

Yale SCHOOL OF MEDICINE
Department of Neurology





As chair of the Department of Neurology for more than 15 years, I have been fortunate to witness the remarkable progress we made in advancing our missions in clinical care, education, and research. We have become one of the top-rated neurology centers in the United States by any measure, and I am proud to introduce our 2023–2024 annual report as a testament to our collective success.

This report reflects not only the exceptional quality of our programs but also the unwavering dedication and collaborative spirit that define our department. This year, our residency program welcomed its largest class to date—12 residents; we hosted the successful second annual Yale Parkinson's Disease Research and Clinical Care Symposium; prioritized physician wellness; established multidisciplinary research centers that will transform our patients' treatments; and celebrated alongside our faculty members as they were honored with awards and assumed new roles within the department and the School of Medicine. In particular, I wish to thank Jeremy Moeller, MD, MSc, for his decade of service as director of the adult residency program, and congratulate him in his new role of associate dean for curriculum of the MD program at Yale School of Medicine (YSM). At the same time, we are thrilled with the appointment of Sara Schaefer, MD, MHS, as the new director of the neurology residency program.

In my introduction to last year's annual report, I remarked on our progress in restoring a sense of community and our connections to one another. Unified in our sense of purpose, we will see no limit to the advances we will make in our research, clinical, and education programs in the months and years to come. As I reflect on the tremendous progress we have made, I am filled with gratitude for the contributions of every member of our department. It has been an honor and a privilege to serve as chair. As many of you know, I had announced last year that I would be stepping down from this role. I will continue with my pursuit of understanding inflammatory nervous system diseases in the wonderful scientific environment at YSM. I have every confidence in the future of our department under the exceptional leadership of our incoming chair, **Pooja Khatri, MD, MS**. Please join me in welcoming her and offering your full support as she leads us to even greater heights in the years to come.

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*

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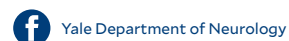
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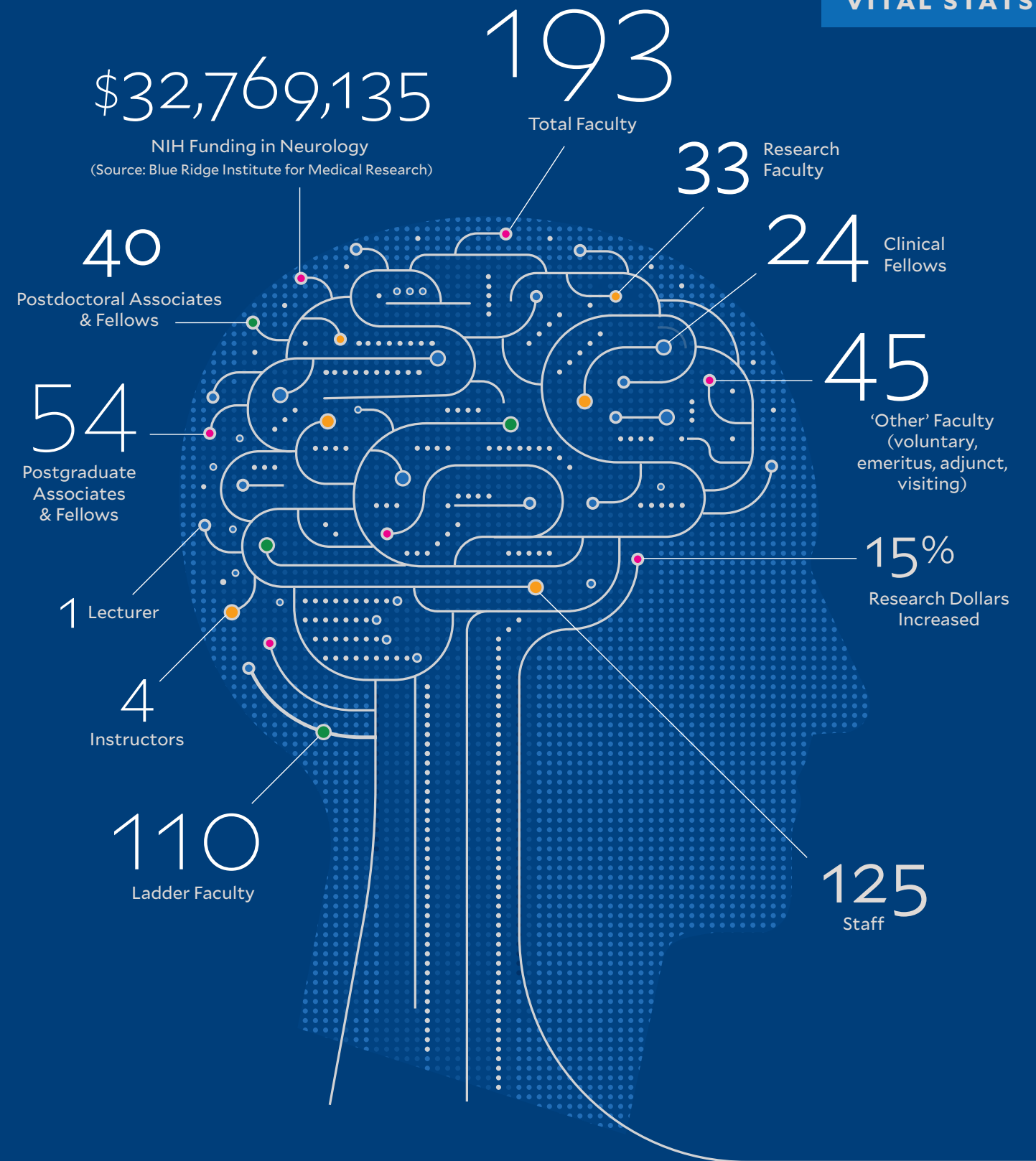
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VITAL STATS



CLINICAL SITES:

New London, Bridgeport, Milford, Greenwich, Stamford, Fairfield, Guilford, North Haven, and Westerly, Rhode Island



The 2023–24 academic year was a tremendous success for our educational programs. We continue to attract top candidates to our residency and fellowship programs, and many graduates of these programs join our department as faculty members. Our award-winning teaching faculty members provide instruction across the continuum, including a highly rated pre-clerkship neuroscience course; clinical training for medical students, residents, neuropsychology trainees and fellows; and several continuing medical education courses.

SARA SCHAEFER, MD, MHS, neurology residency program director

The 2023–24 academic year was a tremendous success for our educational programs. We continue to attract top candidates to our residency and fellowship programs, and many graduates of these programs join our department as faculty members. Our award-winning teaching faculty members provide instruction across the continuum, including a highly rated pre-clerkship neuroscience course; clinical training for medical students, residents, neuropsychology trainees and fellows; and several continuing medical education courses.

Medical Student Education

The core of our pre-clerkship medical student education is the Connection to the World (CTW) course, which takes place in the fall of the second year of the MD curriculum. Neurology faculty members teach all aspects of this course, including interactive case discussions; neuroanatomy teaching; lectures; patient presentations; and team-based learning (TBL) sessions. Connection to the World is consistently rated one of the best courses in the pre-clerkship curriculum.

Every medical student spends four weeks in a core neurology clerkship rotation; some students participate in electives and sub-internships. Many students complete their MD thesis under the supervision of department members. The department also hosts visiting students through the Yale Visiting Elective Scholarship Program.

Resident and Fellow Education

Starting in July 2024, we expanded our residency program to 12 residents per year.

This number represents a dramatic increase over the last 15 years; in 2010, we had only six residents per year! The remarkable expansion of our clinical program and faculty ranks allows us to ensure that all residents have an outstanding individualized educational experience. We also have 28 fellows in nine training programs. This is a significant improvement from having had just a few clinical fellows in a handful of programs 15 years ago.

Our trainees continue to distinguish themselves in clinical care, research, and education. The T32 and R25 training and research education programs have promoted high-level research careers, and clinical fellows have had the option of pursuing a master’s degree in medical education. Our faculty members provide hundreds of hours of small-group and one-on-one education to our trainees, including a robust simulation program.

Education across the Continuum

While much of our educational work focuses on medical students, residents, and fellows, our commitment to education includes many other activities. Our faculty members are engaged in outreach initiatives. For example, Sara Schaefer, MD, MHS, associate professor of neurology, and neurology residency program director, “leads the Grey Matter Project, an educational program for high school students; and Rachel Forman, MD, assistant professor and neurology residency program director,” leads Stamp Out Stroke, which provides community education on stroke prevention. Many faculty members serve as teachers and mentors for a diverse group of graduate students, postdoctoral researchers, and postgraduate research associates. We also have a neuropsychology residency program, which trains graduates of clinical psychology programs in specialized neuropsychological methods.



Sara Schaefer, MD, MHS, (right) trains Clinical Fellow Kathryn Zuchowski, MD, in the Botox Clinic.

To bring together faculty from our satellite locations, we have continued “Fabulous Fridays,” which relieve all our faculty members of their clinical duties on Friday afternoons.

The department continues to address issues related to culture and internal climate change. Jeffrey Dewey, MD, MHS, remains in the role of departmental wellness officer, reporting to the vice chair for faculty affairs. He is a member of the departmental cabinet and represents the department on the Yale New Haven Hospital/Yale School of Medicine Wellness Council. In these capacities, Dewey employs a data-driven strategy to enhance faculty and trainee well-being in coordination with efforts across the university and health system. Preparations are underway for the next system-wide faculty well-being survey during this academic year.

The priority for 2023–2024 was access to mental health care and individual well-being. A guide to resources for mental health and well-being has been compiled and distributed to faculty. Dewey meets with individual faculty members on an ad hoc basis, providing guidance on navigating wellness resources, and meets with each division at least once throughout the year to provide an overview of these resources as well as additional support. Similar assistance is available to and widely utilized by trainees in the residency and fellowship programs.

We established regular department retreats not only to solicit opinions and suggestions for initiatives on a broad basis, but also to strengthen collegiality across the department. We made a substantial investment by allocating protected time to faculty in charge of preparing the event and developing programming that emphasizes faculty development, group dynamics, communication, and community. Our most recent retreat took place on May 31, 2024, with a focus on building relationships, enhancing inclusion, and creating new connections between clinical and research faculty members.

We have also established a formal process for faculty development. All junior faculty members now have an assigned departmental leader with whom they meet annually to guide career development, choice of academic track, and navigating the promotions process.

In addition to 1:1 mentoring, the department has instituted regular mentoring committee meetings of academic leaders who provide additional guidance and perspective on these topics to faculty members. Oversight is provided by the associate vice chair for faculty development (traditional, CS track) and the vice chair for clinical affairs (AC, CES track). Protected time has been allotted to a faculty leader for mentoring (Amar Patel, MD), who has done an excellent job of managing this process.

To bring together faculty from our satellite locations, we have continued “Fabulous Fridays,” which relieve all our faculty members of their clinical duties on Friday afternoons. We continue to hold M&M, Clinical Grand Rounds, Grand Rounds, section meetings, and faculty meetings on Fridays from noon to 3 p.m. Faculty at outlying sites are provided with additional protected clinical time for travel so that they can attend the department-wide academic afternoon meetings in person. This provision has been extremely well received and has enhanced faculty collegiality.

Appreciation is the focus of well-being for the 2024–25 academic year. At this year’s retreat, faculty members were surveyed on preferred interventions to ensure that they know their work is appreciated. Several high-yield interventions were identified, including increasing inclusion in departmental changes; support in reducing frustration and increasing efficiency in daily work; and positive feedback from patients and families as well as from department leadership. Planned strategies include the launch of a well-being committee; mechanisms to route positive patient feedback to providers; and new opportunities to improve EMR efficiency, including a newly launched artificial intelligence scribing platform.

Primary Care Neurology + Headache Medicine



CHRISTOPHER H. GOTTSCHALK, MD, *clinical chief*

THE DIVISION OF **PRIMARY CARE NEUROLOGY & HEADACHE MEDICINE** EVALUATES AND TREATS ALL NEUROLOGICAL DISORDERS. IT INCLUDES THE YALE HEADACHE AND FACIAL PAIN CENTER, WHICH SPECIALIZES IN THE DIAGNOSIS AND MANAGEMENT OF PRIMARY AND SECONDARY HEADACHE DISORDERS AND FACIAL PAIN, AS WELL AS THE YALE NEUROLOGY RESIDENT CLINICS. THE RESIDENT CLINICS OFFER SPECIALIZED CARE IN GENERAL NEUROLOGY AND STROKE, AND INCLUDE THE NEUROLOGY URGENT ACCESS CLINIC (NUAC).

RESEARCH

- ▶ The **Headache Medicine** section implements investigator-initiated and industry-sponsored trials of treatments for primary headache disorders. Recent industry-sponsored trials include a novel rebreathing device for treating migraine with aura, and an upcoming trial of a novel botulinum toxin for chronic migraine.

Division members continue to publish clinical updates in the advanced care of headache disorders:

- Christopher H. Gottschalk, Early Improvements with Atogepant for the Preventative Treatment of Migraine: Results from Three Randomized Phase 3 Trials. *Neurology* (forthcoming)
- Meningeal lymphatic vessel dysfunction driven by CGRP signaling causes migraine-like pain in mice. *Journal of Clinical Investigation*, 2024.

- ▶ **Emmanuelle Schindler, MD PhD**, is an assistant professor of neurology and medical director of the Headache Center of Excellence in the VA Connecticut Healthcare System in West Haven. Schindler's lab studies the therapeutic effects of the psychedelic compound psilocybin; she is thought to be the only researcher in the United States studying psychedelics as potential treatments for headache disorders. Schindler is also the first Yale researcher to study the application of any psychedelic compound in human medicine.

- ▶ The **Schindler Lab**, in collaboration with the Biostudies Unit at the VA Connecticut Healthcare System in West Haven under the direction of Deepak Dsouza, MBBS, MD, continues studies of 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.

- Psilocybin pulse regimen reduces cluster headache attack frequency in the blinded extension phase of a randomized controlled trial. *Journal of the Neurological Sciences*, 2024.

CLINICAL

The Headache Medicine section 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, and others. 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 healthcare system, including:

- 2- and 4-bed infusion suites (New Haven, Fairfield, New London, and Stamford).
- 3T MRI with dedicated protocols for cranial neuralgias.
- Surgical options that include microvascular decompression (MVD) and Gamma Knife therapy for refractory cranial neuralgias.
- Interdisciplinary care with interventional neuroradiologists, neurosurgeons, and pain specialists for patients with such complex disorders as CSF leaks.
- Procedures that include on-demand nerve blocks and Botox® for chronic migraine.
- Services of physical therapists, social workers, and dietitians.
- Access to participation in clinical trials.

LOCATIONS:

With a main hub in New Haven, the division has expanded with satellite locations in Stamford, Fairfield, Milford, North Haven, Guilford, and New London, Connecticut; and most recently to a location in Westerly, Rhode Island.

The general neurology division includes a multi-disciplinary concussion program available across all clinical sites, offering diagnostic evaluation and treatment; neuropsychological evaluation and neuropsychiatric care; physical therapy; and social work services.



Bilchik has worked on numerous clinical trials for new therapies to treat headache disorders.

Vanessa Cooper, MD, is an alumna of Yale Neurology's residency and headache medicine fellowship programs, and is now an assistant professor of neurology.

PROVIDERS:

Christopher H. Gottschalk, *MD, *professor; section chief, general neurology; director, fellowship program; director, Headache & Facial Pain Center*

Nicholas Tzikas, *MD, *assistant professor, clinical neurology; co-director, headache medicine fellowship program; Stamford site director, Headache & Facial Pain Center*

Vanessa Cooper, *MD, *assistant professor, neurology; associate director of collaborative excellence, education, neurology*

Risako Shirane, *MD, MSc, *assistant professor, neurology*

Tanya Bilchik, *MD, *assistant professor, neurology*

Steven Novella, *MD, *associate professor, neurology*

Sirisha Sanamandra, *MD, *assistant professor, neurology; director of the Lumbar Puncture Clinic*

Bryan DeSouza, *MD, *associate professor, neurology*

Emmanuelle Schindler, *MD, PhD, *assistant professor, neurology; medical director of the Headache Center of Excellence in the VA Connecticut Healthcare System West Haven*

Mark Ortiz, *physician associate*

FELLOWSHIP TRAINING

The Yale Headache Medicine fellowship training program is a UCNS-certified year-long clinical program, training two fellows per year since 2020–2021. We also work together with the VA Connecticut Healthcare System in West Haven Headache Center of Excellence to provide an additional clinical research year for future clinician-scientists.

Epilepsy + EEG



LAWRENCE J. HIRSCH, MD
academic chief

ANURADHA SINGH, MD
clinical chief

THE **DIVISION OF EPILEPSY & EEG** IS LOCATED IN THE YALE COMPREHENSIVE EPILEPSY CENTER IN YALE NEW HAVEN HOSPITAL, WHICH PROVIDES PROMISING TREATMENT OPTIONS FOR ADULT AND PEDIATRIC PATIENTS WITH EPILEPSY. KNOWN FOR ITS CLINICAL EXCELLENCE AND INNOVATIVE RESEARCH, THIS PROGRAM WAS ONE OF THE NATION'S FIRST, AND HAS GROWN INTO ONE OF THE MOST ACTIVE AND ADVANCED IN THE WORLD.

RESEARCH

► **Lawrence J. Hirsch, MD**, academic division chief, performs clinical research on brain monitoring with electroencephalography (EEG); status epilepticus; brain stimulation in epilepsy treatment; epilepsy surgery; rescue therapy for acute seizures outside the hospital; antiseizure medications; EEG devices; and more. Hirsch is the founder and former chair of the Critical Care EEG Monitoring Research Consortium (CCEMRC); co-chair of the medical advisory board of the NORSE Institute; PI of the International Open Biorepository for New-Onset Refractory Status Epilepticus (NORSE) and Febrile Infection-Related Epilepsy Syndrome (FIRES); and lead author of the American Clinical Neurophysiology Society's Standardized Critical Care EEG Terminology: 2021 Version. He has published more than 250 peer-reviewed research papers and more than 100 reviews, editorials, and book chapters. Hirsch directed or co-directed five symposia and gave more than 20 invited talks in eight countries in 2023–24. The second edition of his *Atlas of EEG in Critical Care* was published in early 2023.

- Systematic 1 Hz direct electrical stimulation for seizure induction: A reliable method for localizing seizure onset zone and predicting seizure freedom. *Brain Stimulation*, 2024.
- Second-line immunotherapy in new onset refractory status epilepticus. *Epilepsia*, 2024.
- Cytokines in New-Onset Refractory Status Epilepticus Predict Outcomes. *Annals of Neurology*, 2023.
- Clinical and Electroencephalographic Predictors of Seizures and Status Epilepticus in 12,450 Critically Ill Adults: A Retrospective Cohort Study. *Critical Care Medicine*, 2023.
- Diagnosing nonconvulsive status epilepticus: Defining electroencephalographic and clinical response to diagnostic intravenous antiseizure medication trials. *Epilepsia*, 2023.

► **Anuradha Singh, MD**, joined the YSM on September 1, 2024, as the clinical chief and director of the Yale Comprehensive Epilepsy Center. She is also professor emerita of neurology of Bellevue Hospital. She oversees clinical operations and expansion of system-wide access to EEG/epilepsy services as well as quality improvements in her division. Her research interests include neuroimaging in epilepsy; stereo EEG; neuromodulation; epilepsy surgery; education about and prevention of sudden unexpected death in epilepsy (SUDEP); and education for trainees and patients with epilepsy. Singh won the 2024 Tauba Pasik, MD, and Pedro Pasik, MD, Award for Teaching Excellence in the Neurosciences—an annual award given by the Icahn School of Medicine at Mount Sinai to recognize notable women in neurology and neuroscience.

- Neuropsychiatric complications of coronavirus disease 2019: Mount Sinai Health System cohort study. *Journal of Neurology*, 2024.
- Elevated phase amplitude coupling as a depression biomarker in epilepsy. *Epilepsy & Behavior*, 2024.
- Responsive Neurostimulation for People With Drug-Resistant Epilepsy and Autism Spectrum Disorder. *Journal of Clinical Neurophysiology*, 2024.
- Older adults with epilepsy and COVID-19: Outcomes in a multi-hospital health system. *Seizure*, 2024.
- A multicenter retrospective study of patients treated in the thalamus with responsive neurostimulation. *Frontiers in Neurology*, 2023.
- Neuroimaging findings and neurological manifestations in hospitalized COVID-19 patients: Impact of cancer and ventilatory support status. *PLoS One*, 2023.

► **Hal Blumenfeld, MD, PhD**, leads multidisciplinary collaborative research on disease-oriented neuroimaging. He is a world expert on the mechanisms of impaired consciousness in epilepsy. His research group is completing 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 patients with focal seizures. Blumenfeld has multiple R01 grants using animal models to investigate the fundamental mechanisms of the same clinical problem—impaired consciousness during focal seizures—and to develop new translational therapeutic approaches to treating epilepsy.

- Predictive Power of Interictal Epileptiform Discharges in Fitness-to-Drive Evaluation. *Neurology*, 2023.
- Decreased but diverse activity of cortical and thalamic neurons in consciousness-impairing rodent absence seizures. *Nature Communications*, 2023.
- Distinct signatures of loss of consciousness in focal impaired awareness versus tonic-clonic seizures. *Brain*, 2023.

► **Hitten Zaveri, MSE, PhD**, is an electrical, computer, and biomedical engineer by training. He directs the Computational Neurophysiology Laboratory and co-directs the BioSense Laboratory and the Yale Clinical Neuroscience Group for Neuroanalytics (YNN). He studies brain networks and EEG connectivity, and is involved in the development of neurotechnology and medical devices. Zaveri's current projects include the use of network analysis to locate the onset area of epileptic seizures (NIH R01 NS109062); the introduction of a multimodal brain probe for traumatic brain injury (NIH UG3 NS123307); the development of a multimodal brain atlas (Yale Brain Atlas); seizure forecasting; and the development of a next-generation brain computer interface for brain monitoring and modulation.

- Modeling seizure networks in neuron-glia cultures using microelectrode arrays. *Frontiers in Network Physiology*, 2024.
- Mapping the structure-function relationship along macroscale gradients in the human brain. *Nature Communications*, 2024.
- A CMOS Nanosensing System for Continuous Brain Multianalyte Monitoring. *Paper presented at the 74th Electronic Components and Technology Conference of the IEEE in May 2024.*



Yale continues to house a Level 4 comprehensive epilepsy center that collaborates with other departments to deliver targeted, patient-centered care.

Continued on next page.

