifically is interested in elucidating cellular and molecular mechanisms of neurodegeneration; and developing methods for intravital brain imaging and translational neuroscience with therapeutics efforts within the fields of neurodegeneration, and nervous system injury.

The Strittmatter Lab studies the molecular and cellular basis of synapse loss in Alzheimer' s disease with a particular focus on treatments to protect synapse and cognitive function.

- Alzheimer Risk Gene Product Pyk2 Suppresses Tau Phosphorylation and Phenotypic Effects of Tauopathy. ***Molecular Neurodegeneration***, 2022.
- Reversal of Synapse Loss in Alzheimer Mouse Models by Targeting mGluR5 to Prevent Synaptic Tagging by C1q. ***Science Translational Medicine***, 2022.
- Liquid and Hydrogel Phases of PrP^{C} Linked to Conformation Shifts and Triggered by Alzheimer's Amyloid-β Oligomers. ***Molecular Cell***, 2018.
- Loss of TMEM106B Ameliorates Lysosomal and Frontotemporal Dementia-Related Phenotypes in Progranulin-Deficient Mice. ***Neuron***, 2017.

Stephen M. Strittmatter, MD, PhD, is chair and professor of neuroscience, the Vincent Coates Professor of Neurology, and director of the Yale Alzheimer Disease Research Center (ADRC), the Yale Memory Disorders Clinic, and the Kavli Institute for Neuroscience at Yale. Strittmatter's clinical emphasis is on Alzheimer's disease and frontotemporal dementia. His laboratory has mapped the molecular pathway by which ß-amyloid, innate immunity, and tau are linked at the synapse to cause cognitive symptoms in Alzheimer's, and he has developed therapeutic approaches that target this pathway. His research has also defined the molecular basis of nerve fiber repair after adult injury. His laboratory research has appeared in 250 publications. Dr. Strittmatter's research has been recognized by the King Faisal International Prize in Medicine, the Ameritec Award, and the Alzheimer Association Zenith Fellow Award.

Carmen Carrión, PsyD, primarily researches health disparities and the ways in which social determinants of health influence neurological and cognitive outcomes and influence performance on cognitive evaluations.

- Education differentially contributes to cognitive reserve across racial/ethnic groups. ***Alzheimer's & Dementia: The Journal of the Alzheimer's Association*****,** 2020.
- Functional Reserve: The Residual Variance in Instrumental Activities of Daily Living Not Explained by Brain Structure, Cognition, and Demographics. **Neuropsychology,** 2020.
- One model does not fit all: Individuals who defy stereotypical profiles require distinct brain-phenotype models, *under review in* ***Nature.***

Carmen Carrión is the site PI for the R01, NIH-funded Neighborhoods Study led by Amy Kind, MD, PhD, of the University of Wisconsin. It is a multi-site study through the Alzheimer's Disease Research Center (ADRC) that aims to demonstrate that neighborhood disadvantage will predict lower cognitive function, faster cognitive decline, and greater disease burden, including AD neuropathology among the targeted sample. Carrión is also the site PI for a study led by Juan Carlos Arango-Lasprilla, PhD, of Bio Cruces Biskaia Health Research Institute in Bilbao, Spain. This is a multi-site study that aims to gather normative data among the Spanish-speaking population of the United States.

Emily S. Sharp, PhD, is a co-investigator on NIH-funded clinical trials and neuroimaging projects within the Yale Alzheimer's Disease Research Center (PIs: Strittmatter). She is a co-investigator on a NIH-funded phase III clinical trial within Anesthesiology, examining cognitive outcomes following two types of ED-placed endotracheal tubes (PI: Treggiari). Sharp provides expert consultation on other clinical research projects, including studies of fron-to-temporal dementia, atypical Alzheimer's disease (logopenic; posterior cortical atrophy), Parkinson's disease, and outcomes following deep brain stimulation (DBS) and Gamma Knife therapies in Parkinson's disease and essential tremor.

- Synaptic density and cognitive performance in Alzheimer's disease: A PET imaging study with -[^{11}C]UCB-J. ***Alzheimer's & Dementia*****,** 2022.

Dr. Fesharaki-Zadeh assesses a patient's cognitive functioning at the Guilford clinic.

Anna Szekely, MD, primarily researches key molecular perturbations underlying rare neurological disorders with known or predicted genetic etiology by using emerging genomic technologies. As one of the founding members of Yale's Program on Neurodevelopment and Regeneration, Szekely is a collaborator on several NIH-founded projects (PIs: Vaccarino, Chawarska) related to genetically influenced neurodevelopmental disorders, including autism and Tourette syndrome. She is also a mem-ber of the NIH's PsychENCODE Consortium. Her work involves the use of leading genomic approaches of iPSC-based neuronal modeling and postmortem brain analysis, combined with clinical data. Recent projects also include innovative research on the role of somatic mosaicism in the brain, with implications for adult-onset progressive neurodegenerative disorders, often with lateralized or focal onset/presentation.

- ASD modelling in organoids reveals imbalance of excitatory cortical neuron subtypes during early neurogenesis *under review,* ***Nature*****,** 2022.
- Early developmental asymmetries in cell lineage trees in living individuals. ***Science*****,** 2021.
- Miglustat therapy for SCARB2-associated action myoclonus renal failure syndrome. ***Neurology® Genetics*****,** 2021.
- Ring chromosome formation by intra-strand repairing of subtelomeric double stand breaks and clinico-cytogenomic correlations for ring chromosome 9. ***American Journal of Medical Genetics*****,** 2020.

Anna Szekely is a neurogeneticist with particular expertise in neurodegeneration. She is currently developing a novel large scale, genomic approach to leverage the abundance of data generated by the PsychENCODE Consortium to elucidate the role of non-coding genetic variants in adult-onset neurological disorders, with specific emphasis on neurodegeneration.

CLINICAL

The Yale Memory Disorders Clinic provides care for patients with a broad spectrum of cognitive and affective complaints, including Alzheimer's disease, vascular cognitive impairment, frontotemporal lobar degeneration With its specialists in behavioral neurology, neuropsychiatry, neuropsychology, and neurogenetics, the clinic provides interdisciplinary care to patients and their families.

LOCATIONS: With its primary hub in New Haven, the division has expanded with a satellite location in Guilford.

CLINICAL TRIALS : The division continues to add to its number of NIH-funded grants.

PROVIDERS:

Stephen Strittmatter, MD, PhD, the *Vincent Coates Professor of Neurology and Professor of Neuroscience; chair, neuroscience; director, Kavli Institute for Neuroscience; director, cellular neuroscience, neurodegeneration and repair; director, Yale Alzheimer's Disease Research Center; director, Memory Disorders Clinic*

Carmen I. Carrión, PsyD, *assistant professor, clinical neurology; associate core leader, outreach, recruitment, and engagement core, Alzheimer's Disease Research Center (ADRC)*

Arman Fesharaki-Zadeh, MD, PhD, *assistant professor, psychiatry and of neurology*

Carolyn A. Fredericks, MD, *assistant professor, neurology; Henry F. McCance Scholar in Neurodegeneration*

Jaime Grutzendler, MD, *the Dr. Harry M. Zimmerman and Dr. Nicholas and Viola Spinelli Professor of Neurol-ogy and Neuroscience; vice-chair for research, neurology; director, Center for Experimental Neuroimaging*

Emily Sharp, PhD, ABPP, *assistant professor, neurology; division chief, neuropsychology; associate training director, postdoctoral residency program, neuropsychology*

Anna Szekely, MD, *associate research scientist in neurolo-gy; attending physician, neurogenetics program; member, program in neurodevelopment and regeneration*

Darren Volpe, MD, *associate professor, clinical neurology; associate program director, neurology; director, behavioral neurology and neuropsychiatry fellowship; VA site director, Yale neurology residency program*

FELLOWSHIP TRAINING

The behavioral neurology/neuropsychiatry fellowship program has been expanded, offering two options to incoming fellows: one is the traditional one-year full-time fellowship; the other is a two-year, half-time fellowship for trainees simultaneously pursuing clinical training and clinical/translational research or attending-level clinical care. This expansion to 1.5 slots began in 2022.

Neuro-Immunology

THE YALE MULTIPLE SCLEROSIS CENTER PROVIDES COMPREHENSIVE CARE TO PATIENTS WITH MULTIPLE SCLEROSIS (MS), NEUROMYELITIS OPTICA, TRANSVERSE MYELITIS, OPTIC NEURITIS, AND OTHER NEUROIMMUNE DISORDERS. EXPERT, FELLOWSHIP-TRAINED NEUROLOGISTS COLLABORATE WITH EXPERIENCED NURSES, THERAPISTS, AND SOCIAL WORKERS TO CARE FOR PATIENTS IN ALL STAGES OF DISEASE.

DAVID A. HAFLER, MD
academic chief

KATHERINE DeSTEFANO, MD, MS
clinical chief

RESEARCH

The Hafler Lab investigates the underlying causes of inflammatory neurologic diseases, in particular multiple sclerosis.

- Oleic Acid Induces Tissue Resident FoxP3 Regulatory T cell Function. **The Journal of Clinical Investigation,** 2021.
- Transcriptomic and clonal characterization of T cells in the human central nervous system. ***Science Immunology*,** 2020.
- Role of peripheral immune cells and resident microglia in susceptibility. ***Science*,** 2019.
- Activated β-catenin in Foxp3+ regulatory T cells links inflammatory environments to autoimmunity. ***Nature Immunology*,** 2018
- Low-frequency and rare-coding variation contribute to multiple sclerosis risk. ***Cell*,** 2018.

David A. Hafler, MD is the William S. and Lois Stiles Edgerly Professor and Chair, Department of Neurology Professor of Immunobiology, Yale School of Medicine; and the Neurologist-in-Chief of the Yale New Haven Hospital. A preeminent physician-scientist, Hafler has made seminal discoveries defining the pathogenesis of multiple sclerosis and autoimmune diseases. Hafler has more than 400 publications in the field of MS, autoimmunity, and immunology, and is one of the most frequently cited living neurologists. He has been elected to membership in the AOA Society, the American Society of Clinical Investigation, the Association of American Physicians, and the National Academy of Medicine.

The Pitt Lab focuses on the neurodegenerative aspects of multiple sclerosis, in particular the role of glial cells.

- Towards precision phenotyping in MS. ***Neurology Neuroimmunology & Neuroinflammation*,** 2022.
- Dimethyl Fumarate reduces inflammation in chronic active multiple sclerosis lesions. ***Neurology Neuroimmunology & Neuroinflammation*,** 2022.
- QSM is an imaging biomarker for chronic glial activation in MS lesions. ***Annals of Clinical and Translational Neurology*,** 2021.
- Differential expression of the T-cell inhibitor TIGIT in glioblastoma and MS. ***Neurology Neuroimmunology & Neuroinflammation*,** 2020.

