The Yale Department of Neurology is a world-renowned research, teaching, and clinical center devoted to exceptional patient care, education of medical and graduate students, and neurological research. I am proud to report our continued growth in our 2020-2022 annual report. The tireless efforts of our 138 faculty have resulted in overall percent age increases in active grants, ultimately securing a sixth-place ranking in total NIH funding in 2021 for Neurology. Once again, Neurology recruited an outstanding class of new residents, in spite of the limitations posed by COVID-19. Our clinical work also continues to expand across southern New England.

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

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

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

We were able to enhance the care we provide on our General Neurology service by expanding the team with two advanced practice providers. Neurology inpatient-based services are now available at five of the six YNHHS hospitals, the latest addition being the Neurology program at Bridgeport Hospital. In collaboration with Neurosurgery, an interventional stroke program has been established at Greenwich Hospital. A third interventional stroke program is being launched at Bridgeport Hospital, which recently treated its first patient. We hope that this annual report provides a comprehensive picture of our values, dedication to our pursuit of knowledge, and compassion for the community we serve. We are grateful to every member of our department who made our work possible, and we look forward to continued success in the year ahead.

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

3 Non-Ladder Faculty
5% Active Grants Increased
#6 NIH Funding in Neurology
($36,189,925 Total)
103 Ladder Faculty
3 Instructors
162 Total Faculty
32 Research Faculty
98 Staff
57 Postgraduate Associates & Fellows
35 Postdoctoral Associates & Fellows
25 Clinical Fellows
1 Lecturer
2 ‘Other’ Faculty (voluntary, adjunct, visiting)

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

NEW CLINICAL SITES:
New London, Bridgeport, Milford, Greenwich, Stamford, Fairfield, and Guilford
Neurology faculty and trainees participated in the White Coats for Black Lives demonstration for racial justice in front of Sterling Hall of Medicine.

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

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

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

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


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

Grand Rounds
Neurology Grand Rounds continues to be a cornerstone of our departmental educational offerings. We have transitioned back to primarily in-person sessions, which allows the speakers to visit with potential collaborators and learners, and increases engagement during the presentations themselves. Clinical Grand Rounds continues in a hybrid format, facilitating unique opportunities such as joint Clinical Grand Rounds sessions with the Pitié-Salpêtrière University Hospital in Paris, which occur 3-4 times per year.

Resident and Fellow Recruitment
The residency and fellowship recruitment process has been virtual since 2020, allowing for better equity and lower cost to applicants. To optimize the applicant experience, the department has maintained a robust website and social media presence, including video tours, resident and alumni interviews, and regular updates about the educational and social happenings from within the department. We have hosted 153 residency applicants and dozens of fellowship applicants each year, and we continue to attract the most competitive candidates in the world. The residency and fellowships have never been more diverse, and many of our former trainees stay on as faculty members, making important contributions to the department’s clinical, educational, and research missions.

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

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

Wellness
As a result of specific concerns raised in the context of the YNHH/YM Physician Wellness Action Collaborative Survey, the department has since made substantial changes.

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

RESEARCH

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

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


- In an exploratory randomized, double-blind, placebo-controlled, cross-over study, psychoactive doses of intravenous delta-9-tetrahydrocannabinolfail to produce antinociceptive effects in healthy human volunteers. Psychopharmacology, 2020.


CLINICAL

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

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

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

LOCATIONS:

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

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

PROVIDERS:

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

[* = UCNS board-certified in Headache Medicine]

FELLOWSHIP TRAINING

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

RESEARCH

Lawrence J. Hirsch, MD, division chief, performs clinical research on brain monitoring with EEG, status epilepticus, brain stimulation for treating epilepsy, epilepsy surgery, rescue therapy for acute seizures outside the hospital, antiseizure medications and more. Hirsch is the founder and former chair of the Critical Care EEG Monitoring Research Consortium, which now includes more than 50 centers; co-chair of the medical advisory board of the NORSE Institute; PI for the new (2020) donor-funded international open NORSE/FIRES biorepository based at Yale; chair of the new (2022) national responsive neurostimulation research registry; and lead author of the 2021 American Clinical Neurophysiology Society guidelines on Critical Care EEG terminology. He has published more than 250 peer-reviewed publications and over 100 reviews, editorials, and book chapters. In 2021, he gave invited talks (mostly virtual) in eight countries and on five continents.