- Antiseizure Medications in Post-stroke Seizures: A Systematic Review and Network Meta-analysis (P8-1.012). *Neurology*, 2024.
- Systematic 1 Hz direct electrical stimulation for seizure induction: A reliable method for localizing seizure onset zone and predicting seizure freedom. *Brain Stimulation*, 2024.
- Quantitative assessment of burst suppression as a predictor of seizure recurrence in refractory status epilepticus. *Clinical Neurophysiology*, 2023.
- Seizure forecasting: Where do we stand? *Epilepsia*, 2023.

► **Imran Quraishi, MD, PhD**, has co-directed the Center for Neurostimulation in Epilepsy since 2020. He studies the use of long-term ambulatory intracranial EEG as an epilepsy biomarker and as a novel tool for cognitive neuroscience, as well as working on translational models of genetic epilepsies including channelopathies. Quraishi is a contributing editor of *Epilepsy Currents*, the official journal of the American Epilepsy Society.

- Combined neuromodulation and resection for functional cortex epilepsy: a case series. *Journal of Neurosurgery*, 2024.
- Systematic 1 Hz direct electrical stimulation for seizure induction: A reliable method for localizing seizure onset zone and predicting seizure freedom. *Brain Stimulation*, 2024.
- Disease-causing Slack potassium channel mutations produce opposite effects on excitability of excitatory and inhibitory neurons. *Cell Reports*, 2024.
- Slack (KCNT1) potassium channels regulate levels of proteins of the inner mitochondrial membrane. *Biophysical Journal*, 2024.
- Nonquantal transmission at the vestibular hair cell-calyx synapse: KLV currents modulate fast electrical and slow K⁺ potentials. *Proceedings of the National Academy of Sciences of the United States of America*, 2023.



Implementing such tools as telehealth and rapid EEG technology enables the Comprehensive Epilepsy Center to closely and consistently monitor patients' symptoms and treatment plans.

► **Benjamin Tolchin, MD, MS**, is the director of the Yale New Haven Health Center for Clinical Ethics. He studies the outcomes and equity of health care and ethics policies and programs. He also conducts research related to the treatment of functional or psychogenic seizures. Tolchin's research has been recognized with Young Investigator Awards from the American Clinical Neurophysiology Society and the American Epilepsy Society (AES); the Rebecca Goldberg Kaufman Clinical Award in Ethical Neuropsychiatry from the American Epilepsy Society; the Emerging Leaders Fellowship from the American Academy of Neurology (AAN); the Epilepsia Clinical Science Prize from the International League Against Epilepsy (ILAE); and the Office of Health Equity Research (OHER) Award for Yale Research Excellence. He is a Fellow of the AAN and of the AES, and serves on the AAN's Guidelines Subcommittee and Ethics, Law, and Humanities Committee. Tolchin currently leads work groups developing AAN guidelines for the management of functional seizures and an AAN/AES/Epilepsy Foundation position statement on seizures and driving. He is the past president of the Epilepsy Foundation New England.

- Top Ten Tips Palliative Care Clinicians Should Know About Providing Care for People With Disabilities. *Journal of Palliative Medicine*, 2024.
- Improving Communication Around the Diagnosis of Dementia. *Neurology Clinical Practice*, 2024.
- Should He Have a Vasectomy?. *Hastings Center: Clinical Ethics Case Studies*, 2024.
- Moral Distress in Resuscitation Policy Implementation During the COVID-19 Pandemic: A Mixed Methods Study. *Annals of Emergency Medicine*, 2023.
- Work difficulties, work restrictions, and disability benefits in people with functional seizures: a survey study. *Epilepsy & Behavior Reports*, 2023.

► **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 of the Yale Comprehensive Epilepsy Center, and a national co-investigator of the recently funded multicenter effort (Post Acute Symptomatic Seizure Investigation and Outcomes Network, or PASSION) to study epileptogenesis and the management of antiseizure medications in patients with acute brain injury.

- Intracranial Entrainment Reveals Statistical Learning across Levels of Abstraction. *Journal of Cognitive Neuroscience*, 2023.
- Impact of acute symptomatic seizures and their management on patient-reported outcomes after stroke. *Epilepsy & Behavior*, 2023.
- Do acute EEG findings add to clinical features in predicting outcomes after status epilepticus and acute symptomatic seizures? *Epilepsy & Behavior*, 2023.

► **Richard H. Mattson, MD**, a legend in the world of epilepsy research, came to Yale in 1967 after service in the United States Air Force Medical Service, where he and colleagues conducted the first studies establishing sleep deprivation as a useful adjunct in activating epileptogenic activity on an EEG recording. He founded the Yale/VA Epilepsy Center and Intensive Epilepsy Monitoring Unit which was one of the first continuous video/EEG monitoring units. Over the past five decades, this unit has grown into the current Yale Comprehensive Epilepsy Center. During the next 15 years, Mattson directed two multicenter comparative trials of antiseizure drugs. He served as director of the Yale neurology residency training program from 1985 through 1992. In 1990, he founded the Yale Medical School Neuroscience Clinical Clerkship, which he directed 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.

► **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.

- Mood and Anxiety Disorders and Suicidality in Patients With Newly Diagnosed Focal Epilepsy: An Analysis of a Complex Comorbidity. *Neurology*, 2023.

► **Jeremy Moeller, MS, MSc**, researches various aspects of medical education, with a specific interest in resident assessment and the role of technology in neurology education. Moeller began and currently maintains the popular Neurology Exam Prep Podcast, and developed a set of instructional videos on EEG interpretation that have been viewed more than 1 million times on YouTube. The set is part of the core curriculum in neurology residency programs across the country. Moeller is the department lead in the MHS in Medical Education program; residency program director; and vice-chair of education.

- Addressing the Gender Gap in Residency Awards Using a Blinded Selection Process. *Neurology Education*, 2024.
- Education Research: What Medical Students Value in Neurology Residents: A Qualitative Study to Inform Resident as Teacher Curricula. *Neurology Education*, 2024.
- Curriculum Innovation: Design and Implementation of Synchronous and Asynchronous Curricula to Enhance Residents' EEG Knowledge and Experience. *Neurology Education*, 2023.

► **Aline Herlopian, MD**, studies the pharmacokinetics, pharmacodynamics, and interactions of cenobamate, a drug used to treat partial-onset seizures. Herlopian is investigating real world experience using fenfluramine and its effect on EEG findings. She is analyzing thalamic signals from deep brain stimulators and correlating them with scalp EEG findings. Herlopian is presently organizing her lab in order to investigate the role of high-frequency oscillations (HFOs) as a biomarker of epileptic networks. In addition to the three students in her lab, she collaborates with Hitten Zaveri, MSE, PhD, in designing and validating an HFO detector. Herlopian has presented and chaired symposia and workshops at the annual meetings of the American Clinical Neurophysiology Society for the past four years.

- Improving Clinician Performance in Classifying EEG Patterns on the Ictal-Interictal Injury Continuum Using Interpretable Machine Learning. *NEJM AI*, 2024.
- Combined neuromodulation and resection for functional cortex epilepsy: a case series. *Journal of Neurosurgery*, 2024.
- On-demand EEG education through competition – A novel, app-based approach to learning to identify interictal epileptiform discharges. *Clinical Neurophysiological Practice*, 2023.
- Development of Expert-Level Classification of Seizures and Rhythmic and Periodic Patterns During EEG Interpretation. *Neurology*, 2023.
- Interrater Reliability of Expert Electroencephalographers Identifying Seizures and Rhythmic and Periodic Patterns in EEGs. *Neurology*, 2023.



Hirsch holds numerous leadership positions on national and international epilepsy organizations, and published more than 250 peer-reviewed research papers and more than 100 reviews, editorials, and book chapters.

► **Maria Kristina (Inna) Dorotan, MD**, joined the division in July 2023. She completed her epilepsy and clinical neurophysiology fellowship at Brigham and Women's Hospital in Boston. She has both clinical and research interests in women's issues in epilepsy; brain tumor-related epilepsy; and epilepsy surgery.

- Patient-centered management of brain tumor-related epilepsy. *Current Neurology and Neuroscience Reports*, 2024.
- Current state of the epilepsy drug and device pipeline. *Epilepsia*, 2024.
- Challenges and directions in epilepsy diagnostics and therapeutics: Proceedings of the 17th Therapies and Diagnostics Development conference. *Epilepsia*, 2023.
- Glioma genetic profiles associated with electrophysiologic hyperexcitability. *Neuro-oncology*, 2023.

► **Bogdan Patedakis Litvinov, MD**, joined the division in July 2023. His focus is primarily clinical. He divides his time between the neurology hospitalist service at Bridgeport Hospital and the EEG services within Yale New Haven Health. He is a graduate of Yale's neurology residency program and of the epilepsy and clinical neurophysiology fellowship programs. Litvinov is currently studying the clinical utility of rapid EEG devices.

► **Margaret Gopaul, PhD, MSCP**, holds dual appointments as an associate research scientist at YSM and the VA Connecticut Healthcare System in West Haven. Her expertise covers neuropsychology, neurophysiology, and psychopharmacology, with particular interest in epilepsy, neurodevelopmental disorders, and mental health. Gopaul leads a national evaluation of more than 19 VA facilities to improve access to and integration of mental health care for epilepsy patients. At Yale, she contributes to the New-Onset Refractory Status Epilepticus (NORSE) studies, including as co-PI on a recent Patient-Centered Outcomes Research Institute (PCORI) grant submission (\$12 million) for a comparative study examining the effectiveness of anakinra versus tocilizumab in treating NORSE. Gopaul is a member of the NORSE Institute's Medical and Scientific Advisory Board and a member of the Yale Institutional Review Board. Her work bridges clinical practice and research with key publications on seizure risks as well as a co-authored book on comparative psychopathology published by Routledge in 2024. She spoke at the American Epilepsy Society's Ask the Expert Webinar on "Suicide in Epilepsy" in September 2024.

- Do psychotropic drugs cause seizures? *Epilepsy & Behavior Reports*, 2024.
- The seasonality of new-onset refractory status epilepticus (NORSE). *Epilepsia*, 2023.

CLINICAL

Our epilepsy team provides a patient-centered approach responsive to the needs, values, and preferences of patients. We provide education to help patients and family members understand epilepsy; become self-confident; and make informed decisions about their care. We offer such specialized services as PASS clinics; Women with Epilepsy and Psychogenic Nonepileptic Seizures; and Neuromodulation Clinics. We are planning to start First Seizure Clinics this summer. We offer such advanced imaging as PET, fMRI, and SPECT; comprehensive neuropsychological testing and magnetoencephalography (MEG) for better seizure localization; and state-of-the-art surgery at Yale Epilepsy Center. We are designated a Level 4 epilepsy center, which offers the most advanced care to patients with medically refractory epilepsy.

We provide consistent evidence-based access to community services that people with epilepsy and their families may need through our close collaboration with the Epilepsy Foundation of Connecticut. We combine telehealth with in-person medical care to optimize seizure control and reduce the risk of side effects from medications. More than 6,500 patients with epilepsy or possible epilepsy were seen via our outpatient services in the Yale New Haven, Milford, Guilford, and Stamford clinics. In 2025, the North Haven clinic will begin in July or August, and the Bridgeport and Greenwich clinics are expected to begin in either the summer or fall. Our eight-bed epilepsy monitoring unit (EMU) is expected to expand to a 12-bed EMU by March 2027 with the completion of the new Neurosciences Center and Bed Tower project on the Saint Raphael Campus at 659 George Street.

Our EEG services include routine outpatient EEGs; home video/EEG monitoring; inpatient video/EEG/EKG/O2 monitoring in both 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 allow for 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, Westerly, and Lawrence & Memorial Hospitals. We rolled out the use of new rapid EEG technology that allows interpretable EEGs within six minutes at most of these sites as well. This technology has been used more than 400 times at YNHHS. We also offer evoked potential (somatosensory, visual, and auditory) testing, and participate in multiple clinical trials of medications and devices.

We continue to offer the most advanced epilepsy treatments, from medications and dietary therapies (with a full-time dietitian) to intracranial implantation of grid and strip electrodes, both intraoperative and extraoperative resective surgery of the epileptic zone, and neuromodulation—including vagus nerve stimulation, responsive neurostimulation, and deep brain stimulation. We offer minimally invasive epilepsy surgical interventions, including the use of robotically placed depth electrodes (also known as stereo EEG), and minimally invasive laser interstitial thermal therapy (LITT). 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:

Our clinics are located in New Haven, Stamford, Guilford, and Milford. The Milford ambulatory epilepsy clinics were opened in September 2024; epilepsy clinics will be offered in North Haven in July 2025, and in Bridgeport and Greenwich in either the summer or fall of 2025.

CLINICAL TRIALS:

We always offer patients opportunities to participate in clinical trials, including trials of medications and devices.

CLINICAL PROVIDERS:

Anuradha Singh, MD, professor of neurology and neurosurgery; clinical chief, Epilepsy & EEG; director, Yale Comprehensive Epilepsy Center; director, Epilepsy Surgery Program

Lawrence J. Hirsch, MD, professor of neurology; academic chief, Epilepsy & EEG; co-director, Yale Comprehensive Epilepsy Center; co-director, Critical Care EEG Monitoring Program; co-program director, critical care EEG fellowship

Aline Herlopian, MD, associate professor of neurology; medical director of the clinical physiology/EEG lab (including home video/EEG); director of clinical trials in epilepsy

Imran Quraishi, MD, PhD, associate professor of neurology; director, Center for Neurostimulation in Epilepsy; medical director, Epilepsy Monitoring Unit; director of the Electric Source Imaging and Magnetoencephalography Programs

Adithya Sivaraju, MD, MHA, associate professor of neurology; director, Post Acute Symptomatic Seizure (PASS) Clinic; director, Cortical Stimulation Mapping Program

Jeremy Moeller, MD, MSc, associate professor, neurology; 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 Neuroscience Imaging Center (CNIC)

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

Hamada Hamid Altalib, DO, MPH, professor of neurology and psychiatry; chief of VA Neurology Service, VA Connecticut Healthcare System; track director of health informatics, executive MPH program

Benjamin Tolchin, MD, MS, associate professor of neurology; inaugural director, Yale New Haven Health System Center for Clinical Ethics

Maria Kristina (Inna) Dorotan, MD, assistant professor, neurology

Bogdan Patedakis Litvinov, MD, assistant professor, neurology

Sung-Min Park, MD, PhD, assistant professor, neurology; director, evoked potentials

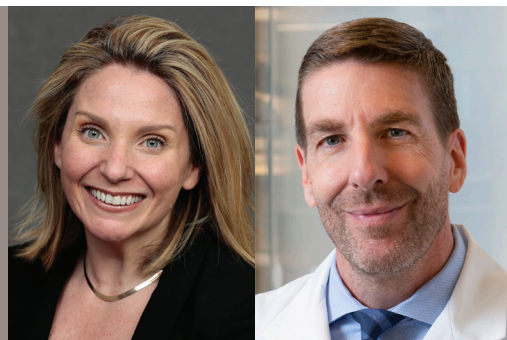


Hirsch analyzes an EEG.

FELLOWSHIP TRAINING

In addition to teaching EEG and epilepsy care to neurology residents, we offer a two-year Epilepsy/EEG fellowship training program. The program includes one year of an ACGME-accredited clinical neurophysiology fellowship followed by a second year of an ACGME-accredited epilepsy fellowship. Training includes extensive video-EEG monitoring; intracranial EEG; surgical and medical treatment of epilepsy; epilepsy comorbidities; neuropsychiatry; brain mapping; inpatient and outpatient epilepsy care; EEG in all settings (ICU, inpatient, and outpatient); brain stimulation; evoked potentials testing; and sleep medicine/polysomnography, all for adults, children, and neonates. There are typically a total of four Epilepsy/EEG fellows (two in the first year, two in the second year) in this program. Lawrence Hirsch, MD, and Emily Gilmore, MD, MS, oversee the nation's longest-running critical care EEG fellowship (one fellow per year).

Movement Disorders



VERONICA SANTINI, MD, MA
clinical chief

CLEMENS SCHERZER, MD,
academic chief

THE **MOVEMENT DISORDERS DIVISION** DELIVERS EXCEPTIONAL PATIENT-CENTERED CARE TO IMPROVE THE LIVES OF PEOPLE WITH MOVEMENT DISORDERS. OUR WORLD-CLASS CLINICIANS, SCIENTISTS, AND ENGINEERS WORK TOGETHER TO DEVELOP THE FUTURE'S PRECISION HEALTH CARE. OUR PHYSICIAN-EDUCATORS ARE NATIONALLY RECOGNIZED LEADERS IN TRAINING THE NEXT GENERATION OF MOVEMENT DISORDERS SPECIALISTS.

RESEARCH

The Movement Disorders division boasts a number of distinctive centers, laboratories, and working groups:

- ▶ The **Stephen & Denise Adams Center for Parkinson's Disease Research: using genomics and AI to develop precision medicine.** The Center seeks to develop predictive, preventive, and precision health care for Parkinson's disease. Rather than treating patients with a one-size-fits-all approach, the Center's staff targets the precise genetic drivers of a person's illness, focusing on breakthrough research with tangible results. The newly endowed Stephen & Denise Adams Center on College Street 100 (since 2024) and 101 (opening in 2025) provides two floors for research and computer labs for up to 70 scientists. Physically and intellectually linked to the Neurology, Neuroscience, and Biomedical Informatics Departments and the Wu Tsai Institute, the center reflects the School of Medicine's commitment to precision neuroscience. Key platforms in place or under construction are the Yale Harvard Biomarkers Study and Biobank; the multiomics Parkinson Cell Atlas in 5D (PD5D); the Parkinson Discovery Engine, a multimodal atlas of hundreds of biosamples from Parkinson's patients; and a multiome tech hub with Xenium, Chromium, and Visium platforms as well as AI neuroscience. The center is directed by Clemens Scherzer, MD.
- ▶ **Yale is the only institution in the world with four \$9 million Aligning Science Across Parkinson's (ASAP) Teams.** The four ASAP teams at Yale are led by Scherzer; Pietro De Camilli, MD; Thomas Biederer, PhD; and David Hafler, MD. These teams join forces to look for the causes of Parkinson's from genomics to genes to cell circuits to neuroimmune responses, with funding from the Aligning Science Across Parkinson's (ASAP) Foundation and implementation by the Michael J. Fox Foundation. Scherzer is a pioneer in precision neurology; he uses massive data streams from genomes, transcriptomes, and large patient cohorts to develop predictive, precise, and preventive health care for patients with PD. His research led to the discovery of genetic drivers, biomarkers, and therapeutic targets for the disease, and will be instrumental in upcoming clinical trials.
- ▶ **PRISMS trial: a first-of-its-kind clinical trial targeting prodromal Parkinson's disease.** Hafler and Jesse Cedarbaum, MD, received a \$13.2 million grant from the Marcus Foundation in February 2024 that will fund "An Exploratory Study of the Potential for Rational Immune System Manipulation to Prevent Emergence of Synucleinopathy [PRISMS] Manifestations in Persons with REM Sleep Behavior Disorders (RBD)," a pathbreaking clinical trial that will test the ability of the anti-TNF antibody adalimumab (Humira) to slow progression toward Parkinson's disease in people with REM sleep behavior disorder (RBD).

▶ **Yale Harvard Biomarkers Study and Biobank (YHBS): a treasure trove of discoveries.** YHBS (previously known as the Harvard Biomarkers Study) is one of the world's largest biobanks for Parkinson's disease, memory impairment, and related neurodegenerative diseases. It comprises more than 200,000 biosamples and health data from 4,000 patients characterized with multiomics and whole genome sequences. The YHBS and the resulting multimodal atlas enable the discovery of new drug targets, genes, and diagnostics. Unique iPSC capability enables clinical trials-in-a-dish using a patient's stem cell avatars with linked biomarkers, genomes, and clinical phenotypes. Over the next two years the study will enroll another 1,000 individuals with alpha-synucleinopathies from multiple Yale sites. The Adams Center makes the YHBS available to qualified scientists and collaborators across Yale.

▶ **Yale is recognized as an American Parkinson Disease Association (APDA) Center for Advanced Research.** APDA Centers for Advanced Research must meet the highest academic standards and be distinguished leaders in the field of Parkinson's disease research, patient care, outreach, and education. The nine national APDA Centers conduct research into the causes, treatments, and finding the cures for Parkinson's disease with annual support from the APDA. Scherzer directs the Yale APDA Center; Veronica Santini, MD, MA, leads the clinical core; and Sara Schaefer, MD, MHS, leads the education core.

▶ The **Neurogenomics Lab** led by Scherzer, uses genomics and computational biology across different scales and dimensions to decode, simulate, and reprogram the genetic software of patients' brain cells.

- Circular RNAs in the human brain are tailored to neuron identity and neuropsychiatric disease. *Nature Communications*, 2023.
- Association Between Use of Any of the Drugs Prescribed in Norway and the Subsequent Risk of Parkinson Disease: A Drug-wide Association Study. *Neurology*, 2023.
- Disease progression strikingly differs in research and real-world Parkinson's populations. *NPJ Parkinson's Disease*, 2023.

▶ **Clemens Scherzer, MD**, is the founding director of the Stephen & Denise Adams Center for Parkinson's Disease Research at YSM, and the Stephen and Denise Adams Professor of Neurology. He also serves as academic chief of the Movement Disorders division. The **Neurogenomics Lab** uses genomes, big data, and deep cohorts to develop both predictive and preventive precision treatments for Parkinson's and other neurologic diseases. The ASAP team led by Scherzer is mapping a \$9 million Parkinson Cell Atlas in 5D (PD5D) in human brains (*Nature Neuroscience*, 2018; *Nature Communications*, 2023) comprising one million brain cells and one thousand brains with single-cell, spatial, allele-specific, multiomic, and functional resolution. The ASAP team includes associate professor Xianjun Dong, PhD, and his laboratory (see paragraph below), who joined the Adams Center and the division in July 2024.

▶ The **Hafler Lab** broadly investigates inflammatory CNS diseases. **David A. Hafler, MD**, is the William S. and Lois Stiles Edgerly Professor of Neurology and Professor of Immunobiology. Hafler headed one of Yale's Aligning Science Across Parkinson's grants. His team performed single-cell genomics analysis of paired blood and CSF in prodromal Parkinson's disease compared to healthy controls, and observed T-cell pleocytosis in the CSF of RBD patients, indicating increases in activated monocytes with upregulation of TNFR2 and TNF α -mediated signaling pathways. These results led to the PRISMS clinical trial with an anti-TNF α mAb in prodromal Parkinson's disease, led by Cedarbaum. The Hafler group includes M. Elizabeth Deerhake, MD, PhD; Yoshiaki Yasumizu, MD, PhD; Rafiad Islam, PhD; and Nick Buitrago-Pocasangre, MSc.



Research presentations at the Second Annual Yale Parkinson's Disease Research and Clinical Care Symposium in 2024.