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David Pitt, MD obtained his MD degree at Philipps University in his native Germany. He subsequently completed a post-doctoral fellowship at the Albert Einstein College of Medicine (laboratory of C.S. Raine, PhD, DSc) in New York, followed by a neurology residency and a clinical/research neuroimmunology fellowship at Washington University in St. Louis. He joined the Yale faculty in 2012, where he is currently an associate professor. Pitt is a co-director of the recently established American National MS tissue bank. He sees patients at the Yale Multiple Sclerosis Center.

The O'Connor Lab investigates the mechanisms by which B cells - and the autoantibodies they produce contribute to the pathology of human autoimmune disease.

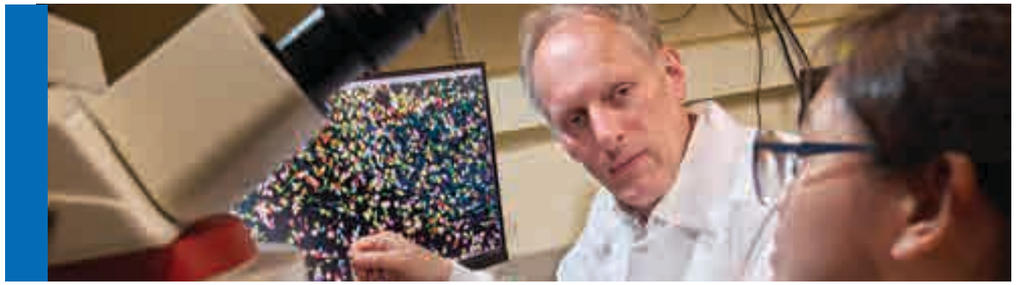
- Heterogeneity of Acetylcholine Receptor Autoantibody-Mediated Complement Activity in Patients With Myasthenia Gravis. ***Neurology Neuroimmunolgy & Neuroinflammation*,** 2022.
- Thymus-derived B cell clones persist in the circulation after thymectomy in myasthenia gravis. ***Proceedings of the National Academy of Sciences of the United States of America*,,** 2020.
- Single-cell repertoire tracing identifies rituximab refractory B cells during myasthenia gravis relapses. ***JCI Insight*,** 2020.
- Self-antigen driven affinity maturation is required for pathogenic monovalent IgG4 autoantibody development. ***Journal of Experimental Medicine*,** 2020.

Kevin O'Connor, PhD, is a neuroimmunologist with a special interest in human autoimmune neurologic diseases. His research focuses on human translational immunology and neurology. He and his group are specifically interested in defining the mechanisms by which B cells and the antibodies they produce - contribute to both the pathophysiology and tissue injury observed in human autoimmune diseases. The researchers are engaged in understanding how particular autoreactive B cell subsets and their autoantibodies initiate and sustain autoimmunity by studying human-derived specimens. The diseases they research include myasthenia gravis (MG), neuromyelitis optica spectrum disorder (NMO) and myelin oligodendrocyte glycoprotein (MOG) antibody disease.

The Longbrake Lab seeks to understand the genetic-environmental-immune interactions that trigger the autoimmune processes leading to multiple sclerosis (MS) as well as the individual-level heterogeneity characteristic of patients with this disease the researchers employ using clinical/translational methodology and close collaborations with wet-lab research groups.

- Worsening physical functioning in patients with neuroinflammatory disease during the COVID-19 pandemic. ***Multiple Sclerosis and Related Disorders*,** 2022.
- Consensus Curriculum for Fellowship Training in Multiple Sclerosis and Neuroimmunology. ***Neurology Clinical Practice*,** 2021.
- Manifestations and impact of the COVID-19 pandemic in neuroinflammatory diseases. ***Annals of Clinical and Translational Neurology*,** 2021.
- CXCR3+ T cells in multiple sclerosis correlate with reduced diversity of the gut microbiome. ***Journal of Translational Autoimmunity*,** 2020.

Erin Longbrake, MD, PhD, is an assistant professor of neurology and directs the clinical and translational research program in multiple sclerosis and the neuroimmunology fellowship program. Longbrake's scientific interests focus on the clinical heterogeneity observed among patients with MS, and on elucidating the immunologic changes that precede the development of clinical disease. She is the PI for multiple pharma and NIH-sponsored clinical trials, as well as a large, investigator-initiated clinical trial of short-term B-cell depletion in patients with radiologically isolated syndrome (www.cellostudy.org). Additional areas of interest include evaluation of the effects of the COVID-19 pandemic on patients with neuroimmune diseases, and exploration of the role of the microbiome in multiple sclerosis.



Through its range of current research projects using innovative techniques, the Pitt Lab seeks to better understand – and ultimately treat – neurodegeneration in MS.

CLINICAL

The Yale Multiple Sclerosis Center provides comprehensive care for a variety of inflammatory neurologic disorders including multiple sclerosis, neuromyelitis optica, sarcoidosis, and autoimmune encephalitis. The MS Center is part of the Yale Interventional Immunology Center, which allows patients to receive highly specialized care from experts in the fields of rheumatology, neuro-immunology, allergy and immunology, and dermatology. The division offers urgent evaluation of patients with new-onset disease within a matter of days through the MS Access program. The division has optimized patient-centered care, with one stop shopping for E&M visits and infusions, including:

- 14-bed infusion suite
- 3T MRI scanner with dedicated MS protocols
- Optical coherence tomography (OCT) testing/imaging interpreted by neuro-ophthalmologists
- Interdisciplinary care with rheumatologists and immunologists for patients with crossover disease
- Spasticity management with Botox®
- Social workers and dietitians
- Patient education and support groups
- Access to clinical trials

LOCATIONS: With a primary facility in North Haven, the division has expanded with satellite locations in Fairfield, New London, and Stamford.

CLINICAL TRIALS : The division continues to expand its work with multiple NIH-funded grants in addition to expansive pharmaceutical trials. Notably, the CELLO clinical trial (www.cellostudy.org) is a multicenter, investigator-initiated effort to determine whether short-term B-cell depletion can prevent MS, if administered before the onset of clinical symptoms. The trial is a collaboration with Genentech/Roche, which has provided funding for the clinical trial; and separately for an ambitious parallel project aimed at discovering core immunologic pathways involved in incidental neuroinflammation and neurodegeneration.

PROVIDERS:

David A. Hafler, MD, *the William S. and Lois Stiles Edgerly Professor of Neurology and Professor of Immunobiology; chair, neurology; neurologist-in-chief, Yale New Haven Hospital*

Katherine DeStefano, MD, MS, *associate professor, neurology medical director, Multiple Sclerosis/Interventional Immunology Center*

Erin Longbrake, MD, PhD, *assistant professor, neurology; director, fellowship program, multiple sclerosis & other inflammatory brain disease*

David Pitt, MD, *associate professor, neurology*

Jeffrey Gross, MD, *associate professor, neurology*

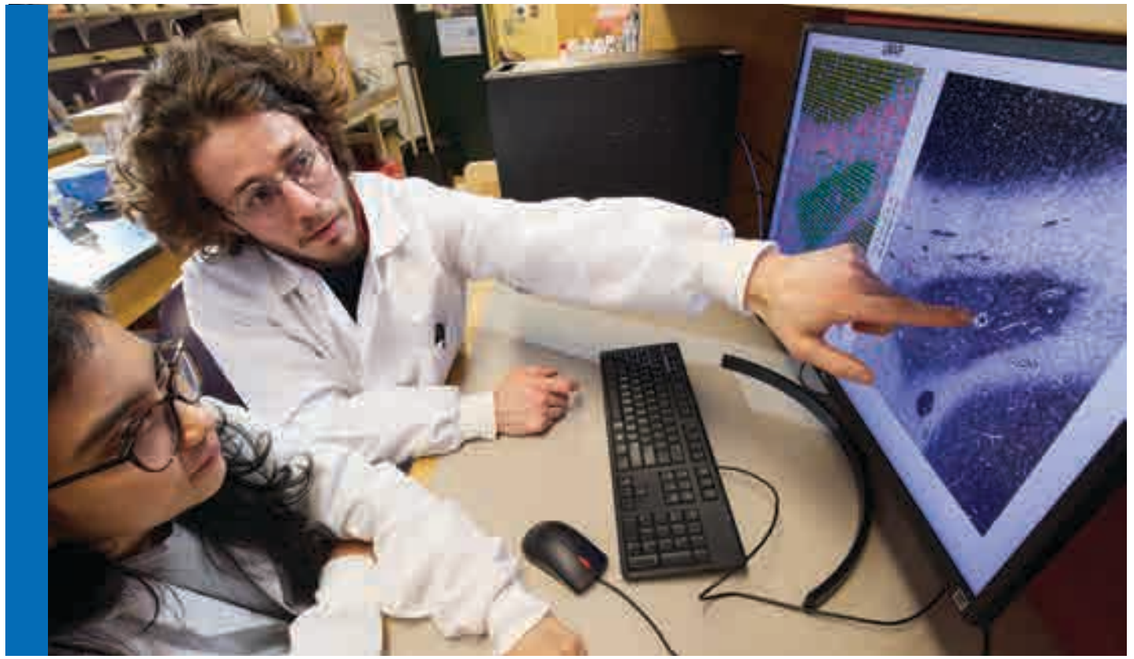
Naila Makhani, MD, MPH, *associate professor, pediatrics (neurology); director, Pediatric MS Program*

Sharon Stoll, DO, *assistant professor, neurology*

FELLOWSHIP TRAINING

The Neuroimmunology fellowship program includes both clinical trainees and those simultaneously pursuing clinical training and clinical/translational research. The program has expanded from two fellows in 2018 to four in 2021–2022.

Dr. DeStefano continues to oversee the clinical operations of the Interventional Immunology clinic and infusion center, as well as the MS Access program.



Neurological Infections + Global Neurology

THE NEUROLOGICAL INFECTIONS & GLOBAL NEUROLOGY DIVISION PROVIDES CARE FOR PATIENTS WITH INFECTIONS DIRECTLY OR INDIRECTLY INVOLVING THE NERVOUS SYSTEM. IT ALSO PERFORMS RESEARCH IN THE CAUSES AND MANAGEMENT OF THESE DISORDERS IN THE UNITED STATES AND IN GLOBAL SETTINGS. THE DIVISION ALSO AIMS TO PROVIDE AN ENVIRONMENT FOR TRAINING IN THE DIAGNOSIS AND MANAGEMENT OF THESE DISORDERS.

SERENA SPUDICH, MD, *division chief*

RESEARCH

The **Spudich Lab** examines the neuropathogenesis and clinical neurologic effects of viral illnesses (HIV-1 and SARS-CoV-2), including long-term effects following the resolution of acute infection, and eradication of viral reservoirs in the brain.

- Nervous System Consequences of COVID-19. ***Science*****,** 2022.
- Central Nervous System Safety During Brief Analytic Treatment Interruption of Antiretroviral Therapy Within Four Human Immunodeficiency Virus Remission Trials. ***Clinical Infectious Diseases*****,** 2021.
- Preliminary In Vivo Evidence of Reduced Synaptic Density in Human Immunodeficiency Virus (HIV) Despite Antiretroviral Therapy. ***Clinical Infectious Diseases*****,** 2021.
- Neuropathogenesis and Neurologic Manifestations of the Coronaviruses in the Age of Coronavirus Disease 2019. ***JAMA Neurology*****,** 2020.