- Brief potentially ictal rhythmic discharges and paroxysmal fast activity as scalp electroencephalographic biomarkers of seizure activity and seizure onset zone. Epilepsia, 2022.
- Patient-detectable responsive neurostimulation as a seizure warning system. Epilepsia, 2022.

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


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

- Impaired motor skill learning and altered seizure susceptibility in mice with loss or gain of function of the Kcnt1 gene encoding Slack (KNa1.1) Na+-activated K+ channels. Scientific Reports, 2020.

Hilton Zaveri, PhD, an electrical, computer, and biomedical engineer by training, directs the Computational Neuropsychology Laboratory, studies brain networks and EEG connectivity, and is involved in the development of medical devices. His current projects include the use of network analysis to locate the seizure onset area (NIH R01 NS109062); the development of a multimodal brain probe for traumatic brain injury (NIH UG3/UG3); seizure forecasting, and the development of a brain/computer interface for brain monitoring and modulation.

- Seizure prediction—ready for a new era. nature reviews Neurology, 2018.

The Comprehensive Epilepsy Center provides promising options for many adults and pediatric patients with epilepsy. Known for clinical excellence and innovative research, this program was one of the nation’s first and has evolved into one of the most active and advanced in the world.
Richard H. Mattson, MD, a legend in the world of epilepsy, came to Yale in 1967 after service in the United States Air Force Medical Service, where he and colleagues conducted the original studies establishing sleep deprivation as a useful adjunct in EEG activation. At Yale, he founded the Yale/VA Epilepsy Center and Medical Resources in a Public Health Emergency, Journal of Clinical Ethics, 2020.


- Randomized controlled trial of motivational interviewing for psychogenic nonepileptic seizures. Epilepsia, 2019.

Aditya 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 Investigation and Outcome Network (PASSION – Post Acute Symptomatic Seizure Investigation and Outcome Network) to study epileptogenesis and antiseizure medication management in patients with acute brain injury.


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


- Electrical cortical stimulation can impair production of the alphabet without impairing counting. Epilepsy & Behavior Reports, 2021.


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


- Randomized controlled trial of motivational interviewing for psychogenic nonepileptic seizures. Epilepsia, 2019.

Dr. Hirsch and Eyiyemisi Damisah, MD

Hamada Hamid Altalib, DO, MPH directs the Epilepsy 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 past-traumatic epilepsy cohort studies.


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


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


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

- Association of Seizure Spread with Surgical Failure in Epilepsy. *JAMA Neurology*, 2019.

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


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

- Elevated homocarnosine and GABA in subject on isoniazid as assessed through 1H MRS at 7T. *Analytical Biochemistry*, 2020.
Each year, we continue to care for more than 4,000 patients with epilepsy or possible epilepsy via our outpatient services in New Haven, Guilford, and Stamford, with plans to expand to North Haven and Greenwich very soon. Our EEG services include routine outpatient EEGs, home video/EEG monitoring, inpatient video/EEG/O2 monitoring in both the ICUs and in our adult (eight beds) and pediatric (three beds) epilepsy monitoring units with 24/7 live monitoring for safety, and advanced automated seizure detection and trending to aid review and timely recognition of important changes in brain activity. We perform more than 5,000 prolonged (more than 12 hours) video/EEG studies each year, with this volume continuing to grow. We now provide EEG services throughout most network hospitals, recently expanding to Greenwich, Bridgeport, and L&M Hospitals. We rolled out the use of new rapid EEG technology, allowing interpretable EEG in six minutes, at most of these sites as well. This technology has been used more than 300 times at YNHHS. We also offer evoked potentials (somatosensory, visual, and auditory) and participate in multiple clinical trials of medications and devices.

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

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

CLINICAL PROVIDERS:

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

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

Aline Herlopian, MD, assistant professor, neurology.

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

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

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

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

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

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

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

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

FELLOWSHIP TRAINING:
In addition to teaching EEG and epilepsy care to neurology residents, we continue to train five epilepsy fellows each year. Dr. Farooque is the overall fellowship director (five fellows) and the program director of the ACGME epilepsy fellowship (two fellows). Dr. Hirsch continues to be program director of the clinical neurophysiology fellowship (two fellows). He continues to co-direct the nation’s longest-running critical care EEG fellowship (one fellow) with Emily Gilmore, MD.
The Movement Disorders Division comprises physicians and scientists dedicated to the recognition, evaluation, treatment, and understanding of the full range of hypokinetic and hyperkinetic movement disorders.