The **Chandra Lab** focuses on synaptic dysfunction in neurodegenerative diseases. Sreenganga Chandra, PhD, is an associate professor of neurology and neuroscience who investigates familial genes for PD. The Chandra Lab has recently focused on endolysosomal genes—in particular, how they influence synapse function and lead to neurodegeneration. The lab uses different approaches to investigate these questions in mouse models and stem cell-derived neurons.

- ▶ Chandra is a member of the 2024 program subcommittee for basic science that is setting the agenda for the 7th World Parkinson Congress in Phoenix, Arizona, May 24–27, 2026.

- Decoding transcriptomic signatures of cysteine string protein alpha-mediated synapse maintenance *Proceedings of the National Academies of Sciences of the United States of America*, 2024.
- Single-cell transcriptomic and proteomic analysis of Parkinson's disease brains. *bioRxiv*, 2024; *Science Translation Medicine*, under revision. *Corresponding author.

- ▶ **Thomas Biederer, PhD**, is professor of neurology. The **Biederer Lab** focuses on cognitive impairments in patients with PD by exploring the vulnerability of different cell types and circuits in the neocortex of the brain. Biederer will lead a strong interdisciplinary team in defining the progression of network pathology through longitudinal in vivo imaging of neuronal activity and analysis of synaptic dysfunction; mapping gene expression patterns that mark both vulnerable and protected types of cells; and using mathematical modeling to synthesize the roles of cellular, synaptic, and network vulnerabilities in the progression of PD. These experiments will determine to what extent PD causes progressive cognitive deficits through damage to vulnerable neurons and synapses as well as disruption of cortical network connectivity. Biederer's team expects their findings to open new avenues to ameliorate cognitive decline in patients with PD.

- A complex of the lipid transport ER proteins TMEM24 and C2CD2 with band 4.1 at cell-cell contacts. *Journal of Cell Biology*, 2024.
- Cortical synaptic vulnerabilities revealed in an α -synuclein aggregation model of Parkinson's disease. [preprint]. *bioRxiv*, 2023.
- Concerted roles of LRRTM1 and SynCAM 1 in organizing prefrontal cortex synapses and cognitive functions. *Nature Communications*, 2023.

- ▶ The **Dong Lab**, focuses on studying transcriptional regulation, including the discovery of regulatory elements in the human genome and their contributions to such neurological diseases as Parkinson's through using computational and experimental methods. **Xianjun Dong, PhD**, is associate professor of neurology and of biomedical informatics and data science (BIDS) at the School of Medicine. Dong joined the Stephen & Denise Adams Center as a core PI in July 2024. He leads an interdisciplinary team of researchers to study transcriptional regulation and noncoding RNAs along with their roles in neurodegenerative diseases through computational methods and brain organoid models. The team members integrate and analyze PD multiomics and clinical data; build the PD5D brain atlas at the cellular and spatial levels; identify novel noncoding RNAs; model genome biology and PD diagnosis with multiomics data and advanced AI methods; and generate a large-scale exosome resource and a brain organoid model for exosome therapy and drug screening.

- ▶ The **Zhang Lab** is investigating the immune system's role in the initiation and progression of disease in PD. Le Zhang, PhD, is assistant professor of neurology and neuroscience. Her lab integrates approaches from neuroimmunology, single-cell genomics, and mouse genetics. Investigators examine whether a T cell-mediated immune response initiates neurodegeneration in PD, and whether these early immunological processes are related to classic archetypes of neurodegeneration. Nicole Corbin-Stein, PhD, a new postdoctoral fellow in the **Zhang Lab**, was awarded an NIH Blueprint and BRAIN Initiative D-SPAN K00 Award for elucidating the role of CD8+ T cells in early-stage PD. Zhang and Rui Chang, PhD, in the Department of Neuroscience are Corbin-Stein's co-mentors.

- Single-cell transcriptomic and proteomic analysis of Parkinson's disease brains. *bioRxiv*, 2024; *Science Translation Medicine*, under revision.

- ▶ The **DeCamilli Lab**, focuses on 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; an investigator of the Howard Hughes Medical Institute; director of the Program in Cellular Neuroscience, Neurodegeneration and Repair; and director of the Kavli Institute for Neuroscience at the School of Medicine. The **De Camilli Lab** uses the tools of cell biology to elucidate the function of the genes known to increase the risk of PD as well as the paths 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 endolysosomes or mitochondria. Investigators will use a multidisciplinary approach to investigate selected PD-associated genes that are active in the endocytic pathway and lysosomes. These include the genes encoding the synaptojanin 1 protein, LRRK2 and VPS13C. The lab will define how their dysfunction leads to PD, including the hypothesis that disruption of the links between the endocytic system and mitochondrial physiology may play a role in the pathogenesis of PD. The lab's research will support translation of PD genetics into new opportunities for successful treatment through identification of dysfunctional cellular processes contributing to PD susceptibility.

- ▶ 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. Sule Tinaz, MD, PhD, is associate professor of neurology.

- Mental imagery content is associated with disease severity and specific brain functional connectivity changes in patients with Parkinson's disease. *Brain Imaging and Behavior*, 2024.
- Magnetic resonance imaging modalities aid in the differential diagnosis of atypical parkinsonian syndromes. *Frontiers in Neurology*, 2023.

► The **Bamford Lab** focuses on the structure and functions of the neurons that connect the cerebral cortex and striatum in mammals. **Nigel Bamford, MD**, is an associate professor of pediatrics (neurology) 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 synaptic function and plasticity in the basal ganglia of genetically modified mice. His experiments have shown that motor and cognitive functions depend on coordinated interactions between dopamine and acetylcholine at striatal synapses. These mechanisms may encode rational and irrational behaviors in humans; underlie a variety of movement disorders; and influence human responses to stress. The lab is currently investigating dopamine/acetylcholine interactions in the dorsolateral striatum; the role of L-dopa in modifying the symptoms of dystonia; and advances in neonatal brain imaging.

- Levodopa for Dystonia in Children: A Case Series and Review of the Literature. *Pediatric Neurology*, 2024.
- A 1-Tesla MRI system for dedicated brain imaging in the neonatal intensive care unit. *Frontiers in Neuroscience*, 2023.

► **Jesse M. Cedarbaum, MD**, is professor of neurology. Cedarbaum and his team of clinical researchers collaborate with the Hafler and Zhang Labs to investigate clinical and immunological aspects of the earliest stages of PD. Together with Hafler, Cedarbaum received a \$13.2 million grant from the Marcus Foundation in February 2024 to fund PRISMS, a clinical trial to test the ability of the anti-TNF antibody adalimumab to slow progression toward Parkinson's disease in people with REM sleep behavior disorder (RBD). He is a recognized leader in industry-academic collaborations, having served as the chair of the Industry Scientific Advisory Board (ISAB) of the Michael J. Fox Foundation-sponsored Parkinson Progression Markers Initiative and as the industry co-chair of the Critical Path Institute's Critical Path for Parkinson's consortium. He currently chairs the scientific advisory committee of the Edmund J. Safra ACT-PD Initiative.

The Movement Disorders division boasts a number of distinctive centers, laboratories, and working groups:

► **Veronica Santini, MD, MA**, is associate professor of neurology; clinical chief of movement disorders; and director of the Adams Comprehensive Parkinson Disease and Movement Disorders Program. She has a niche specialization in the treatment of autonomic dysfunction and multidisciplinary approaches. Santini is a leader in the care of the most complex conditions, including Huntington disease; adult-onset genetic ataxias; multiple system atrophy and other atypical parkinsonian disorders; and advanced PD. As she expands both clinical trial and research opportunities in the movement disorders center, she maintains her focus on clinical excellence driven by social justice and equitable health care; patient-reported outcomes of complementary therapies; and advancing therapeutics in the clinical space. She is internationally recognized as a medical educator, emphasizing instruction in the art of physical examination and enhancing the medical student pipeline into neurology.

► **Sule Tinaz, MD, PhD**, is an associate professor of neurology and a clinician-scientist with multiple NIH-funded grants whose research contributes to a mechanistic understanding of the neurodegenerative process in PD and the development of promising new treatments. Tinaz uses MRI and network analyses to identify structural and functional changes in specific brain networks, and elucidate their relationships to disease severity and to motor and nonmotor symptoms in PD. She is also investigating nonpharmacological interventions for symptom control, disease modification, and neuroprotection.

► **Sara Schaefer, MD, MHS**, associate professor of neurology, is the definition of a clinician-educator with impressive contributions to medical education. As the associate program director of the neurology residency program, she restructured the curriculum with a focus on advanced clinical reasoning and communication, asynchronous learning, and well-being, and drew up individualized formative assessments. She chairs the clinical competency committee and serves as a formal mentor for multiple residents each year. Schaefer was part of a national project to develop standardized milestones for movement disorders fellows. She developed numerous educational tools, including the International Parkinson and Movement Disorder Society's MDS podcast (now serving as its deputy editor) and nationally recognized modules, using a novel algorithm to teach movement disorder phenomenology. Other e-learning tools that Schaefer developed include the "Neurology Nuts and Bolts: Constructing your Career" podcast and the Grey Matter Project virtual high school neuroscience curriculum.

- Rethinking our Approach to Educating New Learners in Movement Disorders Phenomenological Diagnosis. *Movement Disorders*, 2023.

► **Brian Koo, MD**, is an associate professor of neurology and director of the Yale Center for Restless Legs Syndrome. He is also the director of the Sleep Medicine Laboratory at the VA Connecticut Healthcare System in West Haven. Koo's primary research interest is the underlying pathophysiology of restless legs syndrome (RLS), and he is currently conducting research funded by the Department of Defense to assess melanocortin hormone levels in the cerebrospinal fluid of patients with RLS. Koo is also involved in a Michael J. Fox Foundation study to assess autoimmunity and the microbiome in patients with rapid eye movement (REM) sleep behavior disorder

► **Hae-Young Hawong, DO, PhD**, assistant professor of neurology, joined the division in September 2023. At Yale, she is continuing research she began as a movement disorders fellow at Oregon Health and Science University, investigating the electrophysiological markers of levodopa-induced dyskinesia (LID) by using EEG to look at the power spectral density (PSD) of gamma oscillation for LID. She is also building her advanced therapeutics practice and clinical research.



Santini (left), is the director of the Adams Comprehensive Parkinson Disease and Movement Disorders Program and is committed to expanding the divisions' clinical and research programs.



Administering botulinum toxins is one of many therapies utilized by the division to treat a wide array of movement disorders.

CLINICAL

Adams Comprehensive Parkinson Disease and Movement Disorders Care Center

The vision of the Adams Comprehensive Parkinson's Disease (PD) and Movement Disorders Care Center at YSM is delivery of holistic patient-centered care that improves the human experience and empowers patients to take ownership of their disease rather than allowing it to define them. Our mission is first, to help patients to engage fully with us in their care and partner with us in research; second, to optimize complex care with a multidisciplinary approach; third, to secure our subspecialty workforce through individualized fellowship education; and fourth, to empower individual patients with supportive programs. Working in close collaboration with the Adams Center for Parkinson's Disease Research, we hope to advance understanding of and find the cure for PD.

We are setting a nationwide standard with a multidisciplinary approach that incorporates holistic and complementary care, medication management, cutting-edge diagnostics, and advanced therapeutics. We help patients to participate in their health care through comprehensive self-reporting and personalized coaching; nursing education and tailored resource referrals; streamlined engagement in research opportunities; and follow-up nursing that encourages understanding of and compliance with treatment plans. Urgent referral visits and timely follow-up with our advanced practice provider further guarantees patient understanding and adherence. Our weekly multidisciplinary clinic provides time and expertise to patients in coping with issues that most often affect their daily lives. In addition to individualized resource procurement, our social worker identifies patients' psychosocial burdens; and our specialized neurorehabilitation team designs treatment plans to meet their functional needs. Moreover, close collaboration with specialists in the fields of neurosurgery, behavioral neurology, neuropsychology, sleep medicine, psychiatry, autonomic, radiology, neurogenetics, neuro-ophthalmology, and physiatry enable us to provide compassionate care for patients alongside cutting-edge research.

We treat patients in the multiple outpatient clinical sites (listed below) to improve access. Our team has specialized expertise in the full range of movement disorders, including PD and atypical parkinsonian disorders, tremor, tics, dystonia, chorea, ataxia, myoclonus, cognitive impairment, Huntington disease, Wilson disease, gait disorders, restless leg syndrome, and other autoimmune and genetic movement disorders. We completed more than 7,000 comprehensive treatment plans this year. Care is also offered in such specialized clinics as the Memory and Movement Aging Clinic; the Functional Movement Disorders program; the Wilson Disease Association Center of Excellence (one of seven nationwide); and the Yale Center for Restless Legs Syndrome (one of 10 RLS Foundation Quality Care Centers in the United States).

Our advanced therapies program assists eligible patients with complex disease management when disease is medically refractory. In partnership with Zion Zibly, MD, MBA, a functional neurosurgeon and the director of the Center of Neuromodulation, we offer high-volume comprehensive deep brain stimulation and our recently added MR-guided focused ultrasound programs. Yale is the first institution in the state to offer the latter, which is led by two experts in the field. Each patient receives an in-depth evaluation. Our neuromodulation research focuses on the uses of experimental therapies and novel lead placement locations. In addition to neuromodulation, our specialists administer therapeutic botulinum toxins for dystonia, spasticity, hemifacial spasm, tremor, sialorrhea, and hyperhidrosis to more than a thousand patients per year.

To further enrich patients' experience, we have developed the **EmPOWERed** with Parkinson's Program, a holistic program delivering evidence-based complementary therapies. Serving all patients in the Greater New Haven community, we offer free or subsidized programming that allows participants to take ownership of their lives through newly developed ADA- and transportation-accessible support groups; bilingual exercise programs; art and music therapies; and mindfulness and meditation programs. Participants can take advantage of a monthly calendar of events at the Center and enjoy activities in their local communities in partnership with community foundations.

We are honored to have been named an APDA Center for Advanced Research to further our already close collaboration with this organization. Within the clinical and outreach cores, we will continue our mission to reduce barriers to care, and provide the engagement of our patients in their own holistic care and in our research endeavors to improve the human experience of those with neurodegenerative disease.

LOCATIONS: The division provides interdisciplinary care at Yale New Haven Hospital, Guilford, North Haven, Greenwich, and the VA Connecticut Healthcare System in West Haven.

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

PROVIDERS:

Veronica Santini, MD, MA, *clinical division chief, movement disorders; inaugural director, Adams Comprehensive Parkinson Disease and Movement Disorders Care Center; associate professor, neurology*

Clemens Scherzer, MD, *academic division chief; Stephen and Denise Adams Professor of Neurology; director, the Stephen & Denise Adams Center for Parkinson's Disease Research*

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

Amar Patel, MD, *associate professor, neurology; director, YNHH Botulinum Toxin Clinic; director, faculty mentorship*

Sara Schaefer, MD, MHS, *associate professor, neurology; neurology residency program director; movement disorders fellowship*

Ana Vives-Rodriguez, MD, *assistant professor, neurology; director, Memory and Movement Aging Clinic*

Hae-Young Hawong, DO, PhD, *assistant professor, neurology*

Alice Rusk, MD, *associate professor, neurology; chief of neurology, Greenwich Hospital; medical director, Yale Medicine Neurology at Greenwich and Stamford*

Brian Koo, MD, *associate professor, neurology; director, Yale Center for Restless Legs Syndrome; director, Sleep Medicine Laboratory at VA Connecticut Healthcare System in West Haven*

Jesse Cedarbaum, MD, *professor, neurology; director, movement disorders clinical trials program*

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

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

Zion Zibly, MD, MBA, *associate professor, stereotactic & functional neurosurgery; director, Neurosurgical Cancer Pain, neurosurgery; director, Center of Neuromodulation, neurosurgery*

FELLOWSHIP TRAINING

Yale is a premier training institution for two-year clinical and research fellows in movement disorders who receive individually tailored instruction. In addition to extensive training in common and rare movement disorders, multidisciplinary care, and advanced therapies, the fellows receive pediatric, autonomic, vocal cord dysfunction, electromyography, and neurocognitive training. Opportunities for clinical and translational research, medical education, and independent scholarship are available to all fellows.



Neurocritical Care + Emergency Neurology



GUIDO FALCONE, MD, SCD, academic chief



EMILY J. GILMORE, MD, MS, clinical chief

THE DIVISION OF NEUROCRITICAL CARE & EMERGENCY NEUROLOGY IS STAFFED BY A MULTIDISCIPLINARY TEAM DEDICATED TO IMPROVING THE LIVES OF PATIENTS WITH ACUTE NEUROLOGICAL INJURIES. THE GOAL OF THE YALE NEUROSCIENCE INTENSIVE CARE UNIT (ICU) IS TO DELIVER EXCEPTIONAL CLINICAL CARE TO EVERY PATIENT WHILE CONDUCTING CUTTING-EDGE RESEARCH AND TRAINING THE NEXT GENERATION OF LEADERS IN NEUROCRITICAL CARE.

RESEARCH

► **Kevin Sheth, MD,** is a professor of neurology and neurosurgery; executive director of the NNCTU and vice chair for clinical and translational research in the Departments of Neurology and Neurosurgery; and director of the Yale Center for Brain & Mind Health. Sheth has introduced and developed several innovative therapeutic platforms at the individual and population levels for prevention and acute treatment of stroke, brain hemorrhage, and cognitive decline. He has more than 400 publications in the fields of stroke, neurotechnology, and clinical trials, including the first Phase III trials to prevent brain edema; the first clinical trials in ICH survivors; and the deployment of the world's first portable MRI for clinical use. He has been elected to membership in the American Society for Clinical Investigation and the Connecticut Academy of Science & Engineering. Sheth previously received the American Heart Association Stroke Research Mentorship Award.

► The **Sheth Lab** develops innovative strategies to treat neurovascular disease by partnering with colleagues in basic science, innovative technologies, and clinical trial platforms.

- Fever Prevention in Patients with Acute Vascular Brain Injury: The INTREPID Randomized Clinical Trial. *JAMA*, 2024.
- Brain imaging with portable low-field MRI. *Nature Reviews Bioengineering*, 2024.
- Time to Anticoagulation Reversal and Outcomes After Intracerebral Hemorrhage. *JAMA Neurology*, 2024.
- Endovascular Treatment of Acute Ischemic Stroke After Cardiac Interventions in the United States. *JAMA Neurology*, 2024.

► **Emily Gilmore, MD, MS,** is a professor of neurology and neurosurgery; clinical chief of the division of neurocritical care & emergency neurology; medical director of the Neuroscience ICU; co-director of the Critical Care EEG Program; and co-director of neurotrauma, neurology and neurosurgery. Gilmore has built a comprehensive multidisciplinary program to identify patient care needs along a continuum from acute settings through rehabilitation and recovery. She has made Yale a center of advanced multimodal monitoring, exceptional clinical care, and pioneering research.

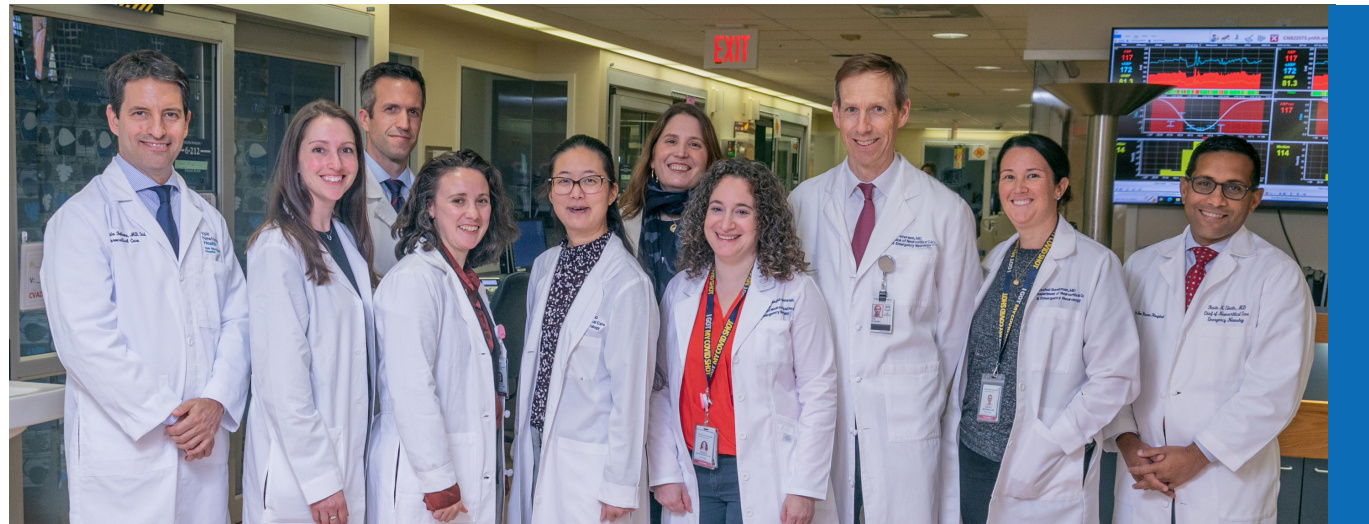
► **The Gilmore Lab** uses advanced invasive and noninvasive technology, including continuous electroencephalogram monitoring, to identify the signatures of metabolic stress, neurologic deterioration, and neurologic recovery in collaboration with the Kim, Petersen and Beekman Labs. The **Gilmore Lab** focuses on the failure of bioenergetic pathways in patients in relation to traumatic brain injuries. The overarching goal is to develop individualized approaches to prevent secondary neuronal damage and improve patient outcomes across a range of acute brain injuries.

- Anti-seizure Medication Withdrawal, Late Seizure Recurrence, and Long-term Electroclinical Trends in Patients with Acute Symptomatic Seizures or Epileptic EEG patterns. *Neurology: Clinical Practice*, 2024.
- Critical Care Management of Patients After Cardiac Arrest: A Scientific Statement from the American Heart Association and Neurocritical Care Society. *Circulation*, 2024; *Neurocritical Care*, 2024.
- Guidelines for Seizure Prophylaxis in Adults Hospitalized with Moderate-Severe Traumatic Brain Injury: A Clinical Practice Guideline for Health Care Professionals from the Neurocritical Care Society. *Neurocritical Care*, 2024.
- Temperature Control Parameters Are Important: Earlier Preinduction Is Associated With Improved Outcomes Following Out-of-Hospital Cardiac Arrest. *Annals of Emergency Medicine*, 2024.

► **Nils Petersen, MD, PhD, MSc,** is an associate professor of neurology; staff neurointensivist on the Neuroscience Intensive Care Unit; and director of the Yale Cerebrovascular Lab (YCVL). Petersen's clinical and research interests lie in using innovative neuromonitoring modalities to understand blood flow regulation. Through working with colleagues in neurology, neurosurgery, and neuroradiology, he is building infrastructure for continuous cerebrovascular autoregulatory monitoring in critically ill patients with neurovascular disorders.