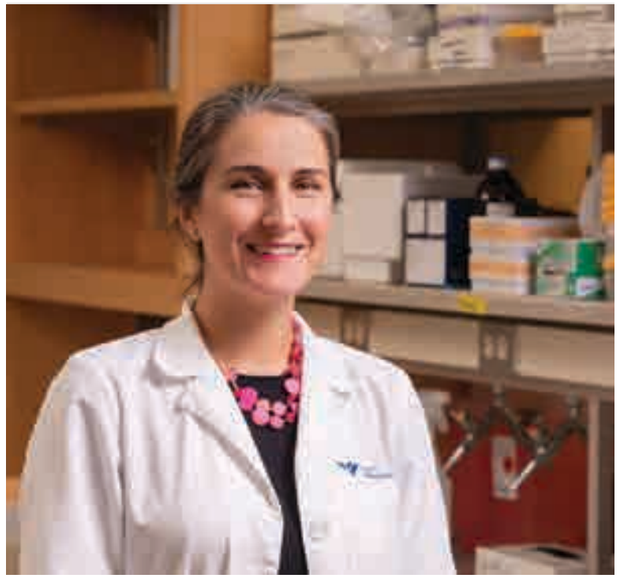
Serena Spudich, MD, is the Gilbert H. Glaser Professor and Chief, Division of Neurological Infections and Global Neurology in the Department of Neurology; and co-director, Center for Neuroepidemiology and Clinical Neurologic Research at Yale. Dr. Spudich is an expert in the clinical and mechanistic understanding of HIV-1 and COVID-19 infections in the nervous system, giving numerous talks, organizing meetings, and advising the National Academy of Medicine, the American Academy of Neurology, and the NIH (including as the co-chair of the Steering Committee of the $1.1 billion NIH RECOVER Study). She has been awarded three new major NIH grants (a UM1 and two R01s) as contact-PI since 2020, totaling more than $23 million. She published 36 papers in 2020–2022, including frequently cited papers on COVID-19 (*Science, JAMA Neurology, Lancet Neurology)* and HIV *(JCI Insight, Lancet HIV, Clinical Infectious Diseases, Journal of Infectious Diseases*).

Dr. Spudich leads the COVID Mind Study at Yale, whose mission is the exploration of lingering neurological and psychological symptoms in patients who have had COVID-19.

The **Farhadian Lab** uses immunologic CSF biomarker tools to examine the pathogenesis and clinical effects of such infections as SARS-CoV-2 (COVID-19), HIV-1, syphilis, babesiosis, and West Nile virus infection, in end organs, including the brain.

- HIV viral transcription and immune perturbations in the CNS of people with HIV despite ART. ***JCI Insight*****,** 2022.
- Divergent and self-reactive immune responses in the CNS of COVID-19 patients with neurological symptoms, ***Cell Reports Medicine*****,** 2021.
- Maternal respiratory SARS-CoV-2 infection in pregnancy is associated with a robust inflammatory response at the maternal-fetal interface, ***Medicine*****,** 2020.
- Acute encephalopathy with elevated CSF inflammatory markers as the initial presentation of COVID-19, ***BMC Neurology*****,** 2020.

Shelli Farhadian, MD, PhD, is an assistant professor in the Department of Medicine (Infectious Diseases) and Neurology at Yale. Farhadian is the recipient of numerous career awards, including a K23 from the NIMH, a Patterson Trust Award, an Irene Diamond Postdoc Transition Award, and the Iva Dostanic Physician Scientist Award from Yale. She was a founder of the IMPACT biorepository study of acute infection at Yale, and currently analyzes clinical data and biospecimens from COVID-19 patients to better understand the myriad aspects of acute COVID-19 and long COVID, including neurological impairment. In 2020–2022, she was awarded a NIH/NIAID R01 as PI for CNS investigation of COVID in humans and mouse models; a Doris Duke Foundation grant; an investigator-initiated award from Merck; and has recently submitted two R21 applications to further understand HIV-1 and COVID-19 neuropathogenesis. She has written 41 papers in 2020–2022, including frequently cited papers on COVID-19 in *Nature* and *The New England Journal of Medicine*.



Dr. Farhadian was recently featured by the Yale Department of Internal Medicine as a "Rising Star of Infectious Diseases" for her research on infectious diseases and brain health.

CLINICAL

Dr. Spudich provides outpatient specialty care and consultation to patients with infections that affect the central nervous system, including HIV, syphilis, progressive multifocal encephalopathy, and long COVID, in the Nathan Smith Clinic at Yale and via telehealth. She also provides inpatient consultation on complex neuroID cases, and attends on the general neurology ward service. From March through May 2020, Spudich ran a daily inpatient consult ation service for patients hospitalized with COVID-19 with neurologic issues. In September 2020, she set up a novel post-COVID neurologic complications clinic with a resident, which has been in such high demand that clinics have been now expanded to four times per month with a long waiting list (primarily run by Lindsay McAlpine, MD, BSc, as clinical instructor).

Dr. Farhadian provides outpatient specialty care and consultation in the Nathan Smith Clinic to patients with infections that affect the central nervous system, including HIV, syphilis, Lyme disease, brain abscesses, post-neurosurgical infections, and West Nile virus in the Nathan Smith Clinic. She also provides inpatient consultation on complex neuroID cases and attends on the infectious disease service and internal medicine inpatient clinical services.

LOCATIONS: Spudich and Farhadian's neuroID clinics are located at the Nathan Smith Clinic at 15 York Street, New Haven, Conn. The neuroCOVID clinic is a completely telehealth facility.

CLINICAL TRIALS: The division has multiple NIH-funded grants that support human subjects research on neuroHIV and neuroCOVID. We do not currently conduct interventional trials.

PROVIDERS:

Serena Spudich, MD, *the Gilbert H. Glaser Professor of Neurology; affiliated faculty, Yale Institute for Global Health; chief, neurological infections & global neurology; co-director, Center for Neuroepidemiology and Clinical Neurological research*

Shelli Farhadian, MD, PhD, *Assistant Professor in the Department of Medicine (Infectious Diseases) and Neurology*

FELLOWSHIP TRAINING

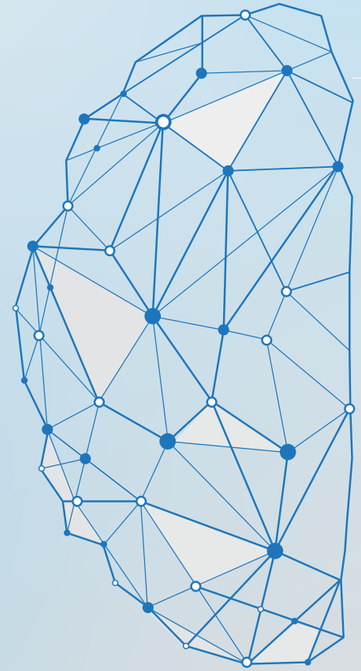
The Division of Neurological Infections and Global Neurology fellowship program includes both clinical trainees and those simultaneously pursuing clinical training and clinical/translational research. The program has had one fellow per year since 2017.

NEUROLOGY PROGRAMS

- Alzheimer's Disease Research Center
- Clinical Neurosciences Imaging Center
- Center for Neuroepidemiology and Clinical Neurological Research (CNE2)
- Center for Neuroscience and Regeneration Research
- Cellular Neuroscience, Neurodegeneration and Repair
- Yale Center for Experimental Neuroimaging
- Program in Clinical & Translational Neuromuscular Research
- COVID Mind Study at Yale
- Yale Program for Neuroinflammation
- Headache and Facial Pain Center
- Yale Concussion Program
- Lumbar Puncture Clinic
- Yale Comprehensive Epilepsy Center
- Botulinum and Neurogenetics Programs
- Restless Legs Syndrome Program
- Yale Neurotrauma Program
- Dorothy Adler Geriatric Assessment Center
- Yale Multiple Sclerosis Center
- ALS Program
- Myasthenia Gravis Program

EDUCATION & TRAINING

- **Yale Visiting Elective Scholarship Program to Enhance Healthcare Workforce Diversity in Neurology**
- **Yale Neurology Residency Program**
- **Fellowships**
  - Behavioral Neurology/Neuropsychiatry
  - Epilepsy & EEG
  - Headache Medicine
  - Movement Disorders
  - Multiple Sclerosis
  - Neurocritical Care
  - Bugher Fellowship in Hemorrhagic Stroke Research
  - Neuromuscular Medicine



Neuromuscular Medicine and EMG

THE NEUROMUSCULAR PROGRAM IS DEDICATED TO THE DELIVERY OF EXPERT CLINICAL CARE, AS WELL AS THE EDUCATION OF BOTH PATIENTS AND COLLEAGUES AT ALL LEVELS OF TRAINING. THE PROGRAM IS VERY ACTIVE IN BASIC SCIENCE AND CLINICAL RESEARCH IN VARIOUS AREAS OF NEUROMUSCULAR DISEASE, WITH FACULTY AS MEMBERS OF BOTH THE NORTHEAST ALS ALLIANCE CONSORTIUM (NEALS) AND THE WORLD FEDERATION OF NEUROLOGY ALS CONSORTIUM.

DANIEL DICAPUA, MD, *clinical chief*

RESEARCH

The **Program in Clinical and Translational Neuromuscular Research (CTNR)** is led by Richard Nowak, MD and is focused on immune-mediated neuromuscular conditions, specifically myasthenia gravis (MG), chronic inflammatory demyelinating polyneuropathy (CIDP), Guillain-Barré syndrome (GBS), and inclusion body myositis (IBM).

Richard Nowak, MD, MS is the founding director of the CTNR and is actively involved in the research of myasthenia gravis. He has launched EXPLORE-MG2 and ADAPT-teleMG pilot trials, as well as an international registrational phase III study titled the Myasthenia Gravis Inebilizumab Trial (MINT). In response to the COVID-19 pandemic in 2020, Dr. Nowak was instrumental in developing MG treatment guidelines and establishing COVID-19-associated risks and effects in myasthenia gravis (CARE-MG), an international physician-reported registry.

- Phase 2 Trial of Rituximab in Acetylcholine Receptor Antibody-Positive Generalized Myasthenia Gravis: The BeatMG Study. ***Neurology***, 2022.

Bhaskar Roy, MBBS, MBioMedSci , MHS, is involved in clinical and translational research in neuromuscular disease, particularly idiopathic inflammatory myopathies. He is the co-chair of the Inclusion Body Myositis (IBM) scientific interest group under the International Myositis Assessment and Clinical Studies (IMACS) group. Roy's research interests focused on IBM include optimizing the functional outcome measures in IBM; modifying and validating the IBM-functional rating scale and developing MRI and blood-based biomarkers in IBM. He is leading an international collaboration with the goal of developing a core set of functional outcome measures of IBM to enable assessment of treatment response in a clinical trial. He is also working to develop objective outcome measures of muscle health in IBM and other muscle diseases.