**RESEARCH**

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

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

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

- The **DeCamilli Lab** focuses on mechanisms underlying the dynamics and traffic of intracellular membranes, with emphasis on membrane transport reactions involved in neurotransmission.
  - Pietro De Camilli, MD, is the John Klingenstein Professor of Neuroscience and Professor of Cell Biology, investigator of the Howard Hughes Medical Institute, director of the Program in Cellular Neuroscience, Neurodegeneration and Repair, and director of the Kavli Institute of Neuroscience at the Yale School of Medicine.
  - The De Camilli Lab will use the tools of cell biology to elucidate the function of the many identified genes that cause or increase the risk of PD as well as the mechanisms through which their mutations lead to disease. Among the mutations that cause or increase susceptibility to PD, some are known or thought to impair the function of endo-lysosomes or mitochondria. Although these mutations may promote disease via independent mechanisms, growing evidence points to important cross-talk between endo-lysosomes and mitochondria, with effects on bioenergetics, mitochondria quality control, and innate immunity. Investigators will use a multidisciplinary approach to investigate the cell biology of selected PD-associated genes that act in the endocytic pathway and lysosomes. These include the genes encoding synaptotagmin 1 (SYT1) and VPS13C. The lab will define how their dysfunction leads to PD, with an emphasis on testing the hypothesis that disruption of mechanisms linking the endocytic system to the physiology of mitochondria may have a pathogenic role. By identifying cellular processes whose dysfunction confers PD vulnerability, the research will support translation of PD genetics into new opportunities for therapeutic interventions.

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

- **The De Camilli Lab**

**Thomas Biederer, PhD** is associate professor of neurology.

Dr. Patel leads the hospital-based botulinum toxin practices of the department. As the primary neurologist of our DBS program, he works closely with the multidisciplinary team to guide evaluations and care within our health system and the region.
Dr. Tinaz (R) is passionate about investigating novel, evidence-based interventions that improve quality of life in Parkinson’s disease. Dr. Cedarbaum (L) has extensive experience as a movement disorders specialist and clinical investigator who focuses on development of novel clinical outcome measures and biomarkers, including digital health technologies and development of new treatments for movement disorders.

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

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

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

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

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

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

Sreeganga Chandra, PhD is an associate professor of neurology and neuroscience. Chandra investigates familial genes for Parkinson’s disease. A recent focus of the lab is endolysosomal genes and how they influence synapse function and lead to neurodegeneration. Her lab uses a variety of approaches to investigate these questions in mouse models and stem cell-derived neurons.
The Yale movement disorders program has a distinguished group of faculty who provide care to children and adults with the most complex movement disorders, including Parkinson’s disease, atypical parkinsonian disorders, tic disorders, ataxia, Wilson disease, Huntington’s disease, and complex genetic syndromes. The program provides comprehensive treatment options, from complementary supportive care to advanced therapeutics. In the last year, our specialists have provided advanced chemo denervation therapies for approximately 900 patients with dystonia, spasticity, hemifacial spasm, tremor, sialorrhea, and hyperhidrosis. Likewise, together with our functional neurosurgeons, our comprehensive deep brain stimulation (DBS) program serves much of the state of Connecticut with the provision of multiple devices and advanced programming techniques. Optimal care is provided through specialized disease centers with a multidisciplinary approach. Amar Patel, MD, provides neurologic care as part of the Wilson Disease Center of Excellence (one of only seven nationwide), while Brian Koo, MD, directs the Yale Center for Restless Legs Syndrome, (one of 10 RLS Foundation Quality Care Centers nationwide), serving patients with severe, refractory RLS with a large referral basis.

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

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

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

PROVIDERS:
Veronica E. Santini, MD, MA, clinical division chief, movement disorders; inaugural director, Yale Comprehensive Parkinson Disease Care Center; associate professor, neurology
Nigel Bamford, MD, associate professor, pediatrics and neurology; associate professor of cellular and molecular physiology; director, Pediatric Movement Disorders Clinic; chief, section of pediatric neurology
Sule Tinaz, MD, PhD, assistant professor, neurology
Amar Patel, MD, assistant professor, neurology; director, Botulinum Toxin Clinic
Sara Schaefer, MD, MHS, assistant professor, neurology; associate program director, neurology
Alice Rusk, MD, assistant professor, neurology
Brian Koo, MD, associate professor, neurology; director, Yale Center for Restless Legs Syndrome; director, Sleep Laboratory of the VA Connecticut Healthcare System
Jesse Cedarbaum, MD, professor adjunct, neurology