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

- Pressure Trajectories and Outcomes After Endovascular Thrombectomy for Acute Ischemic Stroke. *Hypertension*, 2024.
- Impact of Therapeutic Interventions on Cerebral Autoregulatory Function Following Severe Traumatic Brain Injury: A Secondary Analysis of the BOOST-II Study. *Neurocritical Care*, 2024.
- Association between blood pressure variability and outcomes after endovascular thrombectomy for acute ischemic stroke: An individual patient data meta-analysis. *European Stroke Journal*, 2024.
- Reduced-order modeling and analysis of dynamic cerebral autoregulation via diffusion maps. *Physiological Measurement*, 2023.
- Association between intraprocedural drops in blood pressure and infarct growth rate patterns after acute large-vessel occlusions. *Journal of Neurointerventional Surgery*, 2023.



Neurocritical Care & Emergency Neurology faculty

► **Guido Falcone, MD, ScD**, is an associate professor of neurology, academic chief of the division of neurocritical care & emergency neurology, director of clinical research in neurocritical care, a staff neurointensivist, and training director of the Yale/AHA Bugher Center for Intracerebral Hemorrhage Research. Falcone is internationally recognized for his work in population genetics and neuroimaging, and has received several awards for his work in genetic epidemiology in relation to acute brain injury. He co-leads the Yale Longitudinal Study of Acute Brain Injury, an ongoing observational study conducted jointly by the Divisions of Neurocritical Care & Emergency Neurology and Stroke.

► **The Falcone Lab** integrates clinical, genomic, and neuroimaging data to obtain new information on cerebrovascular disease, brain health, and aging-related conditions. Specifically, Falcone's group looks for new pathways and therapeutic targets related to these conditions and to develop precision medicine tools to identify patient populations that will benefit from tailored therapies.

- APOE ϵ_4 and Intracerebral Hemorrhage in Patients with Brain Arteriovenous Malformation. *JAMA Network Open*, 2024.
- Cerebral Amyloid Angiopathy and Risk of Isolated Nontraumatic Subdural Hemorrhage. *JAMA Neurology*, 2024.
- Brain Care Score and Neuroimaging Markers of Brain Health in Asymptomatic Middle-Age Persons. *Neurology*, 2024.
- Polygenic Susceptibility to Hypertension and Cognitive Performance in Middle-aged Persons Without Stroke or Dementia. *Neurology*, 2023.

► **Jennifer A. Kim, MD, PhD**, is an assistant professor of neurology with a specialized interest in improving prediction of short and long-term complications after acute brain injuries. She has received multiple grant awards, and is also a co-investigator on NIH R01 and UG3 grants.

► **The Kim Lab** focuses on advanced computational methods in critical care; researchers use electroencephalography and neuroimaging to predict nervous system deterioration in patients at high risk of complications following such severe brain injuries as subarachnoid hemorrhage, brain trauma, and ischemic stroke.

- Quantitative epileptiform burden and electroencephalography background features predict post-traumatic epilepsy. *Journal of Neurology Neurosurgery & Psychiatry*, 2023.



► **Rachel Beekman, MD**, is an assistant professor of neurology and director of the Neurocritical Care Fellowship Program. Her lab focuses on the evaluation of optimal blood pressure goals after cardiac arrest by using near-infrared spectroscopy for continuous autoregulation monitoring. She was awarded an institutional KL2 grant in March 2022; she also has an industry-sponsored award. Beekman collaborates with the Yale Positron Emission Tomography (PET) Research Center to better understand changes in synaptic density in patients who survive cardiac arrest.

► **The Beekman Lab** uses multimodality monitoring to identify novel physiologic biomarkers and provide individualized treatment to improve patient outcomes after cardiac arrest.

- Variability in temperature control practices amongst the Influence of Cooling duration on Efficacy in Cardiac Arrest Patients (ICECAP) trial. *Resuscitation*, 2024.
- Temperature Control Parameters Are Important: Earlier Preinduction Is Associated With Improved Outcomes Following Out-of-Hospital Cardiac Arrest. *Annals of Emergency Medicine*, 2024.
- Development and validation of a novel score to predict brain death after out-of-hospital cardiac arrest. *JAMA Network Open*, 2023.
- Validation of the rCAST score and comparison to the PCAC and FOUR scores for prognostication after out-of-hospital cardiac arrest. *Resuscitation*, 2023.

► **Jessica Magid-Bernstein, MD, PhD**, is an assistant professor of neurology. Her lab focuses on translational investigation of inflammation in hemorrhagic stroke under the mentorship of Lauren Sansing, MD, MS, and Kevin Sheth, MD. This work combines her doctoral studies in immunology with her clinical knowledge gained from training. She was awarded a Career Development Award from the American Heart Association in 2023.

► **The Magid-Bernstein Lab** studies the role of inflammation in patients following hemorrhagic stroke by profiling the inflammatory cells and biomarkers within cerebrospinal fluid. This research involves collaboration with basic science labs.

- Guidelines in Action: Management of Acute and Chronic Hydrocephalus Following Aneurysmal Subarachnoid Hemorrhage. *Stroke*, 2023.



Neurocritical Care & Emergency Neurology providers frequently collaborate with other disciplines at Yale; critical care nursing; advanced practice providers; and trainees to both deliver world-class care and conduct cutting-edge research.

► **Morgan L. Prust, MD**, is an assistant professor of neurology. He is a neurointensivist interested in building capacity for acute neurologic care in resource-limited health care settings. His international work is primarily based in Lusaka, Zambia; its aim is the development of low-cost, low-tech health care innovations that can be implemented at scale across a range of resource-limited environments. Prust's work also focuses on building capacity through global education and training efforts. He has partnered with the Neurocritical Care Society to develop an Emergency Neurological Life Support (ENLS) Course designed specifically for providers in resource-limited settings, and he supervises the global neurology education track for the Yale Neurology Residency Program.

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

- Early neuro-deterioration and mortality among neurology inpatients in a Zambian referral hospital: a prospective cohort study. *Neurology*, 2024.
- Addressing disparities in the global epidemiology of stroke. *Nature Reviews. Neurology*, 2024.
- Subdural empyema secondary to pansinusitis after coronavirus disease 2019 infection in an immunocompetent patient: illustrative case. *Journal of Neurosurgery: Case Lessons*, 2023.

► **Lena O'Keefe, MD, MS**, is an instructor in neurology with a strong interest in multidisciplinary integration of critical care and individualized trainee mentorship. Her research has evolved into translational proteomics in stroke and subarachnoid hemorrhage. She was recently selected as a mentee by the editorial board of *Neurocritical Care*, the journal of the Neurocritical Care Society.

- Pro-inflammatory cytokines in the CSF of aneurysmal subarachnoid hemorrhage patients are associated with shunt placement. (forthcoming).
- Early CSF inflammatory markers after aneurysmal subarachnoid hemorrhage and their relationship to disease severity and shunt placement. (forthcoming).
- HA.MiR-34c Is Predictive of Delayed Cerebral Ischemia After Subarachnoid Hemorrhage. (forthcoming).
- Activin receptor-like kinase- 1 (ALK-1) is a Novel Biomarker of Cerebral Edema after Subarachnoid Hemorrhage. (forthcoming).

► **Stefanie Cappucci, MD**, is an assistant professor of neurology and the newest member of the Division of Neurocritical Care & Emergency Neurology. Her academic interests include medical education with a specific focus on team leadership, simulation, and communication. She is also pursuing work in bioethics regarding protecting health care providers in ICU settings against moral injury. Cappucci is a member of the Aquifer Neurology editorial board; she designs and reviews an online neurology curriculum for medical students in this capacity.

- Prognostic Implications of Early Prediction in Post-Traumatic Epilepsy. *Seminars in Neurology*, 2024.
- Investigation on Gender Differences in Leadership of Stroke-Related Clinical Trials. *Stroke*, 2023.
- End-of-Life Care in the Potential Donor after Circulatory Death: A Systematic Review. *The Neurohospitalist*, 2023.

CLINICAL

The Division of Neurocritical Care & Emergency Neurology provides comprehensive care for a number 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, as well as providing care for patients with the most complex pre- and postoperative conditions. We offer specialized multidisciplinary care with 10 neurocritical care faculty; world-class 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 other fields to deliver exceptional individualized care coupled with opportunities to participate in pioneering clinical trials. Our division offers urgent evaluation and transfer of patients requiring the most sophisticated care offered in the state of Connecticut through the Y Access Transfer Center and our telehealth programs. We have optimized patient-centered care with our state-of-the-art ICU, which includes:

- A 19-bed unit staffed by neurocritical care nurses
- 24/7 in-house coverage with advanced practice providers and neurocritical care fellows
- Portable MRI imaging
- Advanced invasive and noninvasive neuromonitoring with the use of real-time continuous EEG, electrocorticography, intracranial pressure, brain tissue oxygen, microdialysis, cerebral blood flow, near-infrared spectroscopy, and systemic hemodynamics and autoregulatory indices, as well as additional monitoring with hourly pupillometry and intermittent optic nerve sheath and transcranial doppler ultrasonography
- Integrated patient care across the neurosciences
- Collaborative care with neurosurgery, vascular neurology, general neurology, trauma surgery, emergency medicine, pulmonary critical care, neuroradiology, and cardiology
- Innovative models of care in neurotrauma and resuscitation medicine
- Opportunities to participate in groundbreaking clinical trials across the continuum of care
- Dedicated physical therapy, occupational therapy, psychiatry, and speech-language pathology services
- Dedicated social workers and care managers who arrange optimal placement for rehabilitation and discharge services for our complex patient population
- Specialized patient services managers, a patient educator, and a patient safety nurse as well as family support groups that include our patient and family advisory council

The Division of Neurocritical Care & Emergency Neurology currently participates in 17 clinical trials funded by both the NIH and pharmaceutical companies.

LOCATIONS: Our central facility is our Neuroscience ICU at Yale New Haven Hospital.

PROVIDERS:

Kevin Sheth, MD, professor, neurology and neurosurgery; executive director of the NNCTU and vice-chair for clinical and translational research in the Departments of Neurology and Neurosurgery; staff neurointensivist

Emily J. Gilmore, MD, MS, professor, neurology and neurosurgery; clinical chief of the division of neurocritical care & emergency neurology; medical director of the Neuroscience Intensive Care Unit; co-director of the Critical Care EEG Program; and co-director of neurotrauma, neurology and neurosurgery

Nils Petersen, MD, PhD, associate professor, neurology; staff neurointensivist, Neuroscience Intensive Care Unit; director, Yale Cerebrovascular Lab (YCVL)

Guido Falcone, MD, ScD, associate professor, neurology; academic chief, division of neurocritical care & emergency neurology; staff neurointensivist; director, clinical research in neurocritical care; training director, “Yale AHA/Bugher Center of Research Excellence in Hemorrhagic Stroke Prevention & Treatment”

Jennifer A. Kim, MD, PhD, assistant professor, neurology; staff neurointensivist

Rachel Beekman, MD, assistant professor, neurology; fellowship director, neurocritical care; staff neurointensivist

Jessica Magid-Bernstein, MD, PhD, assistant professor, neurology; staff neurointensivist

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

Lena O’Keefe, MD, instructor, neurology; staff neurointensivist

Stefanie Cappucci, MD, assistant professor, neurology

FELLOWSHIP TRAINING

The Yale Neurocritical Care Fellowship Program is accredited by the Accreditation Council for Graduate Medical Education (ACGME) and the United Council for Neurologic Subspecialties (UCNS). Our faculty members are nationally and internationally recognized for their leadership in advancing research and clinical care for patients with acute neurological injury. The mission of the Neurocritical Care Fellowship Program is to train a diverse group of future leaders equipped to 1) deliver compassionate patient-centered care using cutting-edge technology; 2) lead innovative team research; and 3) develop multidisciplinary educational programs that advance the care for and recovery of brain-injured patients across a wide spectrum of disorders. The distinctive features of our fellowship program include rapid but progressive autonomy and exposure to groundbreaking research, clinical innovation, and advanced neuromonitoring. Our fellows gain proficiency in medical and surgical critical care management; the applications of neuro-monitoring in the delivery of precision medicine; and multidisciplinary collaborations leading to exceptional patient care.



Neurodegenerative Disorders



STEPHEN STRITTMATTER, MD, PHD, AB,
academic chief

SAYED (AUSIM) AZIZI, MD, PHD
clinical chief

THE INCREASING PREVALENCE OF NEURODEGENERATIVE DISEASES AROUND THE WORLD MEANS THAT MANY OF US HAVE LOVED ONES WHO ARE EITHER PATIENTS OR CAREGIVERS FOR AFFLICTED INDIVIDUALS. THE DEPARTMENT OF NEUROLOGY HAS SEVERAL CLINICAL AND RESEARCH PROGRAMS FOCUSED ON COMBATING NEURODEGENERATION AND FACILITATING NEURAL REPAIR.

RESEARCH

► **Arman Fesharaki-Zadeh, MD, PhD, BMath**, is an assistant professor of psychiatry and of neurology, and medical director of Dementia and Behavioral Neurology. His main area of research is the long-term sequelae of traumatic brain injury and chronic traumatic encephalopathy (CTE) using preclinical models. He is one of the founding members of the Yale Concussion Program, which continues to provide comprehensive care for patients with mild traumatic brain injuries. Fesharaki-Zadeh's other areas of research involve synaptic density alterations in behavioral variant frontotemporal dementia (bvFTD) using PET brain imaging, and the treatment of cognitive symptoms in Long COVID syndrome.

► **The Fesharaki Lab**, in collaboration with David Matuskey, MD, associate professor of radiology and biomedical imaging, examines the synaptic density and neurobehavioral symptoms in patients with behavioral variant frontotemporal dementia (bvFTD). The group is also interested in treatment of the cognitive symptoms of Long COVID syndrome.

- Relationship between neuroimaging and cognition in frontotemporal dementia: An FDG-PET and structural MRI study. *Journal of Neuroimaging*, 2024.
- Combined Use of Guanfacine and N-Acetylcysteine for the Treatment of Cognitive Deficits After Traumatic Brain Injury. *Neurotrauma Reports*, 2023.

► **Carolyn A. Fredericks, MD**, is the Henry F. McCance Scholar in Neurodegeneration at Yale and assistant professor of neurology. Fredericks' research focuses on preclinical Alzheimer's disease and on less common Alzheimer's variants, using advanced imaging to better understand how the disease moves 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 (MSAC) and the Yale Alzheimer's Disease Research Center's Clinical Core; and is affiliated with the Yale Interdisciplinary Neurosciences Program in the Graduate School of Arts and Sciences. Her work is funded by the Alzheimer's Association, the National Institute on Aging, and the McCance Foundation.

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

- Medial Amygdalar Tau Is Associated With Mood Symptoms in Preclinical Alzheimer's Disease. *Biological Psychiatry. Cognitive Neuroscience and Neuroimaging*, 2024.
- Connectome-based predictive modeling shows sex differences in brain-based predictors of memory performance. *Frontiers in Dementia*, 2023.

► **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 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 devoted to understanding brain function and the cellular basis of neurological diseases. He is specifically interested in elucidating the cellular and molecular mechanisms of neurodegeneration as well as developing methods for intravital brain imaging and translational neuroscience. Grutzendler is also working to develop small molecules for drug delivery and as imaging probes to treat neurodegenerative disorders and nervous system injuries.

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

- Single cell in vivo optogenetic stimulation by two-photon excitation fluorescence transfer. *iScience*, 2023.

► **Stephen M. Strittmatter, MD, PhD, AB**, is the Vincent Coates Professor of Neurology and Professor of Neuroscience; chair, neuroscience; director, Kavli Institute for Neuroscience; director, Cellular Neuroscience, Neurodegeneration and Repair; director, Memory Disorders Clinic; director, Yale Alzheimer's Disease Research Center (ADRC); and director, Ludwig Program for Neuroimmunity in Dementia. Strittmatter's clinical practice is concentrated on Alzheimer's disease and frontotemporal dementia. His laboratory has mapped the molecular pathway by which β -amyloid, innate immunity, and tau proteins are linked at nerve synapses to cause the cognitive symptoms of 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 more than 270 publications; it has been recognized by the King Faisal Prize in Medicine, the Ameritec Prize, and the Alzheimer Association Zenith Fellow Award.

► **The Strittmatter Lab** studies the molecular and cellular basis of synapse loss in Alzheimer's disease, with particular emphasis on treatments to protect synaptic integrity and cognitive function.

- Reduced progranulin increases tau and α -synuclein inclusions and alters mouse tauopathy phenotypes via glucocerebrosidase. *Nature Communications*, 2024.
- Cellular Prion Protein Conformational Shift after Liquid-Liquid Phase Separation Regulated by a Polymeric Antagonist and Mutations. *Journal of the American Chemical Society*, 2024.
- Repetitive Mild Closed-Head Injury Induced Synapse Loss and Increased Local BOLD-fMRI Signal Homogeneity. *Journal of Neurotrauma*, 2024.
- Soluble Nogo-Receptor-Fc decoy (AXER-204) in patients with chronic cervical spinal cord injury in the USA: a first-in-human and randomised clinical trial. *The Lancet*, 2023.

► **Carmen Carrión, PsyD**, assistant professor of neurology, researches health disparities and the ways in which the 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 led by Amy Kind, MD, PhD, of the University of Wisconsin. This is a multisite study conducted through the Alzheimer's Disease Research Center (ADRC), which seeks to demonstrate that living in a disadvantaged neighborhood predicts lower levels of 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 the Biobiskaia Health Research Institute in Bilbao, Spain. This is a multisite study intended to gather normative data from the Spanish-speaking population of the United States.

- Assessment of disparities in timely diagnosis and comprehensive workup of cognitive impairment between English and Spanish speakers. *American Journal of Geriatric Psychiatry*, 2024.

► **Emily S. Sharp, PhD**, associate professor of neurology and division chief of neuropsychology, is a co-investigator on NIH-funded clinical trials and neuroimaging projects within Yale's Alzheimer's Disease Research Center (ADRC). She is a co-investigator on a NIH-funded Phase III clinical trial within the Department of 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); Parkinson's disease; and the outcomes of deep brain stimulation (DBS) and Gamma Knife treatments in Parkinson's disease and essential tremor.

• Self-reported hearing loss is associated with faster cognitive and functional decline but not diagnostic conversion in the ADNI cohort. *American Journal of Geriatric Psychiatry*, 2024.

► **Anna Szekely, MD**, is an attending physician in Yale's neurogenetics program. She is a neurogeneticist with particular expertise in neurodegeneration. She researches key molecular perturbations underlying rare neurological disorders with known or predicted etiology by using emerging genomic technologies. As one of the founding members of Yale's Program in Neurodevelopment and Regeneration, Szekely is a collaborator on several NIH-funded projects (PIs: Flora Vaccarino, MD, and Katarzyna Chawarska, PhD) related to genetically influenced neurodevelopmental disorders, including autism and Tourette syndrome. She is also a member of the NIH's PsychENCODE Consortium. Her work involves the use of leading genomic approaches to neuronal modeling based on induced pluripotent stem cells (iPSCs) and postmortem brain analysis combined with clinical data. Szekely is currently developing a novel large-scale genomic approach to leverage the data generated by the PsychENCODE Consortium to elucidate the role of noncoding genetic variants in adult-onset neurological disorders, with specific emphasis on neurodegeneration. Other recent projects include research on the role of somatic mosaicism in the brain, which has implications for adult-onset progressive neurodegenerative disorders with lateralized or focal onset/presentation.

• Modeling idiopathic autism in forebrain organoids reveals an imbalance of excitatory cortical neuron subtypes during early neurogenesis. *Nature Neuroscience*, 2023.



Strittmatter (foreground, left), helped guide Sen. Richard Blumenthal (D-CT) through a tour of Yale's neuroscience laboratories, as part of an effort to advocate for NIH support.



Fredericks's research utilizes advanced imaging techniques to better understand Alzheimer's disease in the context of functional networks in the brain.

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, and frontotemporal lobar degeneration. The clinic's specialists in behavioral neurology, neuropsychiatry, neuropsychology, and neurogenetics provide interdisciplinary care for patients and their families.

LOCATIONS: The division has its primary hub in New Haven and has expanded with a satellite location in Guilford, CT

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

PROVIDERS:

Sayed (Ausim) Azizi, MD, PhD, professor, neurology; clinical chief, behavioral neurology and memory disorders

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

Arman Fesharaki-Zadeh, MD, PhD, BMath, assistant professor of psychiatry and of neurology; medical director, dementia and behavioral 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 Neurology and Neuroscience; vice-chair for research, neurology; director, Yale Center for Experimental Neuroimaging (YCEN)

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

Stephen Strittmatter, MD, PhD, AB, the Vincent Coates Professor of Neurology and Professor of Neuroscience; chair, Department of Neuroscience; director, Kavli Institute for Neuroscience; director, Cellular Neuroscience, Neurodegeneration and Repair; director, Yale Alzheimer's Disease Research Center (ADRC); director, Memory Disorders Clinic; director, Ludwig Program for Neuroimaging in Dementia

Anna Szekely, MD, assistant professor, academic clinician track; associate research scientist in neurology; attending physician, neurogenetics program; member, Program in Neurodevelopment and Regeneration

Ana Vives-Rodriguez, MD, assistant professor, neurology, attending physician, memory disorders and movement disorders

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 training program has 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. The expansion of the fellowship program to 1.5 slots began in 2022.

Neuro-Immunology



DAVID HAFLER, MD
academic chief

KATHERINE DeSTEFANO, MD, MS
clinical chief

THE **DIVISION OF NEURO-IMMUNOLOGY** OFFERS PATIENT CARE AND CONDUCTS RESEARCH AT THE YALE MULTIPLE SCLEROSIS CENTER IN NORTH HAVEN. THE CENTER PROVIDES COMPREHENSIVE CARE TO PATIENTS WITH MULTIPLE SCLEROSIS (MS), NEUROMYELITIS OPTICA, TRANSVERSE MYELITIS, OPTIC NEURITIS, AND OTHER NEUROIMMUNE DISORDERS. EXPERT FELLOSHIP-TRAINED NEUROLOGISTS WORK TOGETHER WITH EXPERIENCED NURSES, THERAPISTS, AND SOCIAL WORKERS TO CARE FOR PATIENTS IN ALL STAGES OF DISEASE.