- Advances in Treatments in Muscular Dystrophies and Motor Neuron Disorders. ***Neurologic Clinics***, 2021.
- Challenges for Treatment Trials of Inclusion Body Myositis. ***Neurology***, 2021.

Huned Patwa, MD, is the chief of staff of the VA Connecticut Healthcare System in West Haven. He is the principal investigator on two clinical trials for treatment of ALS, using novel agents to treat neuroinflammation in ALS. He is the chair of the VA ALS executive committee, which is developing a national policy for the care of veterans with ALS. He received the 2021 Beacon of Light Award from the ALS Association.

- Infection rate, mortality and characteristics of veterans with amyotrophic lateral sclerosis with COVID-19. ***Muscle & Nerve***, 2021.
- Utility of intrathecal baclofen pump in primary lateral sclerosis. ***Journal of Neurological Sciences***, 2021.

CLINICAL

The Neuromuscular Division continues to expand care throughout the region. Our physicians have outpatient clinics in New Haven, Greenwich, Stamford, Fairfield, Milford, Guilford, Old Saybrook, and New London. Since 2020, the Division of Neuromuscular Medicine and EMG has increased its number of faculty members from 10 to 14, and provides comprehensive care for a variety of neuromuscular conditions, including myasthenia gravis, myopathies, and acquired and inherited neuropathies. The Yale Myasthenia Gravis Clinic is one of the largest MG clinical programs in the United States, is internationally recognized, and is dedicated to excellence in care. It is designated as a Partner in Care by the Myasthenia Gravis Foundation of America (MGFA) and offers patients access to advanced diagnostics, research participation, and a precision-medicine approach to MG care. Our program is also a designated Muscular Dystrophy Association (MDA) Comprehensive Care Center that is dedicated to providing expert care to patients with muscular dystrophy, ALS, and other neuromuscular conditions.

Drs. Nowak and Roy

PROVIDERS:

Daniel DiCapua, MD, *associate professor, clinical neurology, clinical chief of neuromuscular medicine, clinical director of neuromuscular medicine; director, fellowship program, neuromuscular medicine*

Huned Patwa, MD, *professor, neurology, chief of staff of the VA Connecticut Healthcare System in West Haven*

Richard Nowak, MD, MS, *associate professor, neurology; director, Program in Clinical & Translational Neuromuscular Research; director, Yale Myasthenia Gravis Clinic*

Bhaskar Roy, MBBS, MBioMedSci, MHS, *assistant professor, neurology; director of the Muscular Dystrophy Association adult care clinic, neurology; medical director, Electrodiagnostic Laboratory, Yale Medicine; co-chair, IBM scientific interest group from IMACS, IMACS*

Benison Keung, MD, *associate professor, neurology, ambulatory neurology director for the New Haven area*

Kunal Desai, MD, *assistant professor, clinical neurology; director of neuromuscular medicine at Greenwich/Stamford*

Uzma Usman, MBBS, *assistant professor, neurology*

Bilal Hameed, MD, *assistant professor, neurology*

Babar Khokhar, MD, MBA, *associate dean for clinical transformation; associate professor, neurology and chief clinical transformation officer, YMA; interim chief executive officer, Yale Medicine, interim deputy dean for clinical affairs, Yale School of Medicine, chief ambulatory medical officer, Yale Medicine and Yale New Haven Health; vice-chair, operations, neurology; director, MDA-ALS/Motor Neuron Disease Clinic, neurology*

Jeffrey Dewey, MD, MHS, *assistant professor, neurology; associate program director, neurology residency; director of wellness, neurology residency; director, neurology clerkship*

Thomas Toothaker, MD, *associate professor, neurology*

Bertrand Tseng, MD, PhD, *assistant professor, clinical neurology*

Ylec Mariana Cardenas Castillo, MD, *assistant professor, clinical neurology*

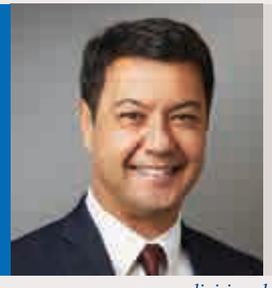
Adeel Zubair, MD, *associate professor, neurology*

FELLOWSHIP TRAINING

Dr. DiCapua is the Neuromuscular Medicine fellowship director; the program currently has two fellows. The fellowship covers all aspects of EMG/NC studies and provides superb clinical and research opportunities in a wide variety of neuromuscular diseases.

Opposite page: Dr. Nowak treats a patient in the Yale Myasthenia Gravis clinic.

Neuro-Oncology



THE DIVISION OF NEURO-ONCOLOGY, AS PART OF THE YALE BRAIN TUMOR CENTER, MAKES USE OF ALL OF THE COMPONENTS CRITICAL TO MANAGING PATIENTS WITH PRIMARY BRAIN TUMORS, METASTASES, AND NEUROLOGIC COMPLICATIONS OF CANCER: COMPREHENSIVE EVALUATION AND DIAGNOSIS, CUTTING-EDGE TREATMENT OPTIONS, THOROUGH FOLLOW-UP; AND PSYCHOSOCIAL SUPPORT. PATIENTS ARE WELCOME WHETHER THEY ARE NEWLY DIAGNOSED OR HAVE ALREADY RECEIVED EXTENSIVE TREATMENT.

ANTONIO OMURO, MD, *division chief*

RESEARCH

We are now leading a NIH-funded, phase 0/IB double-blind placebo-controlled, multi-institutional clinical trial to investigate the effects of targeting anti-TIGIT and anti-PD-1 in patients with recurrent glioblastoma multiforme (GBM). Our study represents the only trial investigating anti-TIGIT in patients with GBM in the United States. Blood and tumor samples collected as part of the trial will be analyzed with cutting-edge techniques, including single-cell sequencing and spatial transcriptomics, to help us understand how the immune system changes in response to these therapies to combat GBM. This study, therefore, offers an exciting opportunity to provide a promising new therapy for patients with GBM and improve our understanding of the immune system's interactions with cancers in the brain.

Antonio Omuro, MD, neuro-oncology division chief, is an internationally recognized clinical researcher and leader in the field of neuro-oncology, having designed and led several highly influential clinical trials and associated translational research. He is a member of the Science Committee of the American Academy of Neurology and a member of the Clinical Oncology NIH review panel. Other recent accomplishments include a NIH R01 grant in partnership with the Hafler Lab to conduct a translational clinical trial investigating anti-TIGIT and anti-PD-1 therapies in glioblastoma. In collaboration with the Mayo Clinic, he was also awarded an U19 grant from the NCI, joining the Glioblastoma Therapeutics Network, a group of select institutions that advances clinical and translational research in glioblastomas. Omuro has also been a formal mentor to several PhD, MD, resident, and fellowship students across Yale.

- Nivolumab plus radiotherapy with or without temozolomide in newly diagnosed glioblastoma: results from exploratory phase 1 cohorts of CheckMate 143. **Neuro-Oncology Advances,** 2022
- Editorial: Advances in neuro-oncology: stepping in the right direction. **Current Opinion in Neurology,** 2021
- T-cell dysfunction in glioblastoma: a barrier and an opportunity for the development of successful immunotherapies. **Current Opinion in Neurology,** 2021

Joachim Baehring, MD, vice-chair of Neurology, is an internationally renowned clinical researcher dedicated to brain tumors and neurologic complications of cancer. As a highly accomplished investigator, he has participated in numerous clinical trials and conducted multiple retrospective projects focusing on a variety of rare brain tumors and other clinical problems. Baehring is a member of the NCCN guidelines faculty for CNS tumors, responsible for determining acceptable clinical practices in neuro-oncology. He is also an active mentor for several neurology residents and students, and serves as the program director of the neuro-oncology fellowship.

Joachim Baehring, MD, *continued from previous page*

- Clinical Reasoning: A 64-Year-Old Man With History of Meningitis Presenting With Proximal Weakness of the Arms. ***Neurology***, 2022.
- Choreoathetosis in the Setting of Human Herpesvirus-6 Infection in a Transplant Recipient. ***Tremor and Other Hyperkinetic Movements***, 2021.
- Hemorrhage Into a Subependymal Giant Cell Astrocytoma in an Adult With Tuberous Sclerosis: Case Report. ***Neurologist***, 2021.

Zachary Corbin, MD, MHS, is an assistant professor of neurology dedicated to the development of novel neuroimaging tools in brain tumors. He has developed a multimodality metabolic imaging technique called the Warburg Index to characterize and quantify the Warburg effect in brain tumors. Corbin has received the YCCI Scholar Award, an intramural KL2 grant, to further develop the Warburg Index, and he has recently submitted a K23 application to the NIH. He also collaborates on preclinical magnetic resonance spectroscopy development with collaborators at the Yale Magnetic Resonance Research Center. He is an investigator on a multi-PI R01 for the development of a technique called deuterium metabolic imaging. He also has a clinical research interest in treatments for brain tumors and complications of cancer, and participates in a number of clinical trials in brain tumors. Corbin is an active participant in education as the associate neuro-oncology fellowship director. He also teaches medical students and physician assistant students. As a clinical mentor, he participates in the clinical training of the neuro-oncology fellows, neurology residents, and hematology/oncology fellows.

- Mononeuritis multiplex as a rare and severe neurological complication of immune checkpoint inhibitors: a case report. ***Journal of Medical Case Reports***, 2022.
- Surgical strategies for older patients with glioblastoma. ***Journal of Neuro-Oncology***, 2021.

Peter Kim, MD, is dedicated to clinical care and clinical research in brain tumors. He has an interest in genomics of gliomas and treatments for primary CNS lymphoma. He currently sees patients at the New Haven outpatient clinic.

- Targeting gene fusions in glioma. ***Current Opinion in Neurology***, 2021.
- Consolidation Therapy in Primary Central Nervous System Lymphoma. ***Current Treatment Options in Oncology***, 2020.

Mary Barden, MD is a neuro-oncologist and assistant professor, clinical neurology (neuro-oncology). Dr. Barden received her medical degree from Yale School of Medicine in 2017 and completed her neurology residency at Yale New Haven Hospital in 2021, during which time she received the Gilbert Glaser Award for her contributions to the residency program. She completed her fellowship in neuro-oncology at Yale in 2022. She is board-certified by the American Board of Psychiatry and Neurology. She cares for patients as part of the Chênevert Family Brain Tumor Center at Smilow Cancer Hospital and Yale Cancer Center, working primarily in the inpatient setting as a neuro-oncology hospitalist and consultant.

Nicholas Blondin, MD, is an assistant professor of neurology. He is a board-certified neuro-oncologist with an active practice in Trumbull and New Haven, and is a principal investigator on multiple clinical trials in gliomas and meningiomas. In fact, he enrolls an outstanding number of participants in clinical trials at Yale. Blondin is a highly sought-after lecturer in CME events and an excellent teacher residents and fellows.

