



THE OHIO STATE UNIVERSITY
Neurological Institute



THE OHIO STATE UNIVERSITY
WEXNER MEDICAL CENTER



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From Our Leaders

Over the last five years we've seen our Neurological Institute evolve in many ways. Our original vision of a hub of multidisciplinary practitioners and scientists collaborating to help people with neurological disorders has certainly come to fruition. But we never could have imagined the breakthrough science, translational discoveries and innovations in treatment we are seeing today.

Looking over the accomplishments of just this past year, we are so impressed with how we are growing. We are welcoming new specialists, faculty and research staff to our team. We're continually initiating and participating in more — and more impactful — research studies and technological advancements. Our expanding educational programs allow us to train a greater number of neuroscience experts.

In this publication, we highlight our departments and specialized centers, featuring just a small sampling of their many activities and ongoing projects. To mention one example, we are advancing knowledge of neurodegenerative and Alzheimer's disease by bringing together fifteen new hires — eight in the Ohio State College of Medicine and seven in allied departments, including Engineering, Public Health, Nursing and Epidemiology — to collaborate in a dedicated facility on campus. Initiatives like this one reflect the best of everything we do.

As we move forward we will continue to celebrate our institute's evolution. And through every challenge and change, we will renew our commitment to make the future brighter for those with challenging neurological conditions.



Amanda Lucas, MEd, MBA
Executive Director of
Clinical Operations Ohio State
Neurological Institute



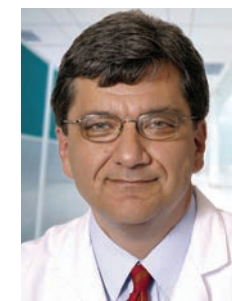
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Rehabilitation



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Mental and Behavioral
Health

What Is the Ohio State Neurological Institute?

2017 by the numbers

- DEPARTMENTS**
- Neuroscience
 - Neurology
 - Neurosurgery
 - Physical Medicine and Rehabilitation
 - Psychiatry and Behavioral Health

4,500+
SURGERIES

280,000+
ANNUAL PATIENT VISITS



220+
PHYSICIANS AND
RESEARCHERS

400+
PUBLICATIONS

330+
ACTIVE CLINICAL
RESEARCH STUDIES

WE ARE **5**
HOSPITALS

- Brain and Spine Hospital
- Ohio State Harding Hospital
- Dodd Rehabilitation Hospital
- Talbot Addiction Medicine
- James Cancer Hospital and Solove Research Institute

8,000+
PATIENTS ENROLLED IN
CLINICAL TRIALS



Ranked number 22 in Neurology/Neurosurgery according to *U.S. News & World Report's* Best Hospitals rankings, jumping more than 30 spots in four years.

Working with 14 schools and colleges across The Ohio State University campus, including the colleges of Engineering and Veterinary Medicine, and with the Department of Athletics to expand understanding of brain and spine disorders and discover diagnostic and treatment tools.



Partnering with leaders in research across campus, including nearly 250 neuroscience researchers at Ohio State, across institutes like the Air Force Research Laboratory at Wright-Patterson Air Force Base and Battelle, and around the world such as the Swiss Federal Institute of Technology in Lausanne, Switzerland, to discover new therapies for brain health and recovery.





Department of Neuroscience

Advancing Scientific Discoveries, Developing New Leaders

In the past year our Department of Neuroscience has seen unprecedented increases in the number of new grant proposals submitted and the total number awarded says Interim Chair Phillip Popovich, PhD. In total, the Department of Neuroscience tripled the number of submitted grant applications and doubled the number of new awards. Overall NIH grants increased more than 20 percent including the award of a highly competitive, nearly \$2 million National Institutes of Health (NIH) P-30 grant that provides core research assistance and services for investigators who are focusing on a common research problem or taking a multidisciplinary approach to a joint research effort. The grant supports studies in areas including brain and spinal cord injury, imaging, electrophysiology and behavioral phenotyping.

We continue to develop forward-thinking leaders in our field by providing educational opportunities and training for current and future neuroscientists. The annual “Explorations in Neuroscience” camp for high school juniors and seniors doubled its enrollment in summer 2017. Highlights for students included rotating among neuroscience faculty members’ labs, watching a live neurosurgical procedure, and experiencing virtual reality and translational device technology. The department has also tripled its graduate and postgraduate fellowships. Enrollment in neuroscience courses at the undergraduate and graduate levels is at a record high and a new master’s program in neuroscience is under development.