FELLOWSHIP TRAINING
The movement disorders fellowship has increased recruitment for its two-year clinical and scholarly program, which is individually tailored to each fellow. In addition to extensive training in common and rare movement disorders and advanced therapies, the fellowship incorporated training in pediatric and autonomic nervous system disorders, vocal cord dysfunction, electromyography, and neurocognition.
Emily Gilmore, MD, MS, is medical director of the neurosciences intensive care unit, fellowship director of neurocritical care and co-director of neurotrauma. Gilmore has built a comprehensive, multidisciplinary program to address a continuum of care needs, from the acute setting through rehabilitation and recovery. She has made Yale a leading center for advanced multimodal monitoring, exceptional clinical care, and cutting-edge research.

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

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

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


Kevin Sheth, MD, is interested in improving support for families of neurointensive care patients, particularly regarding goals-of-care decision making. He leads the Yale Longitudinal Study of Acute Brain Injury for the division of Neurocritical Care and co-director of neurotrauma. Gilmore has built a comprehensive, multidisciplinary program to address a continuum of care needs, from the acute setting through rehabilitation and recovery. She has made Yale a leading center for advanced multimodal monitoring, exceptional clinical care, and cutting-edge research.

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

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


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

- Predictors of family dissatisfaction with support during neurocritical care shared decision making. Neurocritical Care, 2021.
The Peterson Lab utilizes neuromonitoring methods and bedside data processing technology to develop personalized treatments and improve outcomes following acute neurologic injury.


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

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


Rachel Beekman, MD, is an assistant professor. Beekman’s lab focuses on the evaluation of optimal blood pressure goals after cardiac arrest with the use of near-infrared spectroscopy for continuous autoregulation monitoring, for which she was awarded an institutional KL2 that began in March 2022. She also has an industry-sponsored award, a Swebilius Foundation award. She is also co-investigator on R01 and UG3 awards.

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

- Combining Transcranial Doppler and EEG Data to Predict Delayed Cerebral Ischemia After Subarachnoid Hemorrhage. *Neurology*, 2021.

Rachel Beekman, MD, is an assistant professor. Beekman’s lab focuses on the evaluation of optimal blood pressure goals after cardiac arrest with the use of near-infrared spectroscopy for continuous autoregulation monitoring, for which she was awarded an institutional KL2 that began in March 2022. She also has an industry-sponsored award, a Swebilius Foundation award. She is also co-investigator on R01 and UG3 awards.

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


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

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


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

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

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

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

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

PROVIDERS:

Kevin Sheth, MD, professor, neurology and neurosurgery; executive director of the NNCTU and vice chair for clinical & translational research in the departments of neurology & neurosurgery; chief of neurocritical care & emergency neurology
Emily Gilmore, MD, MS, associate professor, neurology medical director, neuroscience intensive care unit; fellowship director, neurocritical care; co-director, neurotrauma
David Y. Hwang, MD, associate professor, neurology
Guido Falcone, MD, associate professor, neurology staff neurointensivist; director, clinical research on neurocritical care; training director, the “Yale AHA/Bugher Center of Research Excellence in Hemorrhagic Stroke Prevention & Treatment”
Nils Petersen, MD, PhD, associate professor, neurology staff neurointensivist, neuroscience intensive care unit; director, of the Yale Cerebrovascular Lab (YCVL)
Rachel Beekman, MD, assistant professor, neurology
Jennifer A. Kim, MD, PhD, assistant professor, neurology
Jessica Magid-Bernstein, MD, PhD, assistant professor, neurology
Morgan L. Prust, MD, assistant professor, neurology affiliated faculty, Yale Institute for Global Health

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

FELLOWSHIP TRAINING

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

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

RESEARCH

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

  - TREM2 Haplodeficiency in Mice and Humans Impairs the Microglia Barrier Function Leading to Decreased Amyloid Compaction and Severe Axonal Dystrophy. Neuron, 2016.
  - Angiophagy prevents early embolus washout but reorganizes microvessels through embolus extravasation. Science Translational Medicine, 2014.

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

  - A Case of Possible Chronic Traumatic Encephalopathy and Alzheimer’s Disease in an Ex-Soccer Player. The Neurologist, 2022.