- Hypermutated phenotype in gliosarcoma of the spinal cord. ***NPJ Precision Oncology***, 2021.
- Surgical strategies for older patients with glioblastoma. ***Journal of Neuro-Oncology***, 2021.
- Type of bony involvement predicts genomic subgroup in sphenoid wing meningiomas. ***Journal of Neuro-Oncology***, 2021.

CLINICAL

The Division of Neuro-Oncology provides comprehensive care for patients with a variety of brain tumors and neurologic complications of cancer. The Division is part of the Yale Cancer Center (YCC) and Smilow Cancer Hospital; it offers chemotherapy management and infusions for patients with gliomas, meningiomas, primary CNS lymphomas, and other cancers. The division. It also collaborates with the Brain Metastasies Program at YCC to offer care for patients with brain metastasis and radionecrosis. All attendings are active principal investigators/recruiters for therapeutic clinical trials. The inpatient service provides elective inpatient chemotherapies for CNS hematologic diseases and provides consultations throughout YNHH. It also provides neurologic support for the CAR T cell program at Smilow. The division offers direct access for patients, with same-week appointments available to all.

Former neuro-oncology fellow and current assistant professor Mary Barden, MD, and Dr. Omuro.

LOCATIONS: Smilow Cancer Hospital on Park Street, New Haven, and the Smilow Cancer Care Center in Trumbull.

CLINICAL TRIALS: A highlight of the program is the wide variety of clinical trials to advance novel treatments for neuro-oncologic diseases, including multicenter trials led by Yale research.

PROVIDERS:

Antonio Omuro, MD, *professor, neurology; chief, neuro-oncology; clinical trials director, Chenevert Family Brain Tumor Center at Smilow Cancer Hospital and Yale Cancer Center*

Joachim Baehring, MD, *professor, neurology and of neurosurgery; associate chief, neurology; director, neuro-oncology fellowship program; vice chair, clinical affairs, neurology*

Nicholas Blondin, MD, *assistant professor, clinical neurology*

Zachary Corbin, MD, MHS, *assistant professor, associate director, neuro-oncology fellowship program*

Peter Kim, MD, *assistant professor, neurology*

Mary Barden, MD, *assistant professor, clinical neurology*

FELLOWSHIP TRAINING

The Neuro-Oncology fellowship program is a UCNS-accredited, two-year program, offering both clinical and research training in neuro-oncology. Two positions are available per year, and completion of the fellowship enables trainees to become UCNS board-certifiable in neuro-oncology. The program has been successful as a pipeline of talent to the division, with three of our attendings having completed the neuro-oncology fellowship at Yale.

Neuropsychology

NEUROPSYCHOLOGY IS A SPECIALTY CLINICAL SERVICE PROVIDING IN-DEPTH EVALUATIONS OF COGNITIVE FUNCTIONING (THINKING ABILITIES). THESE FUNCTIONS INCLUDE MEMORY, ATTENTION, AND PROBLEM SOLVING, AS WELL AS PSYCHOLOGICAL FUNCTIONING (DEPRESSION, ANXIETY). NEUROPSYCHOLOGICAL ASSESSMENT IS PART OF THE GOLD STANDARD WORKUP FOR DIAGNOSES AND STAGING OF MANY NEUROLOGICAL AND MEDICAL DISORDERS. THIS ASSESSMENT WILL ALSO HELP PROVIDERS TO BETTER UNDERSTAND A PATIENT'S COGNITIVE STRENGTHS AND WEAKNESSES.

EMILY S. SHARP, PHD, *clinical chief*

RESEARCH

The division faculty have ongoing research collaborations with faculty in neurology, the wider medical school and the university, and other national and international institutions. Our faculty are sought out for their expertise in the measurement of cognition within clinical trials and longitudinal studies, as well as for expertise in multicultural and bilingual assessment.

Emily Sharp, PhD, is dedicated to expanding the clinical and research work of the Neuropsychology division. Her patient care centers on neuropsychological evaluation referrals from behavioral neurology and movement disorders. She is a co-investigator on NIH-funded clinical trials and neuroimaging projects within the Yale Alzheimer's Disease Research Center (ADRC). She is also co-investigator on a NIH-funded-phase III clinical trial within Anesthesiology, examining cognitive outcomes following two types of ED-placed endotracheal tubes. Sharp provides expert consultation on other clinical research projects, including studies of frontotemporal dementia, atypical Alzheimer's disease (logopenic; posterior cortical atrophy), and outcomes following deep brain stimulation (DBS) and Gamma Knife therapies in Parkinson's disease and essential tremor. This year, she has expanded neuropsychology clinical services to provide presurgical evaluations to the audiology and cochlear implant team, and collaborated with Dr. Towns to develop a postdoctoral training program in neuropsychology.

- Synaptic density and cognitive performance in Alzheimer's disease: A PET imaging study with [^{11}C] UCB-J. ***Alzheimer's & Dementia*,** 2022.

Christopher Benjamin, PhD provides neuropsychological evaluations of patients with epilepsy and memory disorders. He is the division's epilepsy neuropsychologist and a member of the epilepsy surgical program, where he also assists as needed in intracranial mapping on the ward. He has published frequently cited articles describing and validating new ways of mapping the brain's language and visual systems by using MRI. His contributions have been recognized through grants from the National Academy of Neuropsychology, the American Academy of Neuropsychology, and the Yale Center for Clinical Investigation. His ongoing projects focus on standardizing a multi-lingual battery for language mapping; improving training in clinical fMRI;and clarifying how training in language fMRI currently takes place and might be improved. Benjamin is co-chair of the International Neuropsychological Society's Epilepsy Special Interest Group.

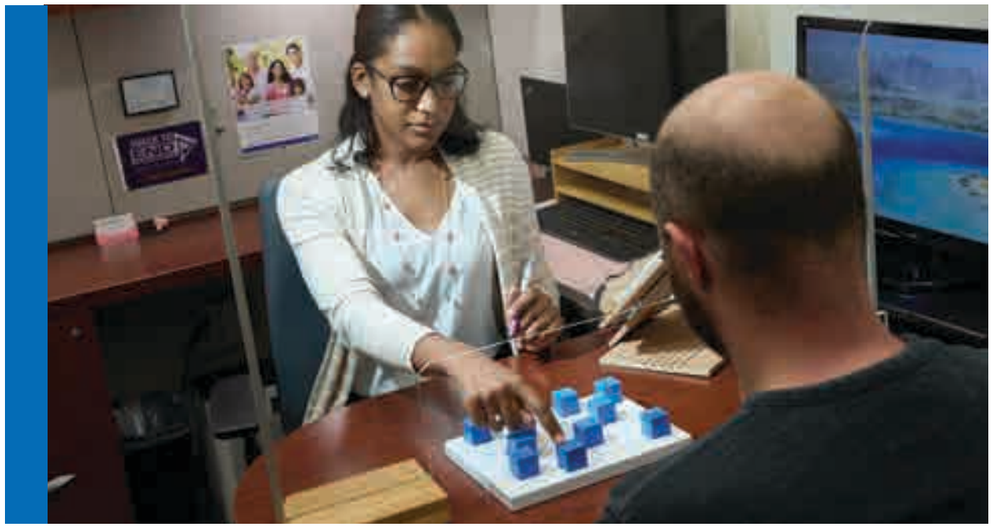
- Cognitive biomarkers in the clinic: Lessons from clinical fMRI. ***Journal of Clinical Neurophysiology*,** 2022.
- Cortical stimulation mapping can impair production of the alphabet without impairing counting. ***Epilepsy & Behavior Reports*,** 2021.
- Gerstmann Syndrome Deconstructed by Cortical Stimulation. ***Neurology*,** 2021.

Carmen I. Carrión, PsyD, provides culturally informed clinical neuropsychological evaluations in English and Spanish for patients, primarily those with memory issues and movement disorders. She has several areas of research, including studying the limitations of existing neuropsychological measures; disparities in neurocognitive disorders; and understanding how social determinants of health influence neurological and cognitive outcomes, as well as performance on cognitive evaluations. She is the site PI for the R01 NIH-funded Neighborhoods Study, and the site PI for a multisite study that aims to gather normative data among a Spanish-speaking population resident in the United States. As part of the Yale ADRC, Dr. Carrión works toward increasing participation of underrepresented groups in Alzheimer's disease and related dementia research and clinical trials; participates in weekly consensus case conferences; and supervises medical residents and fellows. Dr. Carrión is a member of the Medical Council and a member of the Diversity, Equity, and Inclusion steering committee of the Connecticut Chapter of the Alzheimer's Association, and she recently completed a two-year term as member-at-large for the Hispanic Neuropsychological Association.

- Functional Reserve: The Residual Variance in Instrumental Activities of Daily Living Not Explained by Brain Structure, Cognition, and Demographics. ***Neuropsychology*,** 2021.
- Education differentially contributes to cognitive reserve across racial/ethnic groups. ***Alzheimer's & Dementia: The Journal of the Alzheimer's Association*,** 2020.
- One model does not fit all: Individuals who defy stereotypical profiles require distinct brain-phenotype models. ***Under review in Nature***

Lucas Driskell, PsyD, is a co-investigator on a recent NIH grant submission to investigate the cognitive outcomes of revascularization treatment for congestive heart failure and coronary artery disease. He is also working with vascular neurologists to study the impact of bilingualism on cognitive reserve in aging adults with cerebrovascular disease. He is the co-creator of a popular national/international online didactic series in neuropsychology, and has published articles related to education and training standards in neuropsychology.

- What makes for a competitive fellowship candidate? A survey of clinical neuropsychology postdoctoral training directors. ***The Clinical Neuropsychologist*,** 2021.



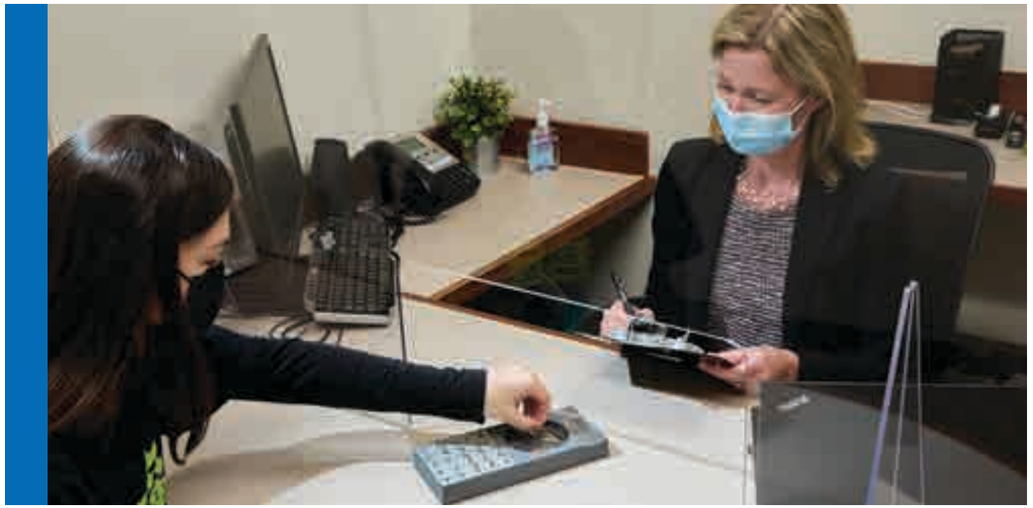
As a bilingual clinical neuropsychologist, Dr. Carrión conducts neuropsychological evaluations for a diverse patient population.