RESEARCH

► **David A. Hafler, MD** is the William S. and Lois Stiles Edgerly Professor of Neurology and Professor of Immunobiology; chair of neurology; and neurologist-in-chief of Yale New Haven Hospital. A preeminent physician-scientist, Hafler has made seminal discoveries defining the pathogenesis of multiple sclerosis and autoimmune diseases; he has more than 470 publications in the fields of MS, autoimmunity, and immunology. He was the recipient of a Jacob Javits Neuroscience Investigator Award from the NIH; he was also awarded the John Dystel Prize for MS research from the American Academy of Neurology, and the Raymond Adams Prize from the American Neurological Association. Hafler is the 2023 recipient of the prestigious AAI-Steinman Award for Human Immunology Research. He is a member of the AOA Society, the American Society of Clinical Investigation, the Association of American Physicians, and the National Academy of Medicine.

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

- David Hafler, Transcriptomic profiling after B-cell depletion reveals central and peripheral immune cell changes in multiple sclerosis. *Journal of Clinical Investigation* 2025.
- An autoimmune transcriptional circuit drives FOXP3+ regulatory T cell dysfunction. *Science Translational Medicine*, 2023.
- Locus for severity implicates CNS resilience in progression of multiple sclerosis. *Journal of Clinical Investigation*, 2022.

► **David Pitt, MD** obtained his medical degree from the Philipps-Universität Marburg in his native Germany. He subsequently completed a postdoctoral fellowship at the Albert Einstein College of Medicine in New York in the laboratory of C.S. Raine, PhD, DSc, followed by a neurology residency and a clinical/research neuroimmunology fellowship at Washington University in St. Louis. He joined the Yale faculty in 2021, where he is currently an associate professor. Pitt is a co-director of the recently established National Multiple Sclerosis Brain Bank. He sees patients at the Yale Multiple Sclerosis Center.

► The **Pitt Lab** focuses on the neurodegenerative aspects of multiple sclerosis, particularly the role of glial cells, and on biomarker development for progressive MS.

- CNS Cell-Derived Exosome Signatures as Blood-Based Biomarkers of Neurodegenerative Diseases. *Frontiers in Neuroscience*, 2024.
- AutoMorFi: Automated Whole-image Morphometry in 2 Fiji/ImageJ for Diverse Image Analysis Needs. *bioRxiv*, 2024.
- Imaging chronic active lesions in multiple sclerosis: a consensus statement. *Brain*, 2024.

► **Kevin O'Connor, PhD**, is a neuroimmunologist with a special interest in human autoimmune neurologic diseases. His research is concentrated on human translational immunology and neurology. He and his working 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. By studying human-derived specimens, the team seeks to understand how particular autoreactive B cell subsets and their autoantibodies initiate and sustain autoimmunity. The diseases the researchers investigate include myasthenia gravis (MG); neuromyelitis optica spectrum disorder (NMOSD); and myelin oligodendrocyte glycoprotein antibody-associated disease (MOGAD).

► The **O'Connor Lab** investigates the mechanisms by which B cells and the autoantibodies they produce contribute to the pathology of autoimmune disease in humans.

- Unveiling the proteome-wide autoreactome enables enhanced evaluation of emerging CAR-T therapies in autoimmunity. *Journal of Clinical Investigation*, 2024.
- A Noncanonical CD56dimCD16dim/- NK Cell Subset Indicative of Prior Cytotoxic Activity Is Elevated in Patients with Autoantibody-Mediated Neurologic Diseases. *Journal of Immunology*, 2024.
- B cell and aquaporin-4 antibody relationships with neuromyelitis optica spectrum disorder activity. *Annals of Clinical and Translational Neurology*, 2024.
- Distribution and Temporal Changes of Autoantibody-Mediated Pathogenic Mechanisms Among Acetylcholine Receptor-Positive Myasthenia Gravis Patients. *medRxiv*, 2024.

► **Erin Longbrake, MD, PhD**, is an associate professor of neurology; director of the clinical and translational research program in multiple sclerosis; and director of 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 pharmaceutical and NIH-sponsored clinical trials. She also manages the observational Detection Research of Early Asymptomatic MS (DREAM) study cohort and the neuroimmunology biorepository. 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.

► **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 heterogeneity characteristic of individual patients with this disease. Using clinical/translational methodology and fostering close collaborations with wet-lab research groups, the Longbrake Lab is particularly interested in the preclinical spectrum of MS and developing ways to identify disease pathology before the emergence of clinical symptoms.

- Emerging Cerebrospinal Fluid Biomarkers of Disease Activity and Progression in Multiple Sclerosis. *JAMA Neurology*, 2024.
- A multicenter pilot study evaluating simplified central vein assessment for the diagnosis of multiple sclerosis. *Multiple Sclerosis*, 2024.
- Prior cycles of anti-CD20 antibodies affect antibody responses after repeated SARS-CoV-2 mRNA vaccination. *JCI Insight*, 2023.

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 in North Haven, which provides patients with specialized care from experts in the fields of rheumatology, neuroimmunology, 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 for E&M visits and infusion, *including*:

- A 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
- Interdisciplinary care with rheumatologists and immunologists for patients with crossover disease
- Spasticity management with Botox®
- Assistance from social workers and dietitians
- Patient education and support groups
- Access to clinical trials

LOCATIONS: The division's primary facility is in North Haven; it 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 numerous pharmaceutical trials. Current NIH-funded initiatives include the CAVS Study, a multicenter investigator-initiated study examining the utility of the central vein sign for distinguishing MS from its mimics. In addition, the Ocrelizumab Discontinuation in Relapsing Multiple Sclerosis (AMS05) trial will investigate whether short-term B-cell depletion is sufficient to prevent MS disease activity if initiated early during the disease pathogenesis.

PROVIDERS:

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

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

Erin Longbrake, MD, PhD, *associate professor, neurology; director, neuroimmunology/multiple sclerosis fellowship program; director of clinical research in neuroimmunology; director of the fellowship program in multiple sclerosis and other inflammatory brain disease*

David Pitt, MD, *associate professor, neurology*

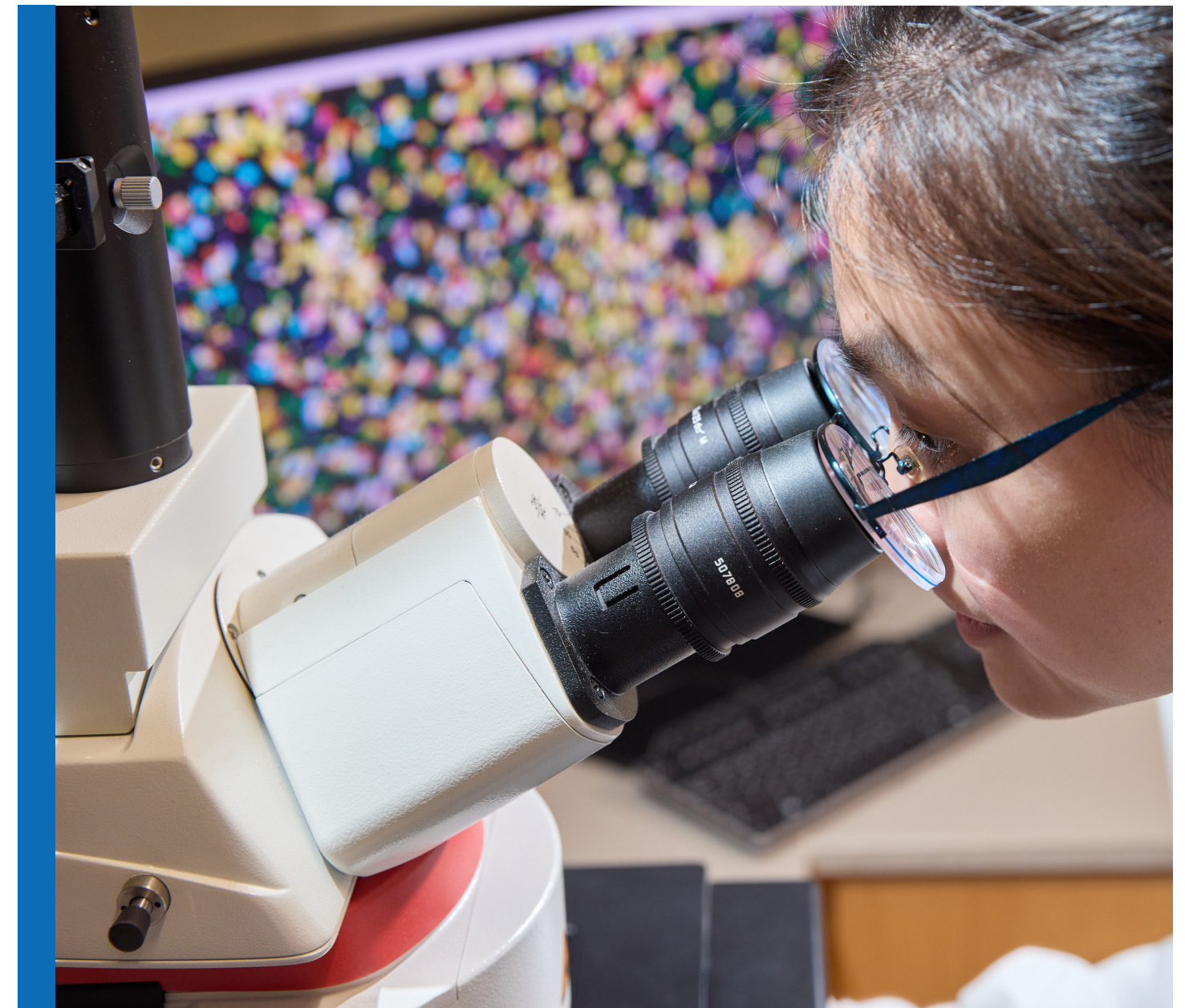
Naila Makhani, MD, MPH, *associate professor, pediatrics (neurology); director, Pediatric MS Program*

John Peters, MD, *assistant professor, clinical neurology*

Lindsay McAlpine, MD, BSc, *assistant professor, neurology*

FELLOWSHIP TRAINING

The Neuro-Immunology fellowship program includes both clinical trainees and those simultaneously pursuing clinical training and clinical/translational research. The program typically has two to four trainees during any given academic year.



(Above) The Neuro-Immunology group at Yale

(Below) Research in the Neuro-Immunology Division ranges from studies on the inflammatory mechanisms of such conditions as multiple sclerosis and Parkinson disease to clinical trials of new therapies.

Neurological Infections + Global Neurology



THE **NEUROLOGICAL INFECTIONS & GLOBAL NEUROLOGY DIVISION** PROVIDES CARE FOR PATIENTS WITH INFECTIONS INVOLVING THE NERVOUS SYSTEM EITHER DIRECTLY OR INDIRECTLY. THE DIVISION ALSO CONDUCTS RESEARCH INTO THE CAUSES AND MANAGEMENT OF THESE DISORDERS IN GLOBAL SETTINGS AS WELL AS IN THE UNITED STATES, AND PROVIDES SPECIALIZED TRAINING IN THE DIAGNOSIS AND MANAGEMENT OF THESE DISORDERS.

SERENA SPUDICH, MD, MA, *division chief*

RESEARCH

► **Serena Spudich, MD, MA**, is the Gilbert H. Glaser Professor of Neurology; chief of the Division of Neurological Infections and Global Neurology in the Department of Neurology; and co-director of the Yale Center for Brain & Mind Health (CBMH). Spudich is an expert in the clinical and mechanistic understanding of HIV-1 and COVID-19 infections of the nervous system. She gives numerous lectures; organizes professional meetings; and advises the National Academy of Medicine, the American Academy of Neurology, and the National Institutes of Health—which includes her role as co-chair of the steering committee of the \$1.1 billion NIH Researching COVID to Enhance Recovery (RECOVER) initiative. She is currently director of the International NeuroHIV Cure Consortium (INHCC) and is the PI on active NIH grants totaling more than \$7 million annually for studies of nervous system infections.

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

- Neurosymptomatic HIV-1 CSF escape is associated with replication in CNS T cells and inflammation. *Journal of Clinical Investigation*, 2024.
- New approaches for understanding the potential role of microbes in Alzheimer's disease. *JBrain, Behavior, and Immunity-Health*, 2024.
- Changes in cerebrospinal fluid proteins across the spectrum of untreated and treated chronic HIV-1 infection. *PLoS Pathogens*, 2024.
- Self-Reported Neuropsychiatric Post-COVID-19 Condition and CSF Markers of Neuroinflammation. *JAMA Network Open*, 2023.



Spudich's (right) lab examines damage to the central nervous system caused by viral infections.

► **Lindsay McAlpine, MD, BSc**, is an assistant professor in the Department of Neurology. McAlpine completed a Yale fellowship in neuroimmunology, neuro-infectious disease, and clinical research. She co-founded the NeuroCOVID Clinic with Serena Spudich to treat patients with neurologic sequelae of COVID-19. McAlpine is also an investigator in Yale's COVID Mind Study. She was awarded an NIH five-year K23 career development award to support her work on neuroimaging the signatures of Long COVID; she also submitted an R01 application with Todd Constable, PhD, the Elizabeth Mears and House Jameson Professor of Radiology and Biomedical Imaging and professor of neurosurgery. McAlpine published 13 papers related to COVID-19 between 2020 and 2024, and has been an invited speaker at multiple international conferences. She continues to direct the NeuroCOVID Clinic located in Guilford, Connecticut. Her current research uses advanced MRI techniques to investigate the effects of Long COVID on the brain.

- Internal Tremors and Vibrations in Long COVID: A Cross-Sectional Study. *American Journal of Medicine*, 2024.
- Case-Control Study of Individuals With Small Fiber Neuropathy After COVID-19. *Neurology® Neuroimmunology & Neuroinflammation*, 2024.
- Virology, ecology, epidemiology, pathology, and treatment of eastern equine encephalitis. *Journal of the Neurological Sciences*, 2024.

► **Phillip Chan, MBChB, PhD**, is an associate research scientist in Yale's Department of Neurology and a member of the International NeuroHIV Cure Consortium (INHCC). A neurologist by training, he completed his PhD in 2021 based on research with patients from the RV254 acute HIV cohort in Bangkok, Thailand. Chan joined Yale in May 2022, and won the 2023 Robert E. Leet and Clara Guthrie Patterson Trust Mentored Research Award for his proposal titled "Impact of Vascular Risk Factors and Vascular Injury Biomarkers on Synaptic Density in People Living with HIV on Stable Treatment."

- Central Nervous System Effects of Early HIV Infection and Consequences of Antiretroviral Therapy Initiation during Acute HIV. *Viruses*, 2024.
- Cerebrospinal fluid pleocytosis is associated with HIV-1 neuroinvasion during acute infection. *AIDS*, 2024.
- Psychological stress and vessel wall inflammation: Opportunity of reducing cardiovascular risk in people with HIV. *Brain, Behavior, and Immunity*, 2024.



McAlpine is an investigator with the COVID Mind Study at Yale, a multidisciplinary research project that studies persistent effects of COVID-19 on the brain.



Spudich (center) is a co-director of the Center for Brain & Mind Health (CBMH). Pictured with Dr. Spudich from left to right are fellow CBMH co-directors Kevin Sheth, MD; James McPartland, PhD; Christopher Pittenger, MD, PhD; and Eiyemisi Damisah, MD

CLINICAL

Spudich provides outpatient specialty care and consultations in the Yale Center for Infectious Diseases and via telehealth for patients with infections affecting the central nervous system, including HIV infection, syphilis, progressive multifocal leukoencephalopathy, and Long COVID. She also provides inpatient consultations on cases of complex neuro-infectious disease and is an attending physician on the general neurology ward service.

McAlpine provides outpatient specialty care and consultations in neuroimmunology at the Yale Multiple Sclerosis Center in New London and in Long COVID at the NeuroCOVID Clinic in Guilford. She specializes in the diagnosis and treatment of neuroinflammatory and neuroinfectious diseases, including multiple sclerosis, neuromyelitis optica spectrum disorder (NMOSD), sarcoidosis, encephalitis, tickborne diseases, HIV infection, and Long COVID.

CLINICAL TRIALS: The division has multiple NIH-funded grants that support human subjects research on neuroHIV and neuroCOVID. We have recently begun clinical trials on infection-associated central nervous system (CNS) conditions.

LOCATIONS: Spudich's NeuroID clinic is located at 200 Orchard Street (Scranton Building) in New Haven. McAlpine's NeuroCOVID clinic is located at 800 Boston Post Road in Guilford; and her neuroimmunology clinic is located at 194 Howard Street in New London, Connecticut.

PROVIDERS:

Serena Spudich, MD, MA, the Gilbert H. Glaser Professor of Neurology; affiliated faculty, Yale Institute for Global Health; chief, neurological infections & global neurology; co-director, Yale Center for Brain & Mind Health.

Lindsay McAlpine, MD, assistant professor, 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

- Center for Brain and Mind Health
- Charcot Marie Tooth Association (CMTA) Center of Excellence
- Comprehensive Movement Disorders Program
- Chênevert Family Brain Tumor Center at Smilow Cancer Hospital and Yale Cancer Center
- Adams Center for Parkinson's Disease
- Yale Clinical Neuroscience Group for Neuroanalytics (YNN)
- 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 Center 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
- Epilepsy Surgery Program
- Deep Brain Stimulation Program
- Yale Autoimmune Encephalitis Program
- Stroke Center
- Stroke Telemedicine Program

EDUCATION + TRAINING

- **Yale Visiting Elective Scholarship Program to Enhance Access to Health Care Careers in Neurology**
- **Yale Neurology Residency Program**
- **Grey Matter Project**
- **Fellowships**
 - Behavioral Neurology/Neuropsychiatry
 - Epilepsy & EEG
 - Headache Medicine
 - Movement Disorders
 - Multiple Sclerosis
 - Neuroinfectious Diseases
 - Neurocritical Care
 - Neuromuscular Medicine
 - Neuro-Oncology
 - Neuropsychology
 - Vascular Neurology

CENTERS + PROGRAMS



Neuromuscular Medicine



SASHA ZIVKOVIC, MD, PHD,
academic chief

DANIEL DICAPUA, MD,
clinical chief

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

RESEARCH

The **Program in Clinical and Translational Neuromuscular Research (CTNR)** led by Richard Nowak, MD, MS, associate professor of neurology, 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 specializes in myasthenia gravis research. He launched the EXPLORE-MG2 and ADAPT-teleMG pilot trials, as well as an international registrational Phase III study, the Myasthenia Gravis Inebilizumab Trial (MINT). Nowak remains involved in translational and clinical research of MG, and has served as chief medical advisor of the Myasthenia Gravis Foundation of America (MGFA) since 2022.

- United States clinical practice experience with eculizumab in myasthenia gravis: symptoms, function, and immunosuppressant therapy use. *Journal of Neurology*, 2024.
- Unveiling the proteome-wide autoreactome enables enhanced evaluation of emerging CAR T cell therapies in autoimmunity. *Journal of Clinical Investigation*, 2024.
- Subcutaneous batoclimab in generalized myasthenia gravis: Results from a Phase 2a trial with an open-label extension. *Annals of Clinical and Translational Neurology*, 2024.
- Safety and Efficacy of Nipocalimab in Patients With Generalized Myasthenia Gravis: Results From the Randomized Phase 2 Vivacity-MG Study. *Neurology*, 2023.



The ALS Association Certified Treatment Center of Excellence at the VA Connecticut Healthcare System in West Haven provides exceptional care to people with ALS.

► **Bhaskar Roy, MBBS, MBioMedSci**, is the director of the Muscular Dystrophy Association (MDA) clinic for adult patients at the School of Medicine. He performs clinical and translational research in neuromuscular disease, and his laboratory focuses on immune dysfunction in inflammatory neuropathies and idiopathic inflammatory myopathies. He is the chair of the Inclusion Body Myositis (IBM) scientific interest group under the International Myositis Assessment and Clinical Studies Group (IMACS), and is also a member of the scientific committee of the IMACS. He remains involved in optimizing the functional outcome measures for IBM. Roy is the site PI of several multicenter clinical trials in chronic inflammatory demyelinating polyneuropathy (CIDP); multifocal motor neuropathy (MMN); idiopathic inflammatory myopathies (IIMs); and inclusion body myositis (IBM). He also curates samples for the Muscle and Nerve Biopsy Repository at Yale in collaboration with Farhad Bahrassa, MD, assistant professor of neurosurgery.

- Provisional practice recommendation for the management of myopathy in VCP-associated multisystem proteinopathy. *Annals of Clinical & Translational Neurology*, 2023.
- Diagnosing and managing dysphagia in inclusion body myositis: a systematic reviews. *Rheumatology (Oxford)*, 2023.
- Current status of clinical outcome measures in inclusion body myositis: a systematised reviewdouble-blind, placebo-controlled, phase 3 study. *Clinical & Experimental Rheumatology*, 2023.

► **Uzma Usman, MBBS**, assistant professor of neurology, is the director of the Yale ALS/Motor Neuron Disease Clinic; the associate director of the Yale Muscular Dystrophy Association (MDA) Clinic; and the leader of ALS clinical research at the School of Medicine. She currently serves as a site PI of two multicenter clinical trials for ALS through the HEALEY ALS platform.

- Design and Statistical Innovations in a Platform Trial for Amyotrophic Lateral Sclerosis. *Annals of Neurology*, 2023.

► **Sasha Zivkovic, MD, PhD** is a professor of neurology and clinical director of the Charcot-Marie-Tooth Association (CMTA) Center of Excellence at Yale. He leads the Yale CMT program with Irvin Oh, MD, associate professor of orthopaedics & rehabilitation and division chief of foot and ankle surgery. Zivkovic will be the Yale site investigator of an international registry of patients with chronic inflammatory demyelinating polyneuropathy. He is also an active researcher of hereditary, autoimmune, and paraproteinemic neuropathies.

- Update on amyloid polyneuropathy and treatment. *Current Treatment Options in Neurology*, 2024.
- Neuromuscular manifestations of wild type transthyretin amyloidosis: a review and single center experience. *Frontiers in Cardiovascular Medicine*, 2024.
- Clinical and Genotype Characteristics and Symptom Migration in Patients with Mixed Phenotype Transthyretin Amyloidosis from the Transthyretin Amyloidosis Outcomes Survey. *Cardiology and Therapy*, 2024.

► **Huned Patwa, MD**, is a professor of neurology; associate dean for veterans affairs at the School of Medicine; and chief medical officer at the VA CT Healthcare System. He is the chair of the VA ALS executive committee, which is developing a national policy for the care of veterans with ALS.

- Plasmapheresis Versus Intravenous Immunoglobulin in Patients With Autoimmune Neuromuscular and Neuro-immunological Conditions. *Journal of Clinical Neuromuscular Disease*, 2023.