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

  - Reversal of Synapse Loss in Alzheimer Mouse Models by Targeting mGluR5 to Prevent Synaptic Tagging by C1q. Science Translational Medicine, 2012.
  - Liquid and Hydrogel Phases of PrPC Linked to Conformation Shifts and Triggered by Alzheimer’s Tagging by C1q. Science Translational Medicine, 2014.
  - Angiophagy prevents early embolus washout but reorganizes microvessels through embolus extravasation. Science Translational Medicine, 2014.

Jaime Grutzendler, MD, is the founding member of the Yale Concussion Program, which continues its clinical and translational neuroscience/intravital microscopy.

Arman Fesharaki-Zadeh, MD, PhD, an assistant professor of neurology and psychiatry. His main area of research is the long-term sequelae of traumatic brain injury and chronic traumatic encephalopathy using preclinical models. He is one of the founding members of the Yale Concussion Program, which continues its clinical and translational neuroscience efforts within the fields of neurodegeneration, and nervous system injury.

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

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

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- Angiophagy prevents early embolus washout but reorganizes microvessels through embolus extravasation. Science Translational Medicine, 2014.
Stephen M. Strittmatter, MD, PhD, is chair and professor of neuroscience, the Vincent Coates Professor of Neurology, and director of the Yale Alzheimer Disease Research Center (ADRC), the Yale Memory Disorders Clinic, and the Kavli Institute for Neuroscience at Yale. Strittmatter’s clinical emphasis is on Alzheimer’s disease and frontotemporal dementia. His laboratory has mapped the molecular pathway by which β-amyloid, innate immunity, and tau are linked at the synapse to cause cognitive symptoms in Alzheimer’s, and he has developed therapeutic approaches that target this pathway. His research has also defined the molecular basis of nerve fiber repair after adult injury. His laboratory research has appeared in 250 publications. Dr. Strittmatter’s research has been recognized by the King Faisal International Prize in Medicine, the Ameritec Award, and the Alzheimer Association Zenith Fellow Award.

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

- One model does not fit all: Individuals who defy stereotypical profiles require distinct brain-phenotype models, under review in Nature.

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

Emily S. Sharp, PhD, is a co-investigator on NIH-funded clinical trials and neuromaging projects within the Yale Alzheimer’s Disease Research Center (PIs: Strittmatter). She is a co-investigator on a NIH-funded phase III clinical trial within Anesthesiology, examining cognitive outcomes following two types of ED-placed endotracheal tubes (PT: Treggiari). Sharp provides expert consultation on other clinical research projects, including studies of frontotemporal dementia. His laboratory has mapped the molecular pathway by which β-amyloid, innate immunity, and tau are linked at the synapse to cause cognitive symptoms in Alzheimer’s, and he has developed therapeutic approaches that target this pathway. His research has also defined the molecular basis of nerve fiber repair after adult injury. His laboratory research has appeared in 250 publications. Dr. Strittmatter’s research has been recognized by the King Faisal International Prize in Medicine, the Ameritec Award, and the Alzheimer Association Zenith Fellow Award.

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


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

CLINICAL

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

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

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

PROVIDERS:

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

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

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

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

Anna Szekely, MD, associate research scientist in neurology; attending physician, neurogenetics program; member, program in neurodevelopment and regeneration

Darren Volpe, MD, associate professor, clinical neurology; associate program director, neurol-ogy, Center for Experimental Neuromaging

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

Jaime Grutzendler, MD, the Dr. Harry M. Zimmerman and Dr. Nicholas and Viola Spindel Professor of Neurology and Neuroscience; vice-chair for research, neurology; director, Center for Experimental Neuromaging

Anna Szekely, MD, associate research scientist in neurology; attending physician, neurogenetics program; member, program in neurodevelopment and regeneration

FELLOWSHIP TRAINING

The behavioral neurology/neuropsychiatry fellowship program has been expanded, offering two options to incoming fellows: one is the traditional one-year full-time fellowship; the other is a two-year, half-time fellowship for trainees simultaneously pursuing clinical training and clinical/translational research or attending-level clinical care. This expansion to 15 slots began in 2022.

Dr. Fesharaki-Zadeh assesses a patient’s cognitive functioning at the Guilford clinic.
Neuro-Immunology

The Yale Multiple Sclerosis Center provides comprehensive care to patients with multiple sclerosis (MS), neuromyelitis optica, transverse myelitis, optic neuritis, and other neuroimmune disorders. Expert, fellowship-trained neurologists collaborate with experienced nurses, therapists, and social workers to care for patients in all stages of disease.