Alice Perez, PhD, is a bilingual neuropsychologist who conducts assessments in both English and Spanish of patients with various neurological conditions, including neurodegenerative disorders, epilepsy, and autoimmune disorders. She continues to collect clinical normative data on Hispanic individuals, stratifying by demographic factors (e.g., country of origin, education, sex, and age). She conducts research on neuropsychological outcomes of cancer and cognitive functioning in vulnerable and underserved populations.

- Cognitive Impairment in Older Incarcerated Males: Education and Race Considerations. ***The American Journal of Geriatric Psychiatry***, 2021.
- Reliability and validity of a novel cognitive self-assessment tool for patients with cancer. ***Neuro-oncology Practice***, 2021.
- Unilateral vocal nerve resection alters neurogenesis in the avian song system in a region-specific manner. ***PloS One***, 2021.

Stephanie Towns, PsyD, ABPP, provides clinical care for patients at Greenwich Hopsital. In her generalist practice, she receives referrals from Yale Neurology and Neurosurgery, the Center for Healthy Aging at Greenwich Hospital, and community neurology practices in southern Connecticut and Westchester, New York. She also provides presurgical evaluations for DBS for patients in southern CT. Towns studies education and training in neuropsychology and has recently focused on the impact of the COVID-19 pandemic on neuropsychology trainees. She serves on the educational committees of the American Academy of Clinical Neuropsychology (AACN) and Division 40 of the American Psychological Association. She also serves as the chair of two AACN committees. In addition to having developed a neuropsychology residency with Dr. Sharp, she also supervises several neuropsychology externs each year.

- Boston Naming Test: Lose the Noose. ***Archives of Clinical Neuropsychology***, 2021.
- Neuropsychology Trainee Concerns during the COVID-19 Pandemic: A 2021 Follow-Up Survey. ***The Clinical Neuropsychologist***, 2021.
- 2020 COVID-19 American Academy of Clinical Neuropsychology (AACN) Student Affairs Committee Survey of Neuropsychology Trainees. ***The Clinical Neuropsychologist***, 2020.



Dr. Sharp provides thorough neuropsychological evaluations of patients with altered cognition.

Dr. Christopher Benjamin

In addition to his clinical practice, Dr. Driskell co-founded the KnowNeuropsychology online didactic series to expand the global exchange of neuropsychological knowledge.

CLINICAL

The Yale Neuropsychology Division provides comprehensive evaluations of the neurocognitive functioning of patients with CNS disorders, including neurodegenerative, movement, autoimmune, and neurovascular disorders. Over the past year, the division has developed specialty clinics for neuro-oncology and traumatic brain injury. The Neuropsychology Division provides presurgical evaluations essential to candidacy for invasive and noninvasive surgical interventions for epilepsy, tumor resection, cochlear implants, deep brain stimulation, and Gamma Knife therapies. There has been significant demand for our expertise, and our division has expanded from two faculty clinicians in 2014 to eight in 2021, with two additional clinical faculty having been added in July 2022. Our growth has allowed us to offer both specialty (e.g., epilepsy; neuro-oncology; DBS) and generalist clinical services across a large portion of Connecticut.

LOCATIONS: With a central facility in North Haven, the division has expanded with satellite locations in Fairfield, Guilford, Greenwich and Milford, and it will add another location in New London in 2022.

PROVIDERS:

Emily S. Sharp, PhD, *chief, division of neuropsychology; associate training director, neuropsychology*

Timothy Belliveau, PhD, ABPP, *associate professor of neurology*

Christopher Benjamin, PhD, *assistant professor of neurosurgery; assistant professor of psychology; assistant professor of radiology and biomedical imaging*

Franklin Brown, PhD, *associate professor*

Carmen I. Carrión, PsyD, *assistant professor of clinical neurology; associate core leader, outreach and engagement, Alzheimer's Disease Research Center (ADRC)*

Lucas D. Driskell, PsyD, *assistant professor*

Alice Perez, PhD, *assistant professor*

Stephanie J. Towns, PsyD, ABPP, *assistant professor of clinical neurology; training director, neuropsychology*

Ginger Mills, PsyD, *assistant professor, neurology*

Linda Ruiz, PhD, *assistant professor, neurology*

FELLOWSHIP TRAINING

The Neuropsychology training program is a two-year postdoctoral program in clinical neuropsychology. Our program has received accreditation by the Association of Postdoctoral Programs in Clinical Neuropsychology (APPCN) and YYale New Haven Hospital's graduate medical education (GME) program approval. We participated in the APPCN Match, and our inaugural resident joined us in July 2022.

West Haven VA Medical Center

THE VA CONNECTICUT HEALTHCARE SYSTEM WAS OFFICIALLY FOUNDED IN 1995 WITH THE INTEGRATION OF THE VA MEDICAL CENTERS IN WEST HAVEN AND NEWINGTON. WE SERVE VETERANS IN CONNECTICUT AND SOUTHERN NEW ENGLAND. THE WEST HAVEN FACILITY IS A TEACHING HOSPITAL, PROVIDING A FULL RANGE OF PATIENT CARE SERVICES WITH STATE-OF-THE-ART TECHNOLOGY AND A RENOWNED RESEARCH PROGRAM.

HAJIME TOKUNO, MD, *chief of neurology, VA Connecticut Healthcare System*

RESEARCH

Hamada Altalib, DO, MPH researches traumatic brain injury, neuropsychiatric impact of epilepsy, and psychogenic non-epileptic seizures. He continues to serve as the primary investigator of a Department of Defense-funded project, "Post-Traumatic Psychogenic Seizure and Epilepsy Project."

- The Military Injuries – Understanding post-Traumatic Epilepsy: Understanding Relationships among Lifetime Traumatic Brain Injury History, Epilepsy, and Quality of Life. ***Journal of Neurotrauma*,** 2021.

Emmanuelle Schindler, MD, PhD, continues to carry out her clinical trials, investigating the effects of psilocybin on headache disorders (NCT02981173, NCT03341689, NCT03806985), and she has secured additional funding to begin mechanistic studies in this burgeoning field.

- Exploratory Controlled Study of the Migraine-Suppressing Effects of Psilocybin. ***Neurotherapeutics: The Journal of the American Society for Experimental Neurotherapeutics*,** 2020.

Jason Sico, MD, MHS, is overseeing several clinical trials, including two clinical trials funded by VA Health Services Research and Development (HSR&D): "Addressing Sleep Apnea Post-Stroke," and "Telemedicine-based Cognitive Therapy for Migraines."

- Posttraumatic Stress Disorder, Antidepressant Use, and Hemorrhagic Stroke in Young Men and Women: A 13-Year Cohort Study. ***Stroke*,** 2020.

Hajime Tokuno, MD, maintains a large cohort of study subjects with chronic neck and back pain due to dystonia. He tracks their responses to botulinum toxin injections using pain scales, functional scales, medical thermography, surface EMG, and range of motion measures.

- Use of Digital Infrared Thermal Imaging in the Electromyography Clinic: A Case Series. ***Cureus*,** 2019.

Brian Koo, MD, reports ongoing progress for the study, "Restless Legs Syndrome: The Role of Melanocortin Hormones," funded by the Department of Defense. He is also a co-investigator in the study, "Tracing the Origin and Progression of Parkinson's Disease through the Neuro-Immune Interactome."

- Impact of Obstructive Sleep Apnea on Cognitive and Motor Functions in Parkinson's Disease. ***Movement Disorders*,** 2021.

Huned Patwa, MD, is the chair of the VA ALS executive committee, tasked with developing a national system and policy for care of veterans with ALS. He is also the author Healthcare System a manuscript assessing the use of the intrathecal baclofen pump for treatment of spasticity in primary lateral sclerosis. He is the principal investigator on two clinical trials for treatment of ALS, using novel agents to treat neuroinflammation in ALS.

- Infection rate, mortality and characteristics of veterans with amyotrophic lateral sclerosis with COVID-19. ***Muscle and Nerve*,** 2021.

CLINICAL

The Neurology service at VA Connecticut offers outstanding care and clinical services to veterans across New England. The program has several centers recognized for their excellence in patient care: Epilepsy Center of Excellence (Dr. Altalib, director); Headache Center of Excellence (Dr. Sico, director); ALS Certified Treatment Center (Dr. Patwa, director); Parkinson's Consortium Center (Diana Richardson, MD, director); Multiple Sclerosis Consortium Center (Sarah Speranza, DO, director). Treatment services at VA Connecticut include:

- Epilepsy Monitoring Unit Admission
- Prolonged Video-EEG Monitoring
- Psychogenic non-epileptic seizures PNES management
- Mental health support
- Movement disorder and Parkinson's specialists
- EMG
- Telehealth & virtual visit care
- Surgical referral

CLINICAL TRIALS: "Human epilepsy project 3: new-onset generalized epilepsy" (PI: Dr. Altalib); "Realize (cvl-865) – reported to be a non-sedating benzodiazepine" (PI: Dr. Altalib)

PROVIDERS:

Hamada Altalib, DO, MPH, *associate professor of neurology and of psychiatry; track director, health informatics, online executive MPH program*

Diana Richardson, MD, *assistant clinical professor, neurology; director, National VA Parkinson's Disease Consortium, West Haven*

Hajime Tokuno, MD, *associate professor of clinical neurology*

Emmanuelle Schindler, MD, PhD, *assistant professor; medical director, Headache Center of Excellence*

Benjamin Tolchin, MD, MS, *assistant professor*

Dr. Altalib is the director of the VA Epilepsy Center of Excellence at the West Haven VA Medical Center and treats veterans with epilepsy across the region.

FELLOWSHIP TRAINING

At the VA, residents receive extensive outpatient training and education through both continuity and subspecialty clinics. Residents frequently comment on the wide variety of neurologic conditions seen in the general neurology clinics. They work with specialists in sleep disorders, movement disorders, epilepsy, multiple sclerosis and neurodegenerative and neuromuscular disorders. Our clinic preceptors are all dedicated clinician-educators and have more than 40 combined years of experience in working in resident education.

Stroke and Vascular Neurology

JOSEPH SCHINDLER, MD,
clinical chief

LAUREN SANSING, MD, MS,
academic chief

THE DIVISION OF VASCULAR NEUROLOGY EVALUATES, TREATS, AND STUDIES DISEASES THAT AFFECT THE STRUCTURE AND FUNCTION OF THE BLOODVESSELS SUPPLYING THE BRAIN. OUR MAIN PURPOSE IS TO PROVIDE THE BEST POSSIBLE CARE FOR OUR PATIENTS WITH STROKE AND CEREBROVASCULAR DISEASE.