The Ohio State University Wexner Medical Center is making a significant commitment to advancing neurodegenerative and Alzheimer’s disease research and translation, in conjunction with the university-wide Chronic Brain Injury Discovery Theme. Fifteen new hires — eight in the College of Medicine and seven in additional allied departments, including Engineering, Public Health, Nursing and Epidemiology — will collaborate in a dedicated facility on campus. Ohio State and the department are in a unique position to recruit and build in the area of neurodegeneration. “When we are done, we will have established a new area of research excellence that will complement and synergize with a growing strength in neuroimmunology research and Alzheimer’s and Parkinson’s disease patient care,” says Popovich.

Among the many honors our team members have received in the past year are the 2017 FAME Distinguished Mentor Award to A. Courtney DeVries, PhD, and the David F. Apple Award for best paper at the American Spinal Injury meeting to Dr. Popovich. The Society for Neuroscience recently honored Randy Nelson, PhD, with their Award for Education, given to those who have made outstanding contributions to neuroscience education and training.



List of recent publications

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Department of Neurology

Improving Lives with Innovative Treatments

The Department of Neurology was recently ranked #22 in the nation in clinical and patient care metrics by *U.S. News & World Report*. “It’s unbelievable to think that we were unranked only five years ago,” says John Kissel, MD, department chair. “This achievement is a great example of Ohio State’s commitment to neuroscience.”

The department’s research is at the forefront of discovering new, effective treatments to improve people’s lives.

- We’re one of only four centers in the nation exploring an innovative gene therapy to treat Parkinson’s disease. A collaborative study with researchers in the department of neurosurgery, the Phase 1b gene therapy trial is investigating the effectiveness of targeted, direct delivery of the enzyme aromatic acid decarboxylase to improve motor symptoms and response to medications in Parkinson’s patients.
- Ohio State Wexner Medical Center is among very few centers around the country currently offering antisense oligonucleotide therapy for spinal muscular atrophy in adults. Treatment with the FDA-approved, first-in-class drug Spinraza™ is showing good results, improving function and performance with the potential to have preventive benefits in those with genetic indicators for the disease.
- Other pivotal studies planned or in progress include a trial investigating gene therapy for spinal muscular atrophy and several ongoing studies in myasthenia gravis. Our ALS Program continues to lead as one of eight centers in the country participating in the largest coordinated and collaborative science project ever to end ALS: the Answer ALS Research Program.
- Nearly two million individuals have downloaded the SAGE test, developed in our Division of Cognitive Neurology, designed to detect early signs of cognitive, memory and thinking impairments. An online, tablet-based app of the SAGE test has been made commercially available through a license agreement with The Ohio State University. In conjunction with the university-wide Chronic Brain Injury Discovery Theme, the medical center is also making a significant commitment to advancing Alzheimer’s disease research and translation.
- We are one of only six medical centers in the nation participating in all three NIH National Institute of Neurological Disorders and Stroke’s (NINDS) initiatives, the Network for Excellence in Neuroscience Clinical Trials (NeuroNEXT), the Neurological Emergencies Treatment Trials Network (NeuroNETT), and NIH StrokeNet. We led the country in recruitment into NeuroNEXT studies and Ohio State led and successfully completed the very first study to be run using the network infrastructure.

And, as a recently named Lewy Body Dementia Association Research Center of Excellence – our department will continue to contribute to an ever-growing array of promising new therapies and clinical trials.





Department of Neurological Surgery

Furthering Knowledge and Impacting Care

Clinical excellence, cutting-edge research and training of world-class surgeon-scientists are hallmarks of our Neurological Surgery program. Our national reputation for excellent patient care and research are reflected in statistics and rankings: since 2013, we have seen an increase of nearly 50 percent in referrals and surgical case volume, and our department is currently ranked #22 in the nation by *U.S. News & World Report*.

"Based on the strength of our institution and faculty, the department continues to grow across the clinical, research and training domains," says department chair Russell Lonser, MD.