RESEARCH

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

- Activated β-catenin in Foxp3 + regulatory T cells links inflammatory environments to autoimmunity. Nature Immunology, 2018

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

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


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

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

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


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

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

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

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

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

**PROVIDERS:**

- **David A. Hafler, MD,** the William S. and Lois Stiles Edgerly Professor of Neurology and Professor of Immunobiology; chair, neurology; neurologist-in-chief, Yale New Haven Hospital
- **Katherine DeStefano, MD, MS,** associate professor, neurology medical director, Multiple Sclerosis/Interventional Immunology Center
- **Erin Longbrake, MD, PhD,** associate professor, neurology medical director, Multiple Sclerosis/Interventional Immunology Center
- **David Pitt, MD,** associate professor, neurology
- **Jeffrey Gross, MD,** associate professor, neurology
- **Naila Makhani, MD, MPH,** associate professor, pediatrics (neurology); director, Pediatric MS Program
- **Sharon Stoll, DO,** associate professor, neurology

**FELLOWSHIP TRAINING**

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

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

RESEARCH

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

- Preliminary In Vivo Evidence of Reduced Synaptic Density in Human Immunodeficiency Virus (HIV) Despite Antiretroviral Therapy: *Neurology Clinical Infectious Diseases*, 2021.

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

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

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

- HIV viral transcription and immune perturbations in the CNS of people with HIV despite ART. *JCI Insight*, 2022.

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

Dr. Farhadian was recently featured by the Yale Department of Internal Medicine as a “Rising Star of Infectious Diseases” for her research on infectious disease and brain health.
**Clinical**

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

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

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

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

**Providers:**

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

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

**Fellowship Training**

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

**Neurology Programs**

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

**Education & Training**

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

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

RESEARCH

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

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


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


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


CLINICAL

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

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

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

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

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

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

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

Uzma Usman, MBBS, assistant professor, neurology

Bilal Hameed, MD, assistant professor, neurology

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

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

Thomas Toothaker, MD, associate professor, neurology

Bertrand Tsong, MD, PhD, assistant professor, clinical neurology

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

Adeel Zubair, MD, associate professor, neurology

FELLOWSHIP TRAINING

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

**RESEARCH**

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

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

- Nivolumab plus radiotherapy with or without temozolomide in newly diagnosed glioblastoma: results from exploratory phase 1 cohorts of CheckMate 451. *Neuro-Oncology Advances*, 2022
- T-cell dysfunction in glioblastoma: a barrier and an opportunity for the development of successful immunotherapies. *Current Opinion in Neurology*, 2021

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


Zachary Corbin, MD, MHS, is an assistant professor of neurology dedicated to the development of novel neuroimaging tools in brain tumors. He has developed a multimodality metabolic imaging technique called the Warburg Index to characterize and quantify the Warburg effect in brain tumors. Corbin has received the YCCI Scholar Award, an intramural K12 grant, to further develop the Warburg Index, and he has recently submitted a K23 application to the NIH. He also collaborates on preclinical magnetic resonance spectroscopy development with collaborators at the Yale Magnetic Resonance Research Center. He is an investigator on a multi-PI R01 for the development of a technique called deuterium metabolic imaging. He also has a clinical research interest in treatments for brain tumors and complications of cancer, and participates in a number of clinical trials in brain tumors. Corbin is an active participant in education as the associate neuro-oncology fellowship director. He also teaches medical students and physician assistant students. As a clinical mentor, he participates in the clinical training of the neuro-oncology fellows, neurology residents, and hematology/oncology fellows.


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


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

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

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

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

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

**PROVIDERS:**
- **Antonio Omuro, MD,** professor, neurology; chief, neuro-oncology; clinical trials director, Chanezert Family Brain Tumor Center at Smilow Cancer Hospital and Yale Cancer Center
- **Joachim Baehring, MD,** professor, neurology and of neurosurgery; associate chief, neurology; director, neuro-oncology fellowship program; vice chair, clinical affairs, neurology
- **Nicholas Blondin, MD,** assistant professor, clinical neurology
- **Zachary Corbin, MD, MHS,** assistant professor; associate director, neuro-oncology fellowship program
- **Peter Kim, MD,** assistant professor, neurology
- **Mary Barden, MD,** assistant professor, clinical neurology