RESEARCH

The Sansing Lab studies neuroinflammatory responses in stroke, intracerebral hemorrhage, and chronic cerebral vascular diseases with a focus on understanding how immune system activation causes further injury to the brain and also aids in recovery.

- Leukocyte dynamics after intracerebral hemorrhage in a living patient reveal rapid adaptations to tissue milieu. ***JCI Insight***, 2021.
- Longitudinal transcriptomics define the stages of myeloid activation in the living human brain after intracerebral hemorrhage. ***Science Immunology***, 2021.
- Efferocytosis of Erythrocytes Modulates Macrophages towards Recovery after Intracerebral Hemorrhage. ***Journal of Clinical Investigation***, 2018.
- TGF-β1 Modulates Microglial Phenotype and Promotes Recovery after Intracerebral Hemorrhage. ***Journal of Clinical Investigation***, 2017.

Lauren Sansing, MD, MS, is a vascular neurologist specializing in the acute treatment of stroke and complex neurovascular diseases. She also co-leads the stroke program as the academic chief of stroke and vascular neurology; directs the basic and translational stroke research program; co-directs the neurology residency R25 research training program; and leads a NIH-funded research laboratory studying inflammatory mechanisms in brain injury across the basic-translational-clinical spectrum. She leads the Yale program for the first-ever NIH stroke preclinical trial network (SPAN), and the AHA Bugher Yale Center of Excellence for Hemorrhagic Stroke Research. She has won numerous awards, including the American Neurological Association Derek Denny-Brown Neurological Scholar Award and the American Academy of Neurology Michael S. Pessin Stroke Leadership Prize. She has also been elected into the American Society for Clinical Investigation (ASCI) and the Henry Kunkel Society.

Dr. Schindler founded and now leads the Yale New Haven Telestroke Program, which continues to be the most advanced telemedicine program within Yale Medicine and the Yale New Haven Hospital System.

Adam de Havenon, MD, MSCI, joined the division in late 2021. He focuses his research on intracranial atherosclerosis, white matter hyperintensities and vascular contributions to cognitive impairment and dementia (VCID), and blood pressure variability. During vascular neurology fellowship training, he discovered that he wanted his expertise to fill the space between the basic science of stroke research and its implementation in human subjects. His long-term research goal is to bridge these fields and lead a team of basic and clinical researchers to address the most treatment-resistant diseases in vascular neurology and provide excellent care to patients suffering from these diseases. Havenon has published more than 100 peer-reviewed articles, and his research into secondary stroke prevention and advanced neuroimaging has received funding from the National Institutes of Health, the American Academy of Neurology, and the American Heart Association.

- Evaluation of Systolic Blood Pressure, Use of Aspirin and Clopidogrel and Stroke recurrence in the POINT Trial. ***JAMA Network Open***, 2021.
- Five Year Trends in Payments for Neurologist Prescribed Drugs in Medicare Part D. ***Neurology***, 2021.
- Hispanic Ethnicity and Risk of Incident Cognitive Impairment in Relation to Systolic Blood Pressure. **Hypertension**, 2021.

The Mishra Lab's research interest spans the full width of stroke care, including acute intervention, prevention, and post-stroke recovery.

- International Post Stroke Epilepsy Research Consortium (IPSERC): A consortium to accelerate discoveries in preventing epileptogenesis after stroke. ***Epilepsy & Behavior***, 2021.
- Comparison of magnetic resonance imaging mismatch criteria to select patients for endovascular stroke therapy. ***Stroke***, 2014.
- Thrombolysis in very elderly people: controlled comparison of SITS International Stroke Thrombolysis Registry and Virtual International Stroke Trials Archive. ***BMJ***, 2010.
- Thrombolysis is associated with consistent functional improvement across baseline stroke severity: a comparison of outcomes in patients from the Virtual International Stroke Trials Archive (VISTA). ***Stroke***, 2010.

Nishant Mishra, MD, PhD, is an assistant professor of neurology and a clinical neuroscientist who has been active in clinical stroke research since 2005. He has been a Fellow of the European Stroke Organization (FESO) since 2012, and currently serves on the editorial boards of *Neurology* (Green Journal), *PLOS One* (academic editor), and *Frontiers in Neurology* (associate editor). His lab focuses on clinical research to prevent and treat post-stroke epilepsy and post-stroke cognitive impairment.

- Single particle cryo-EM structure of the outer hair cell motor protein prestin. ***Nature Communications***, 2022.
- Pilot MRI-based strategies to improve the detection of stroke in patients with dizziness/vertigo. ***Clinical Imaging***, 2022.
- Efferent feedback controls bilateral auditory spontaneous activity. ***Nature Communications***, 2021.
- Ischemic Stroke, Inflammation, and Endotheliopathy in COVID-19 Patients. ***Stroke***, 2021.

Dhasakumar Navaratnam, MD, PhD, is a neurotologist and neurologist who provides advanced, comprehensive evaluation and treatment for patients with hearing and balance problems. He conducts a weekly clinic in the Hearing and Balance Center, where he sees patients with a range of hearing and balance problems. He also attends on the inpatient and consultation service at YNHH, and is a member of the YNHH stroke service, which provides 24/7 stroke coverage for Yale New Haven Hospital. Navaratnam directs the clinical neuroscience module for second-year medical students, as well as a course on the molecular and cellular mechanisms of neurological disease.

The Navaratnam Lab's research focus is onthe basic mechanisms of hearing and balance and the clinical aspects of stroke.

The Petersen Lab utilizes neuro-monitoring methods and bedside data processing technology to develop personalized treatment targets and improve outcomes following acute neurologic injury.

- Blood Pressure Trajectory Groups and Outcome After Endovascular Thrombectomy: A Multicenter Study, *Stroke*, 2021.
- Fixed Compared With Autoregulation-Oriented Blood Pressure Thresholds After Mechanical Thrombectomy for Ischemic Stroke. *Stroke*, 2020.
- Decreases in Blood Pressure During Thrombectomy Are Associated With Larger Infarct Volumes and Worse Functional Outcome. *Stroke*, 2019.

Nils Petersen, MD, PhD, an associate professor and staff neurointensivist, is an expert in cerebral hemodynamics and vascular physiology. He has developed an innovative research program that aims to 1) identify patterns of physiologic variability or organ system interactions that yield physiologic markers of impending neurologic deterioration; 2) understand the pathophysiology of critical illness by relating physiologic changes to clinical events, and 3) develop mathematical models of cerebral hemodynamics and physiology to inform clinical decision making for individual patients.

The Sharma Lab explores advanced computational approaches to understand the epidemiology of stroke risk factor epidemiology, determine the underlying causes of strokes; and identify novel therapeutic targets in order to improve the current approaches to stroke prevention and brain health.

- Acute Ischemic Stroke, Depressed Left Ventricular Ejection Fraction, and Sinus Rhythm: Prevalence and Practice Patterns. *Stroke*, 2022.
- Left Ventricular Dysfunction Among Patients With Embolic Stroke of Undetermined Source and the Effect of Rivaroxaban vs Aspirin: A Subgroup Analysis of the NAVIGATE ESUS Randomized Clinical Trial. *JAMA Neurology*, 2021.
- Excess Cerebrovascular Mortality in the United States During the COVID-19 Pandemic. *Stroke*, 2021.
- Common Medications and Intracerebral Hemorrhage: The ARIC Study. *Journal of the American Heart Association*, 2021.

Richa Sharma, MD, MPH, is an assistant professor. Sharma has a particular interest in leveraging advanced technology to improve stroke prevention. Her patient-centered research is funded by an NIH K23 award. Sharma is presently developing computational algorithms, using multimodal data sources including the electronic health record, serum protein expression levels, and neuroimaging to diagnose known as well as recently identified stroke etiologies.

Rachel Forman, MD is a stroke neurologist at Yale New Haven Hospital. She treats patients with stroke-related conditions in the hospital as well as seeing patients in the Guilford stroke clinic. Her areas of interest include community and childhood stroke education; stroke primary prevention; and addressing racial and ethnic disparities in stroke care.

- Protecting the Brain, From the Heart: Safely Mitigating the Consequences of Thrombosis in Intracerebral Hemorrhage Survivors With Atrial Fibrillation. *Stroke*, 2022
- Race/Ethnicity Considerations in the Prevention and Treatment of Stroke. *Current Treatment Options in Neurology*, 2021
- Intracerebral Hemorrhage Outcomes in the Very Elderly. *Journal of Stroke and Cerebrovascular Diseases*, 2020
- *Journal of Stroke and Cerebrovascular Diseases*, 2019

Forman formed stroke outreach groups in Chicago and Boston during her medical training. She recently partnered with the Yale Stamp Out Stroke program to continue this work where she serves as the faculty advisor. Stamp Out Stroke hosted 11 events in 2021 alone, reaching over 400 individuals in the City of New Haven and surrounding communities. More recently she has partnered with two Yale stroke nurses and the Yale Pathways to Science program to assess knowledge and provide stroke education to local high school students. Forman has provided education about racial and ethnic disparities in stroke care, including speaking at the annual Lawrence Brass Yale Stroke Symposium and publishing a paper highlighting this issue in *Current Treatment Options in Neurology*. She also serves as the Yale site PI for the REDUCE trial, which evaluates blood pressure treatment among patients with intracerebral hemorrhage.

CLINICAL

The YNHH Comprehensive Stroke Cente accepts the most complex neurovascular patients in the region, and provides direction and support for all Yale New Haven Affiliated Hospital Programs. The Stroke Center continues to be recognized for its clinical excellence by the American Heart Association in receiving two awards: the Get With the Guidelines Gold Plus Award for meeting the highest stroke performance metrics; and the Target: Stroke Honor Roll Elite for meeting target metrics in the administration of IV alteplase, the FDA-approved clot-buster for acute stroke patients.

The stroke service now provides a dedicated inpatient service and a consultative service. The primary inpatient service provides the evaluation, treatment and transitions of care plans to patients with a primary diagnosis of stroke. The team is led by a Yale Medicine board-certified vascular neurologist, and includes a fellow, two residents, an intern, a nurse practitioner, a nurse navigator, a medical student, and visiting trainees. The consultation service provides acute stroke evaluations to patients in the YNHH Emergency Department; neurovascular specialty consultations to patients not on the stroke service; and emergent telemedicine evaluations to patients at 14 clinical sites. The consultative service is also led by a Yale Medicine board-certified vascular neurologist and includes a stroke fellow and a practitioner.

The Yale New Haven Telestroke Program, provides emergent stroke consultations to patients suspected of having a stroke in 14 hospitals throughout the region. Since January 2020, the service has performed approximately 4,000 consultations.