CLINICAL

The Division of Neuromuscular Medicine continues to expand subspecialized care across southern New England. It has centers of excellence and multidisciplinary clinics for myasthenia gravis, amyotrophic lateral sclerosis (ALS), and Charcot-Marie-Tooth (CMT) disease. The division's physicians work in neuromuscular outpatient clinics, and provide electrodiagnostic evaluation (nerve conduction studies and electromyography) in New Haven, North Haven, Greenwich, Stamford, Fairfield, Milford, Guilford, Old Saybrook, and New London, Connecticut. We have also expanded our neurologic care into Westerly, Rhode Island. The division has increased its number of faculty members from 10 to 17 since 2020. It provides comprehensive care for a variety of neuromuscular conditions, including myasthenia gravis, myopathies, ALS, and acquired and inherited neuropathies.

The Yale Myasthenia Gravis Program is one of the largest MG clinical programs in the United States, and has won international recognition for its dedication to excellence in patient care. It has been designated a national Partner in Care by the Myasthenia Gravis Foundation of America (MGFA) and offers patients access to advanced diagnostics; opportunities to participate in research; and a precision medicine approach to MG treatment. Our program is also a designated Muscular Dystrophy Association (MDA) Comprehensive Care Center that provides expert care for patients with muscular dystrophy, ALS, and other neuromuscular conditions. In addition, ALS patients are treated at the ALS Association Certified Treatment Center of Excellence at the VA Connecticut Interdisciplinary ALS Clinic in West Haven and the Yale ALS/Motor Neuron Disease Clinic, which is the ALS Association-affiliated clinic in New Haven. A new ALS clinic was also established in Greenwich. Most recently, adult patients with CMT are now able to receive subspecialty care at the CMT clinic in North Haven, which is operated under the Yale CMT Program and the CMTA Center of Excellence at Yale.

PROVIDERS:

Sasha Zivkovic, MD, PhD, professor, neurology; academic chief, neuromuscular medicine; clinical director, Yale CMTA Clinic and Yale CMTA Center of Excellence

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

Huned Patwa, MD, professor, neurology; associate dean for veterans affairs; chief medical officer, VA Connecticut Healthcare System; co-director, MDA Clinic.

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

Bhaskar Roy, MBBS, MBioMedSci, associate 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

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; interim stroke medical director, Greenwich Hospital

Sania Atta, MD, assistant professor, neurology

Uzma Usman, MBBS, assistant professor, neurology; director, Yale ALS/Motor Neuron Disease Clinic, New Haven; Director, ALS Association Yale; associate director, Muscular Dystrophy Association adult care clinic

Bilal Hameed, MD, assistant professor, 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

Adeel Zubair, MD, assistant professor, neurology

Michael McCauley, MD, MS, assistant professor, neurology

Victor Bushlyar, MD, assistant professor, neurology

FELLOWSHIP TRAINING

Daniel DiCapua, MD, is the director of the neuromuscular medicine fellowship. The program currently has two fellows. The one-year fellowship covers all aspects of electrodiagnostic testing (EMG/NCS) studies and clinical care of patients with neuromuscular disorders. It also provides fellows with superb clinical and research opportunities across a wide variety of neuromuscular diseases.



Neuro-Oncology



THE **DIVISION OF NEURO-ONCOLOGY**, PART OF THE CHÊNEVERT FAMILY BRAIN TUMOR CENTER AT SMILOW CANCER HOSPITAL AND YALE CANCER CENTER, TREATS AND MANAGES PATIENTS WITH PRIMARY BRAIN TUMORS, BRAIN METASTASES, AND NEUROLOGIC COMPLICATIONS OF CANCER. IT OFFERS COMPREHENSIVE EVALUATION AND DIAGNOSIS; THE NEWEST TREATMENT OPTIONS; THOROUGH FOLLOW-UP; AND PSYCHOSOCIAL SUPPORT. ALL PATIENTS ARE WELCOME, REGARDLESS OF WHETHER THEY ARE NEWLY DIAGNOSED OR HAVE ALREADY RECEIVED TREATMENT.

JOACHIM M. BAEHRING, MD, DSc, acting division chief

RESEARCH

The 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 recurring glioblastoma multiforme (GBM) was initiated by our previous section chief, Antonio Omuro, MD, and is presently nearing completion. The study is the only trial in the United States investigating anti-TIGIT antibody as a treatment for patients with GBM. Blood and tumor samples collected as part of the trial will be analyzed with cutting-edge techniques—including single-cell RNA-sequencing spatial transcriptomics—to help us understand how the immune system changes in response to these therapies. This study offers an exciting opportunity to provide an effective new therapy for patients with GBM, and to improve our understanding of the immune system's involvement with brain cancers.

► **Joachim Baehring, MD, DSc**, professor of neurology and neurosurgery, and vice-chair of neurology, is an internationally renowned clinical researcher dedicated to brain tumors and the neurologic complications of cancer. As a highly accomplished investigator, he has participated in numerous clinical trials and conducted multiple retrospective projects focused on a variety of rare brain tumors and other clinical problems. Baehring is a member of the National Comprehensive Cancer Network (NCCN) Guidelines faculty for CNS tumors, which is responsible for defining the best 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 Program.

- Parkinsonism Following Chimeric Antigen Receptor T Cell Therapy. *JAMA Neurology*, 2024.
- Clinical Presentation, Management, and Outcome in Neurolymphomatosis: A Systematic Review. *Neurology*, 2024.
- NCCN Guidelines® Insights: Central Nervous System Cancers, Version 2.2022. *Journal of the National Comprehensive Cancer Network*, 2023.

► **Sylvia Kurz, MD, PhD**, associate professor of neurology (neuro-oncology), joined the Chênevert Family Brain Tumor Center in May 2024. Prior to that, she was a neuro-oncologist at the Institute for Neurology and Interdisciplinary Neuro-Oncology at the University Hospital Tübingen. She had previously served as the interim director of the Neuro-Oncology Program at the Perlmutter Cancer Center of New York University Langone Health. Kurz focuses on the care of patients with primary and metastatic tumors of the central nervous system, and the neurological complications of cancer and cancer therapies. She has extensive experience with the full spectrum of neuro-oncological disorders. She conducts clinical and translational research on developing more effective treatments for people with intracranial tumors—in particular, patients with high-grade gliomas and progressive and therapy-resistant meningiomas. Kurz has been the principal investigator on investi-

gator-initiated clinical trials as well as the on-site principal investigator and co-investigator on cooperative group and industry-sponsored clinical studies that include several immunotherapy trials. Kurz has also had a longstanding interest in medical education and has served on various committees through the American Academy of Neurology, Neuro-Oncology section. She co-authored several guideline articles and was a co-editor of the *Neuro-Oncology Compendium for the Boards and Clinical Practice*, a 2023 reference book for neuro-oncology trainees and peers.

- NC201 (Dordaviprone) in Recurrent H3 K27M-Mutant Diffuse Midline Glioma. *Journal of Clinical Oncology*, 2024.
- Evaluation of the SSTR2-targeted Radiopharmaceutical 177Lu-DOTATATE and SSTR2-specific 68Ga-DOTATATE PET as Imaging Biomarker in Patients with Intracranial Meningioma. *Clinical Cancer Research*, 2024.
- Towards more Diversity in Neuro-oncology Leadership--the DivINe Initiative. *Neuro-Oncology*, 2023.

► **Mary Barden, MD** is a neuro-oncologist and an assistant professor in clinical neurology. Barden is a graduate of YSM and of the Neurology Residency and Neuro-Oncology Fellowship at Yale New Haven Hospital. She is associate director of the Neuro-Oncology Fellowship, and is directly involved in the education of fellows and residents. As an active clinician, Barden works primarily in the inpatient setting as a neuro-oncology hospitalist and consultant.

- Top advances of the year: Neuro-oncology. *Cancer*, 2023.

► **Nicholas Blondin, MD**, is an associate 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.

- An expanded safety/feasibility study of the EMulate Therapeutics Voyager™ System in patients with recurrent glioblastoma. *CNS Oncology*, 2023.
- The clinical and genomic features of seizures in meningiomas. *Neuro-Oncology Advances*, 2023.



A study on the anti-TIGIT antibody as a method to treat glioblastoma is an example of many ways the Neuro-Oncology employs innovative approaches to understanding the mechanisms of brain tumors and identifying targeted therapies.

CLINICAL

The Division of Neuro-Oncology provides comprehensive care for patients with a range 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 that affect the central nervous system. The division also collaborates with the Brain Metastasis Program at YCC to offer care for patients with brain metastases and radionecrosis. All attendings are active principal investigators/recruiters for therapeutic clinical trials. The inpatient service provides elective chemotherapies for CNS hematologic diseases, and provides consultations throughout YNHH. It also provides neurologic support for the CAR-T Cell Therapy Program at Smilow. The division offers patients direct access to the hospital, with same-week appointments available to all.



The Neuro-Oncology Division is proud to report that two current attendings are alumni of its rigorous, two-year fellowship program.

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

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

PROVIDERS:

Joachim Baehring, MD, DSc, professor of neurology and of neurosurgery; vice chair, clinical affairs, neurology; associate chief of neurology, Yale New Haven Hospital; acting chief, neuro-oncology, Yale Cancer Center; director, neuro-oncology fellowship program

Sylvia Kurz, MD, PhD, associate professor, neurology (neuro-oncology)

Nicholas Blondin, MD, associate professor, clinical neurology (neuro-oncology)

Mary Barden, MD, assistant professor, clinical neurology (neuro-oncology); associate director, neuro-oncology fellowship program

FELLOWSHIP TRAINING

The Neuro-Oncology Fellowship Program is a two-year program accredited by the United Council for Neurologic Subspecialties (UCNS), offering both clinical and research training in neuro-oncology. Two positions are available each year, and completion of the fellowship enables trainees to become UCNS board-certified in neuro-oncology. The program has been successful as a pipeline to the division, with two of our present attendings having completed the fellowship.



Neuropsychology



NEUROPSYCHOLOGY IS A SPECIALTY CLINICAL SERVICE THAT PROVIDES IN-DEPTH EVALUATIONS OF COGNITIVE FUNCTIONING. THESE EVALUATIONS ASSESS THE DOMAINS OF MEMORY, ATTENTION, VISUOSPATIAL ABILITIES, AND PROBLEM SOLVING, AS WELL AS GENERAL PSYCHOLOGICAL FUNCTIONING. NEUROPSYCHOLOGICAL ASSESSMENT IS PART OF THE GOLD STANDARD WORKUP FOR THE DIAGNOSIS AND STAGING OF NEUROLOGICAL AND MEDICAL DISORDERS. FINDINGS FROM THESE ASSESSMENTS HELP REFERRING PROVIDERS AND TREATMENT TEAMS, AS WELL AS PATIENTS AND THEIR LOVED ONES, TO BETTER UNDERSTAND PATIENTS' COGNITIVE STRENGTHS AND WEAKNESSES. THE PATTERNS OF COGNITIVE ABILITIES IDENTIFIED BY TESTING CAN INFORM TREATMENT DECISIONS AND LEAD TO IMPROVED QUALITY OF LIFE.

EMILY S. SHARP, PhD, *division chief*

RESEARCH

The division's faculty members have ongoing collaborations with faculty members in the Department of Neurology, the wider medical school, the university, and other national and international institutions. Our faculty members are consulted for their expertise in the measurement of cognition within clinical trials and longitudinal studies, and their skills in multicultural and bilingual assessments.

- ▶ **Emily Sharp, PhD**, is dedicated to expanding the clinical, research, and educational missions of the neuropsychology division. She is an expert in the evaluation of cognitive changes in Alzheimer's disease and movement disorders; she is also a co-investigator on NIH-funded clinical trials and neuroimaging projects within the Yale Alzheimer's Disease Research Center (ADRC). Sharp is the site PI for a NIH-funded Phase III clinical trial (PreVent), examining cognitive outcomes following two types of emergency department (ED)-placed endotracheal tubes. Sharp also provides expert consultation on other grant-funded research projects that include cognitive outcomes in Parkinson's disease and atypical Alzheimer's disease, in addition to neuroimaging studies. She has expanded the division's clinical services to provide presurgical evaluations for cognitively vulnerable individuals seeking cochlear implants. Sharp and her colleagues in the ADRC recently published a study examining the association between self-reported hearing loss and cognitive and functional decline.

- Self-Reported Hearing Loss is Associated with Faster Cognitive and Functional Decline but not Diagnostic Conversion in the ADNI Cohort. *Alzheimer's & Dementia: The Journal of the Alzheimer's Association*, (forthcoming).
- Design and implementation of community consultation for research conducted under exception from informed consent regulations for the PreVent and the PreVent 2 trials: Changes over time and during the COVID-19 pandemic. *Clinical Trials*, 2024.

- ▶ **Carmen I. Carrión, PsyD**, is a bilingual (English/Spanish) clinical neuropsychologist with extensive experience in culturally responsive assessment of brain function among persons presenting with diverse neuropsychiatric, medical, and neurological conditions. Carrión is a member of the Hispanic Neuropsychological Society's Practice Subcommittee, which is tasked with establishing guidelines for culturally responsive service delivery. Carrión is certified by YNHH's Bilingual Competency Program (BCP), which allows her to spend 25 percent to 40 percent of her clinical time conducting evaluations in Spanish. Carrión's research centers on identifying the limitations of existing neuropsychological measures; reducing disparities in cognitive health; and understanding how the social determinants of health influence test performance as well as neurological and cognitive outcomes. Carrión serves as the site PI for the NIH-funded Neighborhoods Study, which seeks to understand how living in an under-resourced neighborhood can lead to cognitive disparities and an increased risk of Alzheimer's disease and related dementias.

- Assessment of disparities in timely diagnosis and comprehensive workup of cognitive impairment between English and Spanish speakers. *American Journal of Geriatric Psychiatry*, 2024.

- ▶ **Timothy Belliveau, PhD**, specializes in neuropsychological evaluation and rehabilitation after traumatic brain injury. His clinical research investigates the interdependence of neurological and psychological factors affecting the course of recovery after concussion.
- ▶ **Franklin C. Brown, PhD**, focuses on visual memory and cognitive inefficiency in various neurological disorders, including epilepsy, brain tumors, multiple sclerosis, various forms of cancer that affect cognition, and traumatic brain injury. He also examines the role of such modifiable variables as sleep, mood, anxiety, and other aspects of patients' lives that may affect cognition. His visual memory test is used in multiple-site epilepsy studies in North America and Australia.
- ▶ **Ginger Mills, PsyD**, is a bilingual (English/Spanish) clinical neuropsychologist specializing in the assessment of neurological disorders and neurodegenerative conditions. As a clinical neuropsychologist, she combines such different sources of information as culture and developmental experiences to provide a holistic understanding of patients—particularly those who have been traditionally marginalized—for medical teams and stakeholders in their decision making processes.



Yale neuropsychologists are nationally and internationally recognized as leading experts in neuropsychological evaluations, which help guide clinicians to both diagnose and treat neurological diseases and disorders.

- ▶ **Lucas Driskell, PsyD**, performs neuropsychological evaluations for patients with neurovascular disorders and neurodegenerative diseases. He also serves as the neuropsychologist for the Cardiac Arrest Recovery Pilot (CARP) Program. He spends much of his time outside clinical work in professional leadership within the field. Driskell serves on the executive committee of the Connecticut Psychological Association and also as program chair of the Society for Clinical Neuropsychology (Division 40 of the American Psychological Association). The Connecticut Psychological Association honored him with the 2023 Distinguished Early Career Psychologist Award.
- ▶ **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. Her current research includes collaboration with Nishant K. Mishra, MD, PhD, on the effects of bilingualism on the cognitive outcomes of stroke survivors. Perez also supervises neuropsychology externs at the department's Fairfield office.
- ▶ **Linda D. Ruiz, PhD**, is a bilingual neuropsychologist who conducts assessments of patients presenting with a broad range of conditions, including neurodegenerative and movement disorders; stroke; such chronic illnesses as cancer and autoimmune conditions; head injuries; and comorbid psychiatric conditions. Her research interests include examining the social determinants of health to better understand the ways in which biological, psychological, social, and environmental factors interact to influence health outcomes at the community level.
- ▶ **Stephanie Towns, PsyD**, provides clinical care for patients at Greenwich Hospital. She receives referrals in her generalist practice from Yale Neurology and Neurosurgery; the Center for Healthy Aging at Greenwich Hospital; and community neurology practices in southern Connecticut and Westchester County, New York. She also provides presurgical evaluations for deep brain stimulation (DBS) for patients in southern Connecticut. Towns' research focuses on education and training in neuropsychology; she was an invited speaker on innovation in neuropsychology training at two national conferences in 2024. She serves on the education committees of the American Academy of Clinical Neuropsychology (AACN) and the Society for Clinical Neuropsychology (Division 40 of the American Psychological Association). She has also taken on leadership roles in other national organizations. Towns is the lead developer of our neuropsychology residency and externship training programs.



Yale Neuropsychology faculty

CLINICAL

The division provides comprehensive evaluations of the neurocognitive functioning of patients with CNS disorders, including neurodegenerative, movement, autoimmune, and neurovascular disorders. The division also provides presurgical evaluations essential to candidates for invasive and noninvasive surgical interventions for epilepsy, tumor resection, cochlear implants, and deep brain stimulation (DBS). There is an increasing demand for our expertise, and our division has expanded from two faculty clinicians in 2014 to 10 in 2023, with further growth expected. Our expansion has allowed us to offer specialty (e.g., epilepsy; neuro-oncology; DBS), generalist, and bilingual clinical services across a large portion of Connecticut.

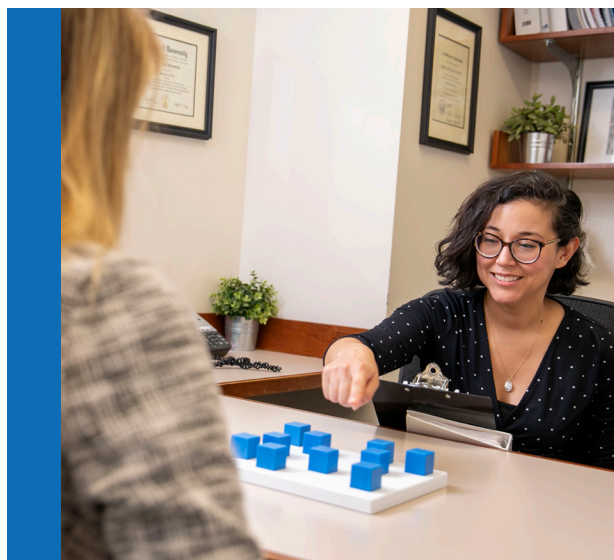
LOCATIONS: With a central clinic in New Haven, the division has expanded with satellite clinics in Fairfield, Guilford, Greenwich, Milford, and New London, with an additional location added in North Haven in fall 2024.

PROVIDERS:

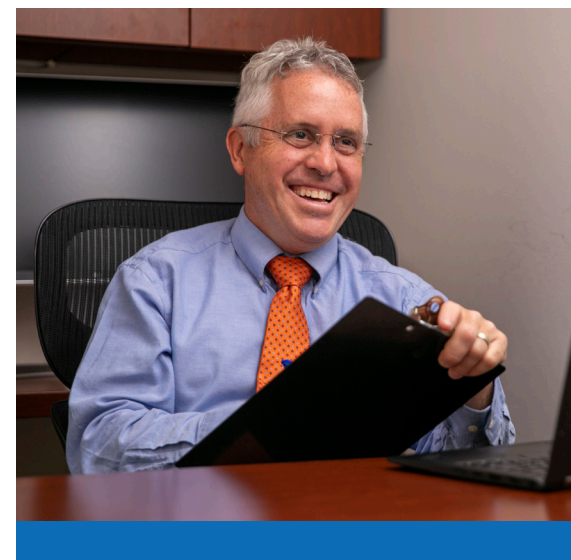
- Emily S. Sharp, PhD**, chief, division of neuropsychology; associate professor, neurology; associate training director, postdoctoral residency program, neuropsychology
- Timothy Belliveau, PhD**, associate professor, neurology
- Franklin Brown, PhD**, associate professor, neurology
- Carmen I. Carrión, PsyD**, assistant professor, neurology
- Lucas D. Driskell, PsyD**, assistant professor, neurology
- Ginger Mills, PsyD**, assistant professor, neurology
- Alice Perez, PhD**, assistant professor, neurology
- Linda Ruiz, PhD**, assistant professor, neurology
- Stephanie J. Towns, PsyD**, associate professor, neurology; training director, neuropsychology

FELLOWSHIP TRAINING

The Neuropsychology Postdoctoral Residency Program is a two-year postdoctoral program in clinical neuropsychology. Our program is accredited by the Association of Postdoctoral Programs in Clinical Neuropsychology (APPCN) and approved by Yale New Haven Hospital's Graduate Medical Education (GME) program. We participate in the APPCN Matching Program.



Ruiz's neuropsychological evaluations cover a broad spectrum of neurologic diseases and disorders.



Brown's research focuses on visual memory and cognitive inefficiency, as well as on the impact of modifiable variables on cognition.

VA Connecticut Healthcare System in West Haven



THE VA CONNECTICUT HEALTHCARE SYSTEM IS ONE OF THE LEADING HEALTH CARE SYSTEMS SERVING VETERANS IN THE COUNTRY. THE VA CONNECTICUT HEALTHCARE SYSTEM PROVIDES VETERANS WITH HEALTH CARE SERVICES AT 10 LOCATIONS IN CONNECTICUT AND ACCEPTS REFERRALS FROM ACROSS THE COUNTRY. THE VA CONNECTICUT HEALTHCARE SYSTEM IS COMMITTED TO EXCELLENCE IN CLINICAL CARE, AND WAS HONORED IN 2023 BY *BECKER'S HOSPITAL REVIEW* WITH A FIVE-STAR RATING FOR EXCELLENT PATIENT EXPERIENCE.

HAMADA ALTALIB, DO, MPH,
chief of neurology, VA Connecticut Healthcare System

Academic research and training are major priorities at VA Connecticut Healthcare System, which has ranked in the top 10 most heavily funded VA centers in the last decade. The neurology service at VA Connecticut Healthcare System is home to the Center for Neuroscience and Nerve Regeneration, and collaborates with many other VA research centers, including the Mental Illness Research, Education, and Clinical Center (MIRECC); the National Center for PTSD; the Clinical Epidemiology Research Center (CERC); and the Cooperative Studies Program Coordinating Center (CSPCC) in West Haven.

RESEARCH

► **Hamada Altalib, DO, MPH** is a professor of neurology at the School of Medicine; chief of neurology for VA Connecticut Healthcare System; and the Northeast Region's director of the VA's Epilepsy Centers of Excellence (ECoE). His research focuses on traumatic brain injury; the neuropsychiatric impacts of epilepsy; and psychogenic nonepileptic seizures. He is also the director of the Yale Executive MPH Program Health Informatics track, and has been leading health informatics program evaluations in VA neurology. He continues to serve as the primary investigator of a Department of Defense-funded project, the Post-Traumatic Psychogenic Seizure and Epilepsy Project.