**FELLOWSHIP TRAINING**

The Neuro-Oncology fellowship program is a UCNS-accredited, two-year program, offering both clinical and research training in neuro-oncology. Two positions are available per year, and completion of the fellowship enables trainees to become UCNS board-certifiable in neuro-oncology. The program has been successful as a pipeline of talent to the division, with three of our attendings having completed the neuro-oncology fellowship at Yale.
Emily Sharp, PhD, is dedicated to expanding the clinical and research work of the Neuropsychology division. Her patient care centers on neuropsychological evaluation referrals from behavioral neurology and movement disorders. She is a co-investigator on NIH-funded clinical trials and neuromaging projects within the Yale Alzheimer’s Disease Research Center (ADRC). She is also co-investigator on a NIH-funded phase III clinical trial within Anesthesiology, examining cognitive outcomes following two types of ED-placed endotracheal tubes. Sharp provides expert consultation on other clinical research projects, including studies of frontotemporal dementia, atypical Alzheimer’s disease (logopenic; posterior cortical atrophy), and outcomes following deep brain stimulation (DBS) and Gamma Knife therapies in Parkinson’s disease and essential tremor. This year, she has expanded neuropsychology clinical services to provide presurgical evaluations to the audiology and cochlear implant team, and collaborated with Dr. Towns to develop a postdoctoral training program in neuropsychology.

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

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

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

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


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


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

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

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

**PROVIDERS:**
- Emily S. Sharp, PhD, chief, division of neuropsychology; associate training director, neuropsychology
- Timothy Belliveau, PhD, ABPP, associate professor of neurology
- Christopher Benjamin, PhD, assistant professor of neurosurgery; assistant professor of psychology; assistant professor of radiology and biomedical imaging
- Franklin Brown, PhD, associate professor
- Carmen I. Carrion, PsyD, assistant professor of clinical neuropsychology; associate core leader, outreach and engagement, Alzheimer’s Disease Research Center (ADRC)
- Lucas D. Driskell, PsyD, assistant professor
- Alice Perez, PhD, assistant professor
- Stephanie J. Towns, PsyD, ABPP, assistant professor of clinical neuropsychology; training director, neuropsychology
- Ginger Mills, PsyD, assistant professor, neurology
- Linda Ruiz, PhD, assistant professor, neurology

**FELLOWSHIP TRAINING**

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

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

RESEARCH

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


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


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


CLINICAL

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

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

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

PROVIDERS:

Hamada Altalib, DO, MPH, associate professor of neurology and of psychiatry; track director; health informatics, online executive MPH program
Diana Richardson, MD, assistant clinical professor, neurology, director,
National VA Parkinson’s Disease Consortium, West Haven
Hajime Tokuno, MD, associate professor of clinical neurology
Emmanuelle Schindler, MD, PhD, assistant professor; medical director, Headache Center of Excellence
Benjamin Tolchin, MD, MS, assistant professor

FELLOWSHIP TRAINING

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

The division of Vascular Neurology evaluates, treats, and studies diseases that affect the structure and function of the blood vessels supplying the brain. Our main purpose is to provide the best possible care for our patients with stroke and cerebrovascular disease.

RESEARCH

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


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

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


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

- Comparison of magnetic resonance imaging mismatch criteria to select patients for endovascular stroke therapy. *Stroke*, 2014.

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


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

The Navaratnam Lab’s research focus is on the basic mechanisms of hearing and balance and the clinical aspects of stroke.
The Peterson Lab utilizes neuro-monitoring methods and bedside data processing technology to develop personalized treatment targets and improve outcomes following acute neurologic injury.

- Decreases in Blood Pressure During Thrombectomy Are Associated With Larger Infarct Volumes and Worse Functional Outcome. Stroke, 2019.

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

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


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

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

- Protecting the Brain, From the Heart: Safely Mitigating the Consequences of Thrombosis in Intracerebral Hemorrhage Survivors With Atrial Fibrillation. Stroke, 2021.
Neurology Leadership

DEPARTMENT LEADERSHIP

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Katherine DeStefano, MD, MS, Clinical Chief, Neuro-Immunology
Lawrence Hirsch, MD, Academic, Epilepsy
Antonio Omuro, MD, Chief, Neuro-Oncology
Daniel DiCapua, MD, FAAN (Neurology), Clinical Chief, Neuromuscular Medicine
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Sara Schaefer, MD, MHS, Associate Neurology Residency Program Director

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

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Clinical

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Shreya Shah, MD

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Kevin Wilson, MD
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