Clinical Trials: *The division is a hub for the NIH StrokeNet and run many clinical trials in acute treatment, prevention, and recovery.*

PROVIDERS:

Hardik Amin, MD, *assistant professor; medical stroke director, Yale New Haven Hospital, St. Raphael Campus*

Daniel Brooks, MD, *assistant professor of neurology, co-medical director, stroke, Bridgeport Hospital; chief of neurology, Bridgeport Hospital*

Adam de Havenon, MD, MSCI, *associate professor*

Rachel Forman, MD, *assistant professor*

James Giles, MBChB, PhD, *assistant professor, neurology*

Adam Jasne, MD, *assistant professor*

Srinath Kadimi, MD, *associate professor, clinical neurology*

Paul Eugene P. Lleva, MD, *assistant professor, clinical neurology; medical director, stroke, Greenwich Hospital*

Caitlin Loomis, MD, *assistant professor, neurology neurology; medical director, stroke, Greenwich Hospital*

Nishant Mishra, MD, PhD, *assistant professor, neurology*

Reshma Narula, MD, *assistant professor, neurology; director, vascular neurology fellowship program; department director, diversity, equity, and inclusion*

Dhasakumar Navaratnam, MD, PhD, *associate professor, neurology and neuroscience*

Nils Petersen, MD, PhD, *associate professor, director, Cerebrovascular Blood Flow Laboratory*

Lauren Sansing, MD, MS, *associate professor, neurology (with tenure); academic chief, stroke and vascular neurology*

Joseph Schindler, MD, *professor, clinical chief, stroke and vascular neurology director, Yale New Haven Comprehensive Stroke Center*

Richa Sharma, MD, MPH, *assistant professor, neurology*

EDUCATION

The ACGME Yale vascular neurology fellowship is one of the most competitive stroke fellowships in the country. It places fellows into highly desired stroke medical directorships and faculty positions post-fellowship. Under the direction of Dr. Narula, the fellowship has expanded to four vascular neurology fellows per year.

Dr. Sansing (center) serves as the academic chief of stroke and vascular neurology, and co-directs the neurology residency R25 research training program.

Neurology Leadership

DEPARTMENT LEADERSHIP

David A. Hafler, MD, FANA, *Chair, Neurology*

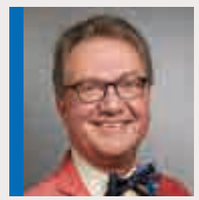
Joachim Baehring, MD, *Vice-Chair, Clinical Affairs*

Babar Khokhar, MD, MBA, *Vice-Chair, Operations*

Jennifer Mulligan, MBA, *Lead Administrator Senior Director, Finance & Administration*

SECTION CHIEFS

Emily Sharp, PhD, ABPP, *Clinical, Neuropsychology*



Christopher Gottschalk, MD, FAHSMD, FAHS *Clinical, General Neurology*

David Hafler, MD, *Chief, Neuro-Immunology*

Katherine DeStefano, MD, MS, *Clinical Chief, Neuro-Immunology*

Lawrence Hirsch, MD, *Academic, Epilepsy*

Antonio Omuro, MD, *Chief, Neuro-Oncology*

Daniel DiCapua, MD, FAAN (Neurology), *Clinical Chief, Neuromuscular Medicine*

Lauren Sansing, MD, MS, FAHA, FANA, *Academic Chief, Vascular Neurology*

Joseph Schindler, MD, *Clinical Chief, Vascular Neurology*

Serena Spudich, MD, MA, *Chief, Neurological Infections and Global Neurology*

Stephen Strittmatter, MD, PhD, AB, *Chief, Neurodegenerative Disorders*

Kevin Sheth, MD, *Academic Neurocritical Care and Emergency Neurology*

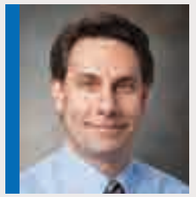
Veronica Santini, MD, *Clinical, Movement Disorders*

POSTGRADUATE EDUCATION + TRAINING PROGRAMS (Residency Program Directors)

Jeffrey Dewey, MD, MHS *Associate Program Director, Neurology Residency Director of Wellness, Neurology Residency*

Jeremy J. Moeller, MD, MSc, FRCP(C), *Associate Vice-Chair of Education, Neurology; Neurology Residency Program Director*

Sara Schaefer, MD, MHS, *Associate Neurology Residency Program Director*



Darren Volpe, MD, *Associate Program Director, Neurology, VA Site Director, Yale Neurology Residency Program*

FELLOWSHIP PROGRAM DIRECTORS

Joachim Baehring, MD, *Director, Neuro-Oncology Fellowship Program*

Daniel DiCapua, MD, FAAN (Neurology), *Director, Neuromuscular Medicine Fellowship Program*

Pue Farooque, DO, *Director, Epilepsy & Seizures Fellowship Program*

CLERKSHIP

Jeffrey Dewey, MD, MHS, *Director, Neurology Clerkship*

Emily J. Gilmore, MD, FNCS, FACNS, *Director, Neurocritical Care Fellowship Program*

Christopher Gottschalk, MD, FAHS, *Director, Headache & Facial Pain Center Fellowship Program*

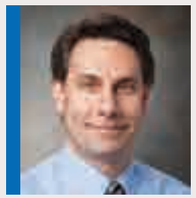
Lawrence Hirsch, MD, *Director, Neurophysiology Fellowship Program*

Erin Longbrake, MD, PhD, *Director, Multiple Sclerosis & Other Inflammatory Brain Disease Fellowship Program*

Reshma Narula, MD, *Director, Vascular Neurology Fellowship Program*

Sara Schaefer, MD, MHS, *Director, Movement Disorders Fellowship Program*

Stephanie Towns, PsyD, ABPP, *Training Director, Neuropsychology*



Darren Volpe, MD, *Director, Behavioral Neurology and Neuropsychiatry Fellowship Program*

Neurology Leadership

2020-2021 CHIEF RESIDENTS

Education

Safa Abdelhakim, MD

Rita Okumu, MD

Shobhit Singla, MD/PhD

Recruitment

Gbambele Kone, MD

Sarah Mancone, MD

Melissa Rethana, MD

Clinical

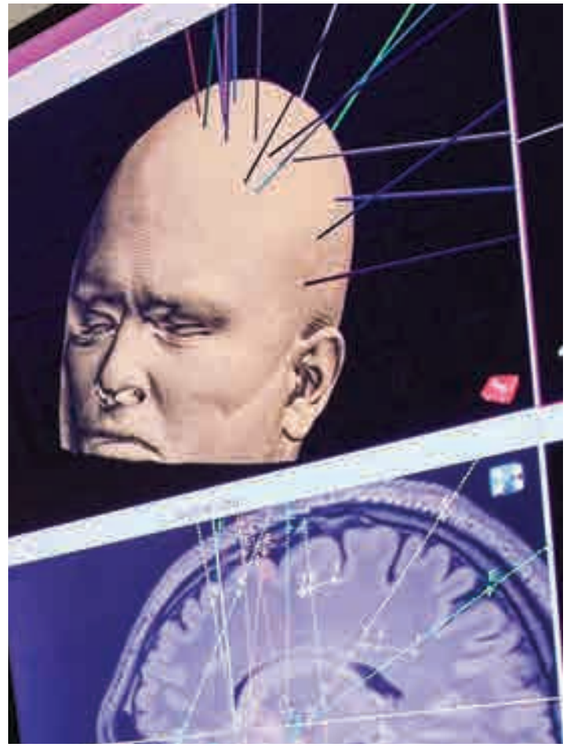
Gabriella Garcia, MD

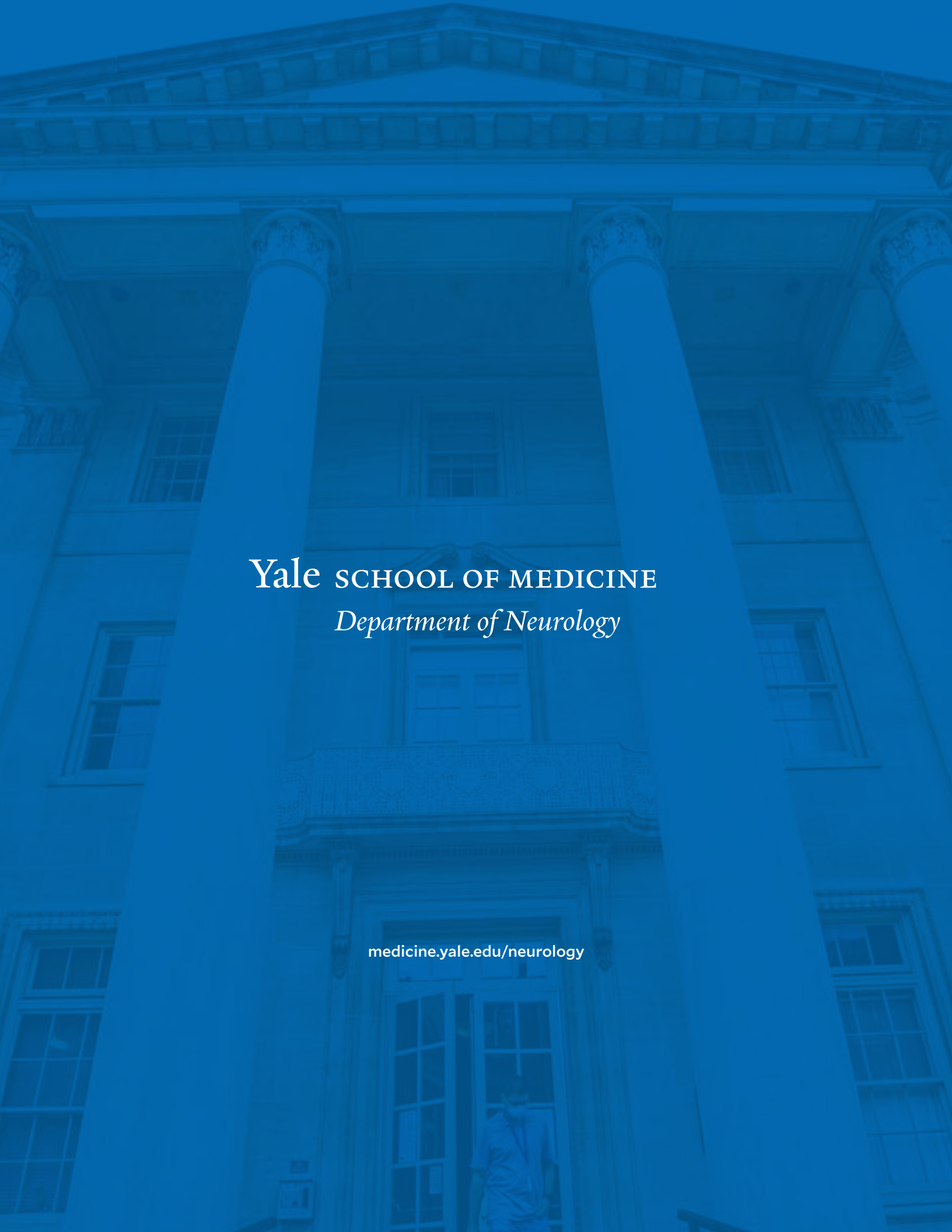
Shreya Shah, MD

Scheduling

Kevin Wilson, MD

Yee Kuang Cheng, MD





Yale SCHOOL OF MEDICINE

Department of Neurology

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