- Mood and Anxiety Disorders and Suicidality in Patients With Newly Diagnosed Focal Epilepsy: An Analysis of a Complex Comorbidity. *Neurology*, 2023.

► **Amy Grinberg, PhD**, is an assistant professor of neurology and a clinical health psychologist who provides behavioral interventions for veterans with headache disorders through individual and interdisciplinary clinics in the VA Connecticut Healthcare System. She served as principal investigator on a clinical trial funded by the VHA Headache Center of Excellence (HCoE), Interactive CBT for Headache And Relaxation Training (iCHART); and as co-investigator on a VA Health Services Research and Development (HSR&D) clinical trial, TelemEdicine-based Cognitive Therapy for Migraines (TENACITY).

- Interactive CBT for Headache and Relaxation Training (iCHART): Study Protocol of a Single-Arm Trial of Interactive Voice Response Technology Delivery of Cognitive-Behavioral Therapy for Veterans with Post-Traumatic Headache. *Cephalalgia Reports*, 2023.

► **Brian Koo, MD**, is an associate professor of neurology at the School of Medicine and the director of the Sleep Medicine Laboratory at the VA Connecticut Healthcare System in West Haven. He conducts research on disorders at the intersection of neurology and sleep medicine. Koo reports ongoing progress for the study titled "Restless Leg Syndrome: The Role of Melanocortin Hormones," funded by the Department of Defense. Koo is also a co-investigator on the study titled "Tracing the Origin and Progression of Parkinson's Disease through the Neuro-Immune Interactome."

- The Melanocortin and Endorphin Neuropeptides in Patients with Restless Legs Syndrome. *New England Journal of Medicine*, 2023.

► **Nishant K. Mishra, MD, PhD**, joined the West Haven VA Medical Center in 2024 as stroke director, and Yale Neurology in 2021 as an assistant professor of neurology after more than a decade at leading stroke centers in Europe and the United States. He previously worked for the U.S. Food and Drug Administration (FDA). Mishra launched a clinical research program to prevent epileptogenesis in stroke patients with colleagues at Yale, and currently leads the International Post-Stroke Epilepsy Research Consortium (IPSERC) with colleagues worldwide. Post-stroke epilepsy is a research topic highly relevant to our veterans. Mishra is co-chair of the European Stroke Organisation (ESO) guideline committee, and serves on the editorial boards of *Neurology*, *PLOS One*, and *Frontiers in Neurology*. His active research interests include post-stroke epilepsy prevention; biomarker research related to epileptogenesis and stroke outcomes; advancing rehabilitation opportunities (predominantly at VA CT); and hyperacute stroke management.

- Pathophysiology, Diagnosis, Prognosis, and Prevention of Poststroke Epilepsy: Clinical and Research Implications. *Neurology*, 2024.
- Prognostic biomarkers of intracerebral hemorrhage identified using targeted proteomics and machine learning algorithms. *PLoS One*, 2024.
- Common Pathways of Epileptogenesis in Patients With Epilepsy Post-Brain Injury: Findings From a Systematic Review and Meta-analysis. *Clinical Trials*, 2024.
- Impact of genetic polymorphisms on the risk of epilepsy amongst patients with acute brain injury: A systematic review. *European Journal of Neurology*, 2023.
- Clinical characteristics and outcomes of patients with post-stroke epilepsy: protocol for an individual patient data meta-analysis from the International Post-stroke Epilepsy Research Repository (IPSEER). *BMJ Open*, 2023.
- Outcomes in Patients With Poststroke Seizures: A Systematic Review and Meta-Analysis. *AMA Neurology*, 2023.



VA Connecticut Healthcare System in West Haven

► **Emmanuelle Schindler, MD, PhD** is an assistant professor of neurology at the School of Medicine and the medical director of the Headache Center of Excellence at VA Connecticut Healthcare System. She completed the first clinical trials investigating the effects of psilocybin on headache disorders, and she has recently completed a follow-up study of migraine. Schindler has secured funding to begin neuroimaging work in the field of psychedelics and headache disorders, and the effects of occipital nerve blockade in chronic post-traumatic headache.

- Characteristics of men and women with medically diagnosed cluster headache in a national integrated healthcare system: A Veterans Health Administration cohort study. *Neurology*, 2024.
- Psilocybin pulse regimen reduces cluster headache attack frequency in the blinded extension phase of a randomized controlled trial. *Journal of the Neurological Sciences*, 2024.
- Managing Cluster Headache in Patients with Medical, Psychiatric, and Surgical Comorbidities. *Current Neurology and Neuroscience Reports*, 2024.
- Psychedelics for the management of headache disorders: Considerations for Veterans. *Journal of Military, Veteran and Family Health*, 2024.
- Psychotropic Drugs Reemerging as Headache Medicines. *CNS Drugs*, 2023.
- Case report: Psychedelic-induced seizures captured by intracranial electrocorticography. *Frontiers in Neurology*, 2023.

► **Jason Sico, MD, MHS**, is an associate professor of neurology at the School of Medicine; the director of the VA Connecticut Healthcare System Stroke Care program; and the director of research and clinical care of the VA Connecticut Healthcare System Headache Center of Excellence (HCoE). He directs the Veterans Health Administration's Research, Education, Evaluation, and Engagement Activities Center for Headache (RE3ACH); has recently completed one VA Health Services Research and Development (HSR&D) clinical trial (TENACITY: TelemEdicine-bAsed Cognitive Therapy for Migraines); and serves as the PI of both an ongoing stroke/TIA clinical trial (Addressing Sleep Apnea Post-Stroke/TIA (ASAP) and a recently funded National Center for Complementary and Integrative Health (NCCIH) study related to chiropractic care and migraine.

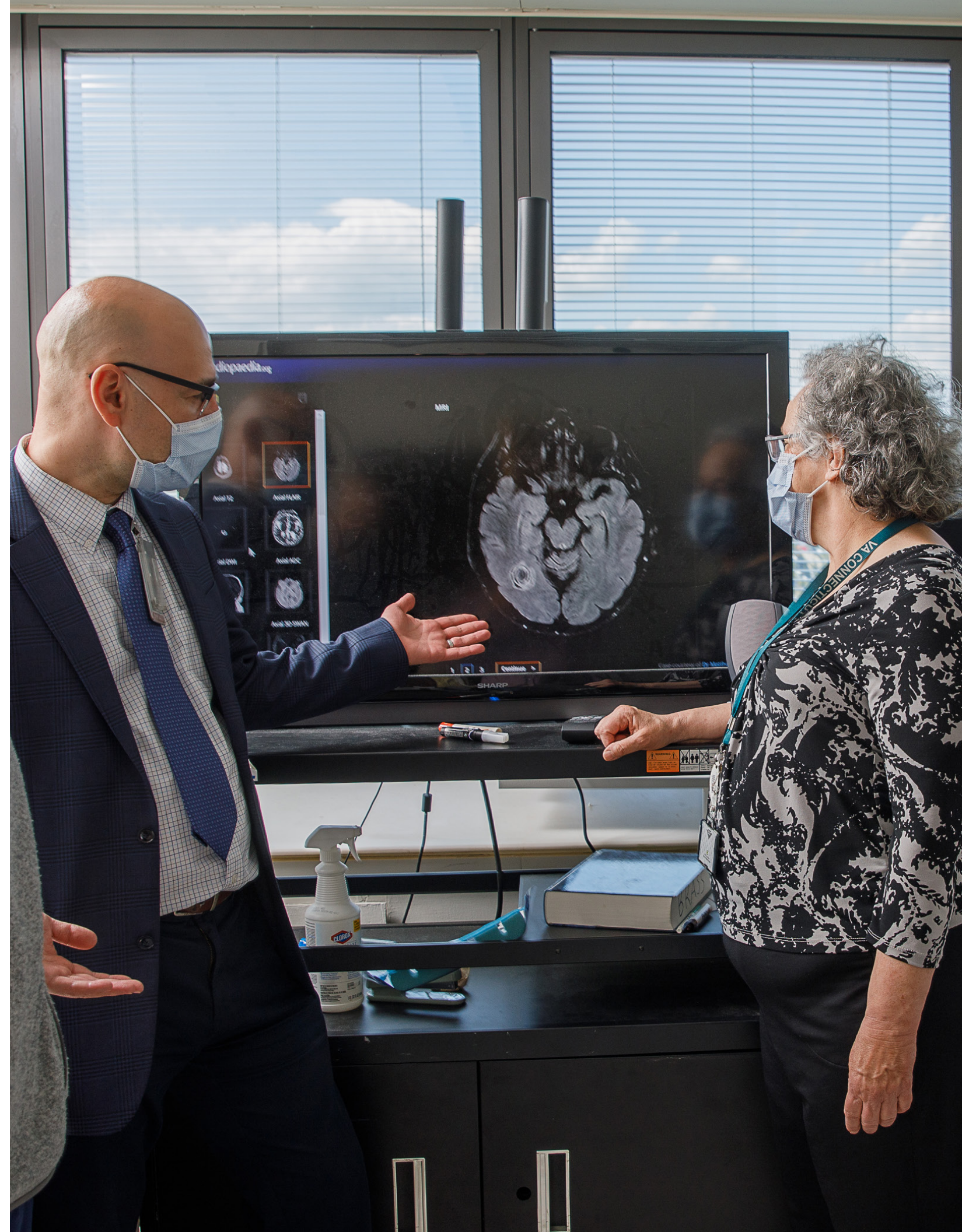
- Calcitonin Gene-Related Peptide Monoclonal Antibodies and Risk of SARS-CoV-2 Infection and Severe COVID-19 Outcomes Among Veterans with Migraine Disorder. *JAMA Network Open*, 2023.

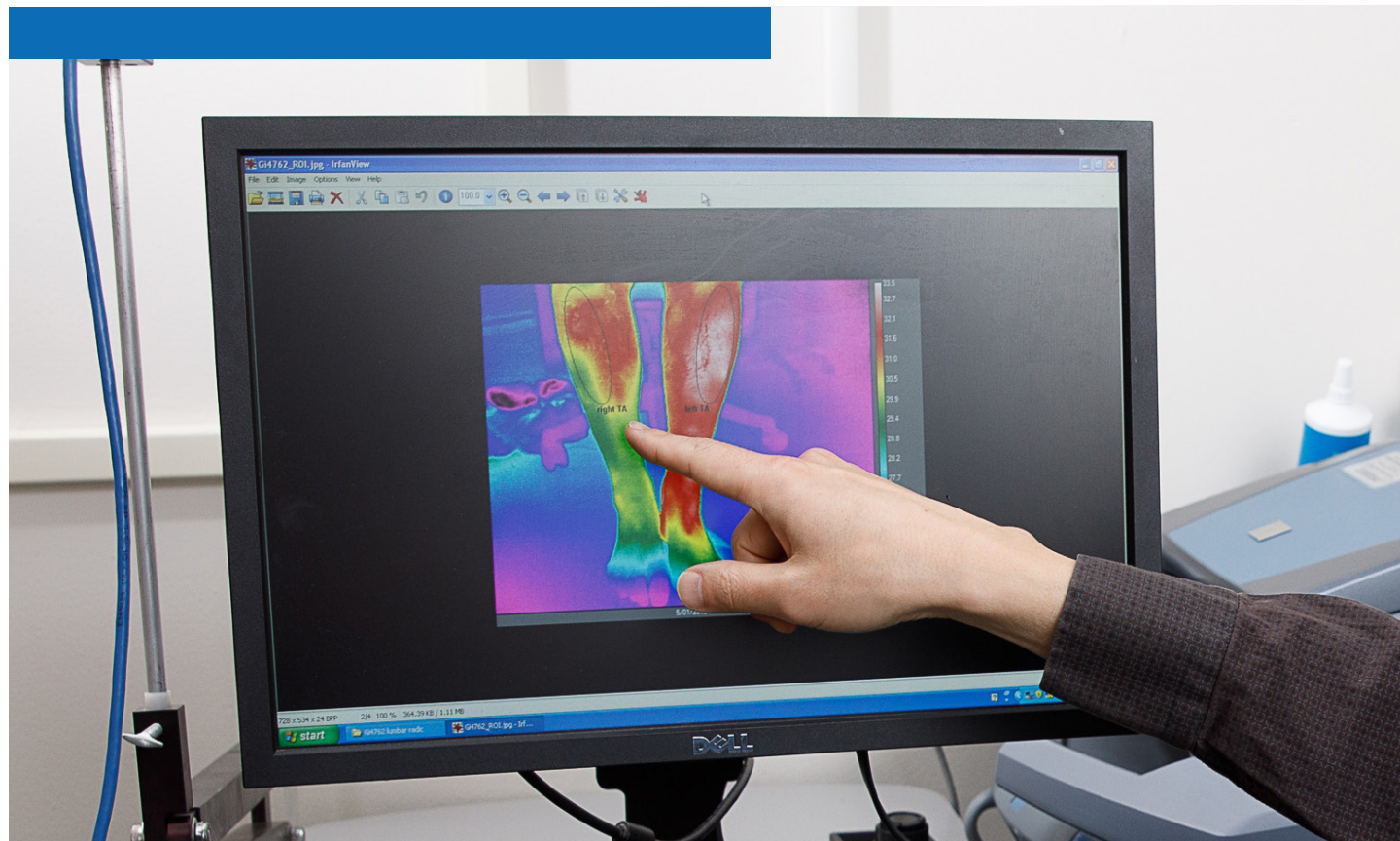
► **Huned Patwa, MD**, is the associate dean for veterans affairs at the School of Medicine and chief medical officer at the VA CT Healthcare System. As a clinician, he chairs the VA ALS executive committee tasked with developing a national system to care for veterans with amyotrophic lateral sclerosis. He is also the author of Healthcare System, a manuscript assessing the use of the intrathecal baclofen pump for treatment of spasticity in primary lateral sclerosis. Patwa is the principal investigator on two clinical trials for treatment of ALS, using novel agents to treat neuroinflammation caused by the disease.

- Plasmapheresis versus intravenous immunoglobulin in patients with autoimmune neuromuscular and neuro-immunological conditions. *Journal of Clinical Neuromuscular Disease*, 2023.

► **Stephen Waxman, MD, PhD**, is the Bridget M. Flaherty Professor of Neurology and of Neuroscience at the School of Medicine, and served as chair of neurology at Yale from 1986 until 2009. He founded the Center for Neuroscience and Regeneration Research in 1988 and is its current director. Waxman has published more than 700 scientific papers, and his papers have been cited more than 40,000 times.

- Prospects for Pain – ITT Episode 14. *New England Journal of Medicine*, 2023.





The numerous Centers of Excellence housed within the VA Connecticut Healthcare System serve as a hub for providing world-class neurologic care for veterans.

CLINICAL

The neurology service at the VA Connecticut Healthcare System offers outstanding care and clinical services to veterans across New England. The program has several centers recognized for their excellence in patient care: the Epilepsy Center of Excellence (Karen Medin, DO, director); the Headache Center of Excellence (Emmanuelle Schindler, MD, PhD, director); the ALS Certified Treatment Center (Huned Patwa, MD, director); and the Parkinson's Consortium Center (Diana Richardson, MD, director). Treatment services at VA Connecticut Healthcare System include:

- Epilepsy monitoring unit admission
- Prolonged video-EEG monitoring
- Psychogenic nonepileptic seizures (PNES) management
- Mental health support
- Movement disorder and Parkinson's specialized treatment
- Electromyography (EMG)
- Telehealth & virtual visit care
- Surgical referral
- Headache Infusion Center
- Inpatient headache treatment

CLINICAL TRIALS: "Human epilepsy 3: new-onset generalized epilepsy" (PI: Hamada Altalib); "REALIZE (CVL-865) Study" (PI: Hamada Altalib).

PROVIDERS

Hamada Altalib, DO, MPH, associate professor, neurology and psychiatry

Adeniyi Fisayo, MD, PharmD, assistant professor, neurology and ophthalmology and visual science

Amy Grinberg, PhD, assistant professor, neurology; national director, behavioral headache medicine, VHA Headache Centers of Excellence (HCoE)

Karen Medin, DO, assistant professor, neurology; director of the ECoE VA Connecticut Healthcare System

John Ney, MD, assistant professor, neurology; director of the ECoE VA Connecticut Healthcare System

Diana Richardson, MD, assistant clinical professor, neurology; director, National VA Parkinson's Disease Consortium, West Haven; director, movement disorders, VA Connecticut Healthcare System

Hajime Tokuno, MD, associate professor, clinical neurology

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

Jason Sico, MD, associate professor, neurology; associate professor, internal medicine (section of general medicine)

Darren Volpe, MD, associate professor, neurology; Yale neurology residency site director for VA Connecticut Healthcare System

FELLOWSHIP TRAINING

Residents at the VA receive extensive outpatient training and education through both continuity and subspecialty clinics. Residents frequently comment on the wide variety of neurologic conditions treated 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. We will be accepting applications for headache and neurophysiology fellows in the coming year.

Vascular Neurology



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

JOSEPH SCHINDLER, MD,
clinical chief

SRIKANT RANGARAJU, MBBS, MS,
academic chief

RESEARCH

► **Adam de Havenon, MD, MSCI**, an associate professor of neurology, concentrates his research on intracranial atherosclerosis; vascular contributions to cognitive impairment and dementia; and blood pressure variability. His long-term goal is to lead a team of translational and clinical researchers to address the most treatment-resistant diseases in vascular neurology as well as provide excellent care to patients suffering from these diseases. De Havenon has published more than 200 peer-reviewed articles; his research in stroke and dementia prevention has received funding from the National Institutes of Health, the American Academy of Neurology, and the American Heart Association (AHA).

- Socioeconomic and medical determinants of state-level subjective cognitive decline in the United States. *Alzheimer's & Dementia*, 2024.
- White matter hyperintensity on MRI and plasma Aβ₄₂/40 ratio additively increase the risk of cognitive impairment in hypertensive adults. *Alzheimer's & Dementia*, 2024.
- Impact of sleep quality and physical activity on blood pressure variability. *PLoS One*, 2024.
- Endovascular Treatment of Acute Ischemic Stroke After Cardiac Interventions in the United States. *JAMA Neurology*, 2024.

► **Rachel Forman, MD**, is an assistant professor of neurology and a stroke neurologist at Yale New Haven Hospital. She treats patients with stroke-related conditions in the hospital as well as in the Guilford vascular neurology clinic. Her areas of interest include community and childhood stroke education; community-based research; post-stroke blood pressure control; and barriers to racial and ethnic disparities in stroke care. Forman also serves as the faculty advisor for the Yale Stamp Out Stroke program. The program received the national AHA Group Hero Award in 2023 and has educated more than 2,000 New Haven area residents about stroke since 2021. In addition, Forman leads several patient and community advisory boards in order to partner with patients and community members to improve stroke risk factors and the well-being of stroke survivors. She also serves as the Yale site PI for the REDUCE trial (blood pressure treatment for stroke survivors) and the Yale AHA/Bugher Collaborative Project (evaluating post-stroke well-being). She is also a passionate advocate for neurology patients; she has traveled to the American Academy of Neurology (AAN) "Neurology on the Hill" program and served as an advisor for the AAN's Palatucci Advocacy Leadership Forum.

► **James Giles, MD, PhD**, is an assistant professor of vascular neurology. He came to the United States from England in 2014 to train in neurology. He attends on the inpatient stroke service at Yale New Haven Hospital and sees outpatients in the Guilford clinic. He has a broad background in both basic science and clinical stroke research. Giles' research has been funded by the American Heart Association and the British Heart Foundation. His core research interest is the use of biomedical and clinical informatics to improve stroke diagnosis, treatment, and prevention. He further serves as the Yale site PI of the SISTER and CAPTIVA trials, testing innovative treatments for stroke patients.

- Multi-Omics Approaches to Discovering Acute Stroke Injury and Recovery Mechanisms. *Stroke Genetics*, 3rd ed. Cham, Switzerland: *Springer*, 2024.
- Antithrombotic Treatment for Stroke Prevention in Cervical Artery Dissection: The STOP-CAD Study. *Stroke*, 2024.
- Stroke Controversies and Debates: Imaging in Intracerebral Hemorrhage. *Stroke*, 2024.

► **Nishant K. Mishra, MD, PhD**, joined the Department of Neurology in 2021 as an assistant professor after spending more than a decade at major stroke centers in Europe and the United States. He previously worked in the U.S. Food and Drug Administration (FDA). Mishra joined the VA Connecticut Healthcare System in West Haven in 2024 as stroke director while maintaining his clinical practice and academic pursuits at Yale. He launched a clinical research program to prevent epileptogenesis in stroke patients with his Yale colleagues, and currently leads the International Post-Stroke Epilepsy Research Consortium (IPSERC) with colleagues worldwide. He is co-chair of the European Stroke Organisation (ESO) guideline committee, and serves on the editorial boards of *Neurology*, *PLOS One*, and *Frontiers in Neurology*. Mishra's research interests include post-stroke epilepsy prevention; biomarker research related to epileptogenesis and stroke outcomes; advancing rehabilitation opportunities (predominantly at the VA); and hyperacute stroke management.

- Pathophysiology, Diagnosis, Prognosis, and Prevention of Poststroke Epilepsy: Clinical and Research Implications. *Neurology*, 2024.
- Outcomes in Patients With Poststroke Seizures: A Systematic Review and Meta-Analysis. *JAMA Neurology*, 2024.

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



Yale vascular neurologists are at the forefront of the latest research on stroke and cerebrovascular disease and have published their findings in numerous prestigious academic journals.

► **The Navaratnam Lab's** research focuses on the basic mechanisms of hearing and balance and the clinical aspects of stroke.

- Clinical criteria to exclude acute vascular pathology on CT angiogram in patients with dizziness. *PLoS One*, 2023.
- Megahertz Sampling of Prestin (SLC26a5) Voltage-Sensor Charge Movements in Outer Hair Cell Membranes Reveals Ultrasonic Activity that May Support Electromotility and Cochlear Amplification. *Journal of Neuroscience*, 2023.

► **Srikant Rangaraju, MBBS, MS**, is an associate professor of neurology, a vascular neurologist, and a physician-scientist. After establishing his research program at Emory University in Atlanta, he moved to Yale in 2023. Rangaraju's research focuses on exploring immune-mediated mechanisms of neurodegeneration and post-ischemic injury in the brain, leveraging pre-clinical mouse models, as well as multi-omics modalities to assess molecular changes occurring in different classes of neurons and glial cells. He is also actively involved in stroke research through, via participation in clinical trials, and clinical research studies related to post-stroke prognosis, plasma-based protein biomarkers, and risk-stratification in cryptogenic stroke.

► **The Rangaraju Lab** has been funded by the NIH since 2016. The group has identified promising therapeutic targets to modulate microglia-mediated mechanisms in neurodegeneration and stroke. One example is the Kv1.3 potassium channel, which is over-expressed in a sub-set of pro-inflammatory microglia and macrophages in the brain in Alzheimer's disease, as well as in the sub-acute phase following ischemic stroke. Using pharmacological and genetic approaches to manipulate Kv1.3, the group has identified the channels as a key regulators of neuroinflammatory responses in these diseases. The group has also developed novel *in vivo* tools to assess protein-associated (proteomic) mechanisms of disease specific to different brain cell types, in pre-clinical mouse models. To this end, the group has developed an approach called cell type-specific *in vivo* biotinylation of proteins (CIBOP) to identify early molecular changes occurring in neurons and glial cells. These changes may offer therapeutic targets for disease-modification.

- Native-state proteomics of Parvalbumin interneurons identifies unique molecular signatures and vulnerabilities to early Alzheimer's pathology. *Nature Communications*, 2024.
- Entorhinal cortex vulnerability to human APP expression promotes hyperexcitability and tau pathology. *Nature Communications*, 2024.
- Proteomic changes in the human cerebrovasculature in Alzheimer's disease and related tauopathies linked to peripheral biomarkers in plasma and cerebrospinal fluid. *Alzheimer's & Dementia*, 2024.
- Identification of State-Specific Proteomic and Transcriptomic Signatures of Microglia-Derived Extracellular Vesicles. *Molecular & Cellular Proteomics*, 2023.

► **Lauren Hachmann Sansing, MD, MS**, professor of neurology, is a vascular neurologist specializing in the acute treatment of stroke and complex neurovascular diseases. She also serves as vice chair of faculty and academic affairs in 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. Sansing leads the Yale program for the first-ever NIH stroke preclinical trial network (SPAN), and the Yale American Heart Association/Bugher Center of Research Excellence in Hemorrhagic Stroke Prevention & Treatment. She has won numerous awards, including the American Neurological Association Derek Denny-Brown Young Neurological Scholar Award and the American Academy of Neurology Michael S. Pessin Stroke Leadership Prize. She has also been elected to the American Society for Clinical Investigation (ASCI) and the Henry Kunkel Society.

► **The Sansing Lab** investigates neuroinflammatory responses in stroke, intracerebral hemorrhage, and chronic cerebrovascular disease, with a focus on understanding which immune responses following acute brain injury cause further injury and which responses aid in recovery. The lab also works on translating preclinical models to clinical trials through large-scale multicenter collaborations.

- A multi-laboratory preclinical trial in rodents to assess treatment candidates for acute ischemic stroke. *Science Translational Medicine*, 2023.
- Embracing Heterogeneity in The Multicenter Stroke Preclinical Assessment Network (SPAN) Trial. *Stroke*, 2023.
- Role of Inflammatory Processes in Hemorrhagic Stroke. *Stroke*, 2023.

► **Richa Sharma, MD, MPH**, is an assistant professor of neurology with a particular interest in leveraging advanced technology and multimodal data to improve stroke prevention at the individual level. Her patient-centered research is funded by a NIH K23 award and the Yale Center for Brain & Mind Health. Sharma is presently developing computational algorithms using multimodal data sources, including electronic health records (EHRs), serum protein expression levels, and neuroimaging to diagnose the etiologies of ischemic stroke. Sharma was issued a provisional patent for StrokeClassifier, the EHR-based automated stroke etiology classifier, and received the 2024 Blavatnik Accelerator Award toward scaling this technology to improve stroke care.

► **The Sharma Lab** utilizes advanced computational approaches to understand the epidemiology of stroke risk factors; determine the underlying causes of strokes; and identify novel therapeutic targets to improve current approaches to stroke prevention and brain health.

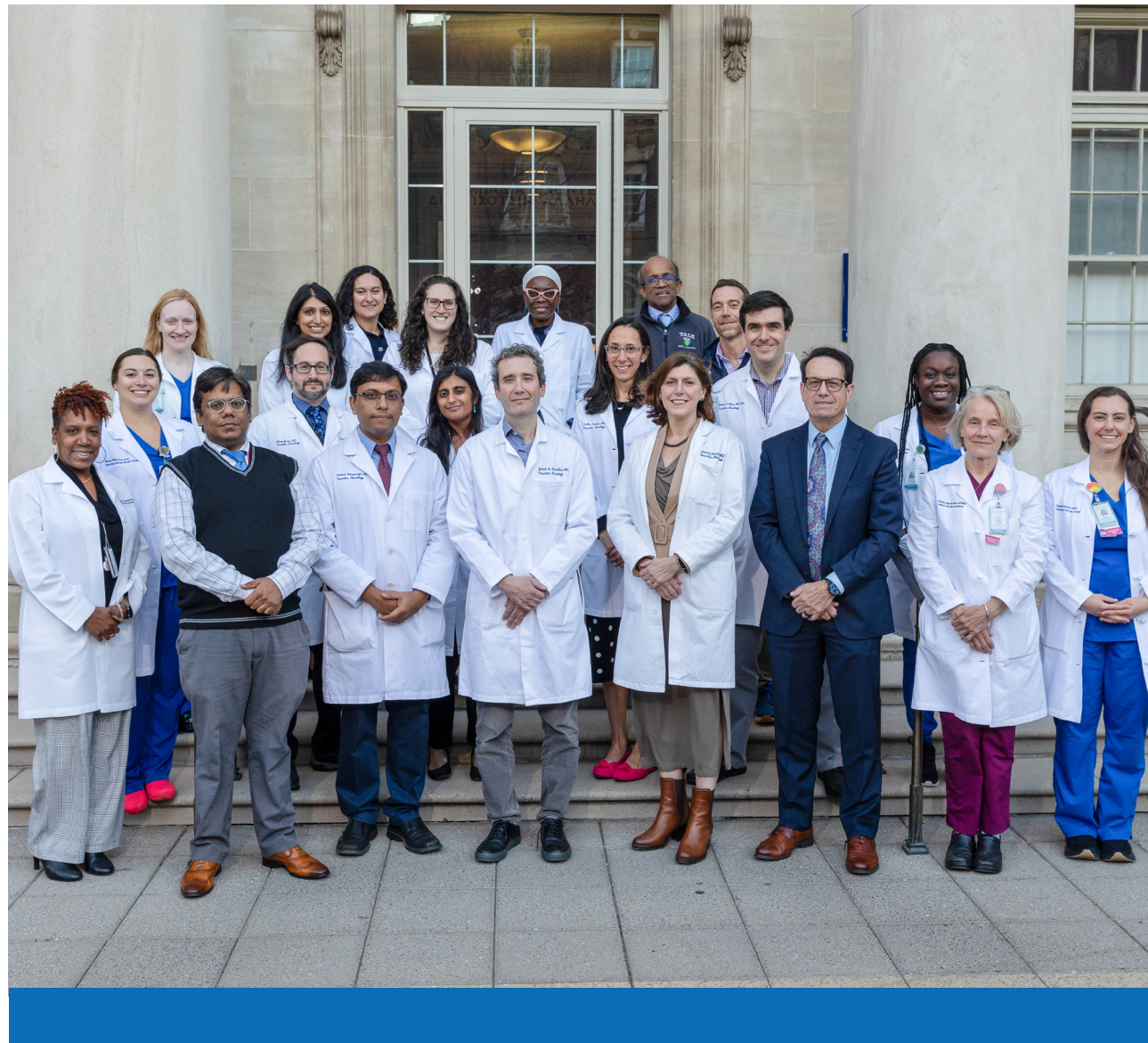
- StrokeClassifier: ischemic stroke etiology classification by ensemble consensus modeling using electronic health records. *NPJ Digital Medicine*, 2024.
- Contemporary Prestroke Dual Antiplatelet Use and Symptomatic Intracerebral Hemorrhage Risk After Thrombolysis. *JAMA Neurology*, 2024.



One of Schindler's (left) roles is director of the Yale New Haven Telestroke Service, which expands Yale's stroke expertise to patients at other hospitals, when in-person care for acute conditions is not possible.

► **N. Abimbola Sunmonu, MD, PhD**, is an assistant professor of neurology and a cerebrovascular geneticist with interests that include genetics, equitable global health, and cerebrovascular neurology. In addition to global health and education, Sunmonu has a strong background in the neurosciences and translational neurology, primarily in genetic control of neurodevelopment, neuroimaging, and the development of preclinical murine models of disease. She recently moved into clinical research, investigating genetic and hereditary stroke syndromes, vasculopathies, and cerebrovascular manifestations of systemic disease. Sunmonu uses computational genomics to investigate the genetic bases of cerebrovascular disease (risk, severity, and recovery) and other significant questions at the population level. She is committed to the principle that medicine and research should benefit all people.

• Understanding Patterns of Missingness in Acute Ischemic Stroke Trials: A Secondary Analysis of Pooled Participant-Level Follow-Up Data.. *Stroke*, 2023.



Vascular Neurology faculty gathered in front of Sterling Hall of Medicine

CLINICAL

The YNHH Advanced Comprehensive Stroke Center accepts the most complex neurovascular patients in the region; it provides direction and support for all hospital programs affiliated with YNHH as well as selected community hospitals throughout Connecticut. The Stroke Center continues to be recognized for its clinical excellence by the American Heart Association's Get With The Guidelines® series, receiving top awards for exceeding target metrics in the evaluation and treatment of acute stroke patients.

The stroke service provides both a dedicated inpatient service and a consultative service. The primary inpatient service offers evaluation, treatment, and transition-of-care plans to patients with a primary diagnosis of stroke and transient ischemic attack (TIA). The team is led by a Yale Medicine board-certified vascular neurologist; it includes a fellow, two residents, an intern, a nurse practitioner, a nurse navigator, a medical student, and visiting trainees. The consultative 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 School of Medicine board-certified vascular neurologist; it includes a stroke fellow and a nurse practitioner.

The stroke program supports a team of nurse navigators who lead transition-of-care initiatives, and follow patients and families throughout their acute and long-term recovery care. Multiple stroke clinics are available in several community locations to provide secondary stroke prevention services and to align with many of the rehabilitation options for patients who benefit from ongoing physical, occupational, and language therapy programs.

The Yale New Haven TeleStroke Program provides emergent stroke consultations to patients suspected of having a stroke at 12 hospital sites across Connecticut and Rhode Island. The program continues to expand its services with outpatient stroke clinics extending along the Connecticut coast. Last year, the program performed more than 2,500 teleconsultations across the region.

CLINICAL TRIALS: The division is a hub for the NIH StrokeNet and conducts many clinical trials in stroke prevention, acute treatment, and recovery.

PROVIDERS:

Gary Bernardini, MD, PhD, chief of neurology, Bridgeport Hospital; director, Stroke Center, Bridgeport Hospital

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

Rebecca M. DiBiase, MD, MPH, assistant professor, neurology

Rachel Forman, MD, assistant professor, neurology

James Giles, MD, PhD, assistant professor, neurology

Safa Hakim Elnazer, MD, assistant professor, neurology

Adam S. Jasne, MD, associate professor, neurology

Srinath Kadimi, MD, associate professor, clinical neurology

Caitlin Loomis, MD, assistant professor, neurology

Nishant Mishra, MD, PhD, assistant professor, neurology; affiliated faculty, Yale Institute of Global Health; stroke director, VA Connecticut Healthcare System

Reshma Narula, MD, associate professor, neurology; director, vascular neurology fellowship program, stroke; departmental director for collaborative excellence, neurology

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

Srikant Rangaraju, MBBS, MS, associate professor; academic division chief, neurology

Lauren Hachmann Sansing, MD, MS, professor of neurology and immunobiology; vice chair of academic and faculty affairs, neurology; director, master of health sciences program; co-director, Carol & Jean Ludwig Program for the Study of Neuroimmune Interactions in Dementia

Joseph Schindler, MD, professor of neurology and neurosurgery; director, Yale New Haven Telestroke Service; clinical division chief, division of vascular neurology; director, Yale New Haven Comprehensive Stroke Center

Richa Sharma, MD, MPH, assistant professor, neurology

N. Abimbola Sunmonu, MD, PhD, assistant professor, neurology

FELLOWSHIP TRAINING

The Accreditation Council for Graduate Medical Education (ACGME) Yale vascular neurology fellowship is one of the most competitive stroke fellowships in the country. It places fellows into highly desired medical directorships and faculty positions after the completion of their fellowship. Under the direction of Reshma Narula, MD, the fellowship has expanded to five vascular neurology fellows per year.

Neurology Leadership

DEPARTMENT LEADERSHIP



David A. Hafler, MD,
Chair, Neurology



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

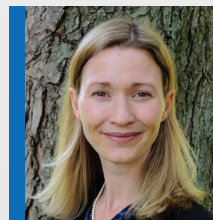


Lauren Hachmann Sansing, MD, MS,
Vice-Chair, Academic and Faculty Affairs



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

SECTION CHIEFS



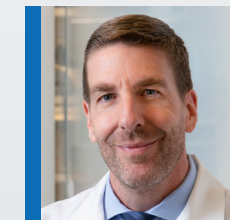
Emily Sharp, PhD, ABPP
Chief, Neuropsychology



Joachim Baehring, MD, DSc,
Acting Chief, Neuro-Oncology



Christopher Gottschalk, MD,
Clinical Chief, Primary Care Neurology & Headache Medicine



Clemens Scherzer, MD,
Academic Chief, Movement Disorders



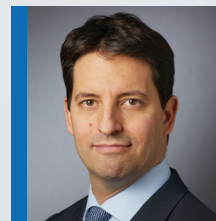
Veronica Santini, MD, MA,
Clinical Chief, Movement Disorders



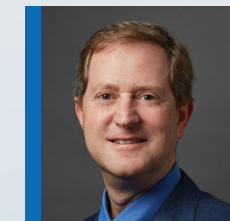
Katherine DeStefano, MD, MS,
Clinical Chief, Neuro-Immunology



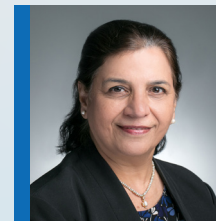
Emily J. Gilmore, MD, MS,
Clinical Chief, Neurocritical Care & Emergency Neurology



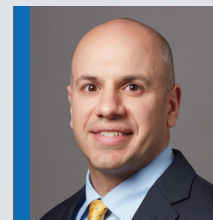
Guido Falcone, MD, ScD,
Academic Chief, Neurocritical Care & Emergency Neurology



Lawrence Hirsch, MD,
Academic Chief, Epilepsy & EEG



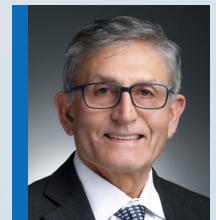
Anuradha Singh, MD,
Clinical Chief, Epilepsy & EEG



Daniel DiCapua, MD,
Clinical Chief, Neuromuscular Medicine



Sasha Zivkovic, MD, PhD,
Academic Chief, Neuromuscular Medicine



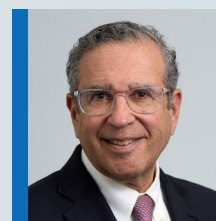
Sayed (Ausim) Azizi, MD, PhD,
Clinical Chief, Neurodegenerative Disorders



Stephen Strittmatter, MD, PhD,
Academic Chief, Neurodegenerative Disorders



Joseph Schindler, MD,
Clinical Chief, Vascular Neurology



David A. Hafler, MD,
Academic Chief, Neuro-Immunology



Hamada Hamid Altalib, DO, MPH,
Chief of Neurology, VA Connecticut Healthcare System



Srikant Rangaraju, MBBS, MS,
Academic Chief, Vascular Neurology



Serena Spudich, MD, MA,
Chief, Neurological Infections & Global Neurology

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,
Vice-Chair, Education



Sara Schaefer, MD, MHS,
Neurology Residency Program Director

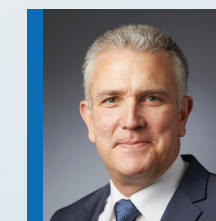


Darren Volpe, MD,
Associate Program Director, Neurology; VA Site Director, Yale Neurology Residency Program

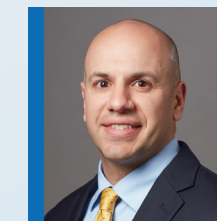


Jeffrey Dewey, MD, MHS,
Director, Neurology Clerkship

FELLOWSHIP PROGRAM DIRECTORS



Joachim Baehring, MD,
Director, Neuro-Oncology



Daniel DiCapua, MD, FAAN,
Director, Neuromuscular Medicine Fellowship Program



Emily J. Gilmore, MD, MS,
Co-Director, Critical Care EEG Fellowship Program



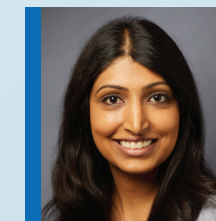
Lawrence Hirsch, MD,
Co-Director, Critical Care EEG Fellowship Program; Director, Clinical Neurophysiology ACGME Fellowship Program



Adithya Sivaraju, MD, MHA,
Director, Epilepsy Fellowship Program



Erin Longbrake, MD, PhD,
Director, Neuro-Immunology/Multiple Sclerosis Fellowship Program



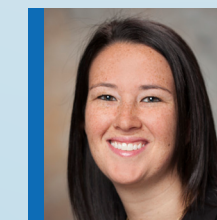
Reshma Narula, MD,
Director, Vascular Neurology Fellowship Program



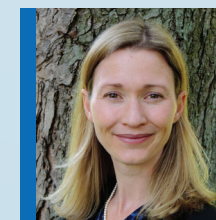
Sara Schaefer, MD, MHS,
Director, Movement Disorders Fellowship Program



Stephanie Towns, PsyD, ABPP,
Training Director, Neuropsychology Postdoctoral Residency Program



Rachel Beekman, MD,
Director, Neurocritical Care Fellowship Program



Emily Sharp, PhD, ABPP,
Associate Training Director, Neuropsychology Postdoctoral Residency Program



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



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

RESEARCH



Jaime Grutzendler, MD,
Vice-Chair, Basic Science Research

RESEARCH



Kevin Sheth, MD,
Vice-Chair, Clinical Research

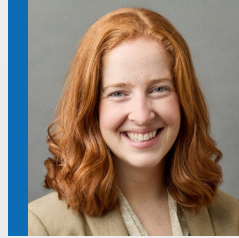
Neurology Leadership

2023-2024 CHIEF RESIDENTS

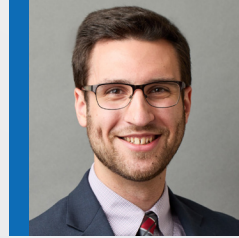
Education/Research



Basil Abdalla, MD



Clare McGarvey Lambert, MD



Nicholas Haberli, MD

Recruitment



Celia Fung, MD



Billy Signorile, MD



Danielle Reynolds, MD



Duong Chu, MD

Clinical

Scheduling



Kenia Lucey, MD

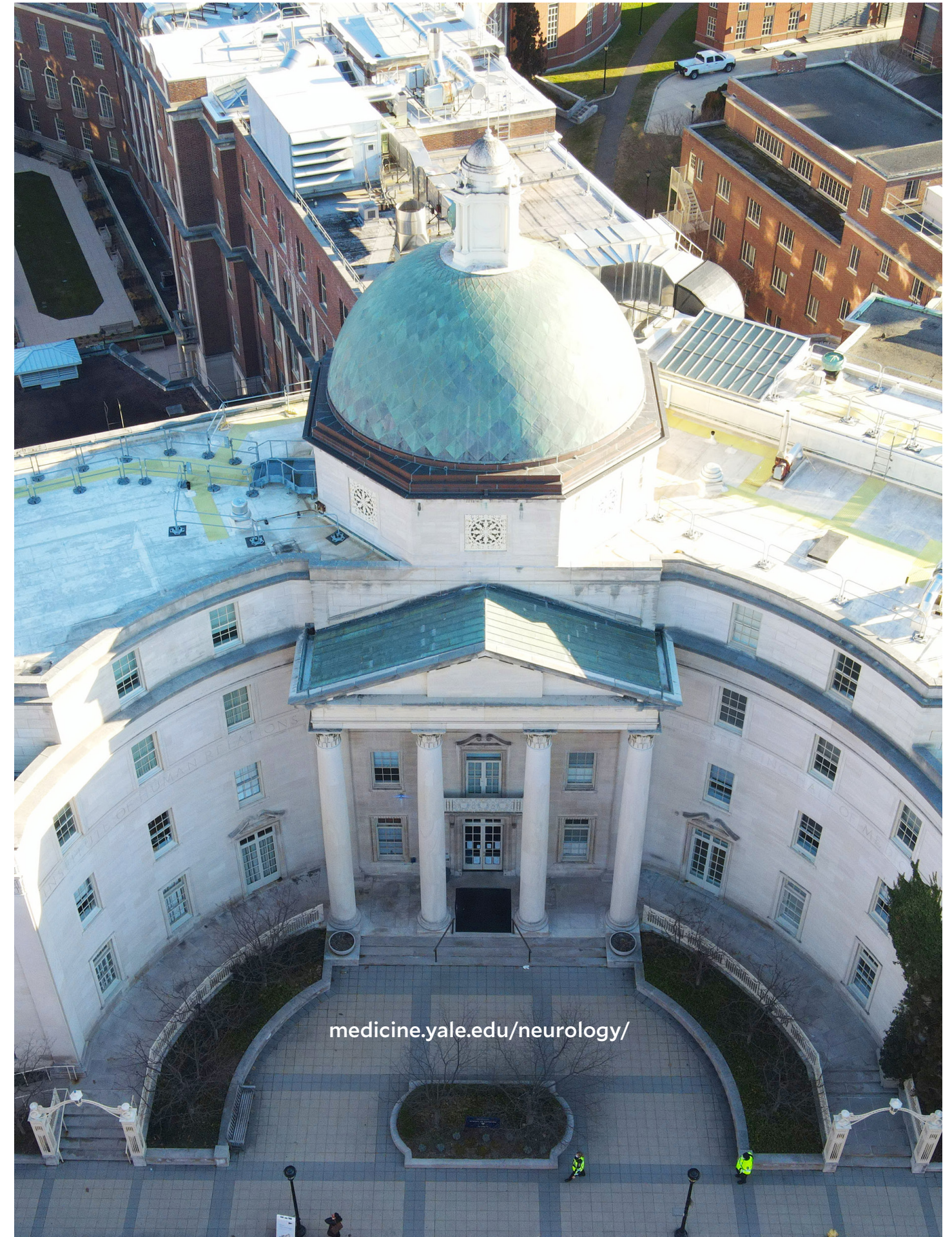


Katherine Teague, MD, MPH

Wellness



João Paulo da Costa Gonçalves, MD



medicine.yale.edu/neurology/

Yale SCHOOL OF MEDICINE
Department of Neurology