Here are some highlights of the past year in Neurosurgery:

- Our department has grown to include 28 clinical faculty members that span all clinical specialties, as well as six research faculty members.
- There are currently more than 75 active clinical trials in neurosurgery, with more than 1,300 individuals participating in those trials. Research covers a wide range of translational topics including cerebrovascular, brain tumors, skull base, functional and spinal neurosurgery.
- Our residency program was expanded to three residents per year and we have seven subspecialty fellowships, including endovascular, skull base, complex spine, spinal oncology, functional, neuro-oncology and pediatric neurosurgery.

In addition, the department has sponsored two national neurosurgery events. At the Annual Midwest Spine Symposium, specialists from Ohio State and Cleveland Clinic presented on topics dealing with degenerative spinal conditions and deformities. Additionally, the State-of-the-Art Skull-Base Surgery Course was attended by over 100 head and neck surgeons and other skull-base surgeons interested in developing skills in endoscopic endonasal surgery of the skull base, pituitary fossa and craniocervical junction.





Department of Physical Medicine and Rehabilitation

Harnessing Emerging Technologies for Better Outcomes

"Our department has a tradition of innovation and leadership in developing new strategies to care for patients. In keeping with that tradition, we are developing new applications for emerging technologies that augment the extent and quality of rehabilitation-driven outcomes," says Jerry Mysiw, MD, chair of the department.

The rehabilitation technologies we are developing include:

- Assistive technologies to maximize mobility and function
- Neuro-therapeutics as an alternative intervention for chronic pain and to maximize plasticity during rehabilitation after brain injury
- Virtual reality for pain control and stroke recovery
- Brain machine interface technology

Our outpatient team is also piloting a telemedicine program as an outreach alternative for rehabilitation patients who are homebound or have profound mobility restrictions that preclude more traditional therapies.

New department initiatives include:

- Establishing the first neuromodulation fellowship for physical medicine and rehabilitation that focuses on training physicians to use neuromodulation for pain management and also to augment functional recovery post brain injury when coupled with activity-based therapies
- Developing a neuro-therapeutics clinic that utilizes noninvasive neuromodulation techniques to treat chronic pain syndromes and to ameliorate the mood and behavioral consequences of brain injury

"The current confluence of emerging technologies and the growing population with chronic neurologic conditions offers us the unique urgency and opportunity to develop new options for our patients that improve function and quality of life. These technologies have the potential to be transformative for our patients, and we are committed to their development and availability," says Dr. Mysiw.





Department of Psychiatry and Behavioral Health

Responding to Patient and Community Needs

Since 2006 the Ohio State Department of Psychiatry and Behavioral Health has more than quadrupled its total faculty, which includes adult psychiatrists, child and adolescent psychiatrists and PhDs. “We’re excited about this wonderful interdisciplinary growth, which allows us to advance both clinical and academic agendas, as well as respond to community needs,” says John Campo, MD, department chair. “We envision a true center of excellence focused on better managing stress and building individual resilience, treating mental disorders and addictions relevant to public health, and reducing the morbidity and mortality associated with suicide and substance use disorders.”

Our specialists provided more than 8,000 emergency psychiatric consultations at Ohio State Wexner Medical Center and an additional 4,000 at Nationwide Children’s Hospital. Psychiatry maintains a 24/7 presence in our main Emergency Department (ED) and uses telepsychiatry services to link emergency psychiatry services to the ED at University Hospital East.

Ohio State is now recognized as one of 25 Centers of Excellence in the National Network of Depression Centers — leading academic programs in the U.S. working to advance the care of mood and emotional disorders and prevent suicide. Additional department accomplishments include:

- We are applying and testing the effectiveness of neurofeedback in a variety of disorders, including post-traumatic stress disorder and ADHD. Ohio State is currently the lead site in a multisite, federally funded, randomized, controlled efficacy trial of neurofeedback for ADHD.
- Interventional psychiatry continues to grow, with our specialists doubling the number of electroconvulsive therapy (ECT) treatments provided to individuals struggling with refractory mood disorders and other problems such as catatonia. Additional innovative neurotherapeutic treatments include transcranial magnetic stimulation (TMS).
- Total external research funding for departmental investigators has increased by over 300 percent. Topics researchers are exploring include psychoneuroimmunology, early-onset psychosis, nutrition and mental health, women’s behavioral health, and the behavioral health needs of the intellectually and developmentally disabled.
- Educational programming is expanding with more trainees in general psychiatry as well as fellowships in child and adolescent psychiatry, forensic psychiatry, consultation-liaison psychiatry, and addiction medicine, in addition to an American Psychological Association-approved psychology internship.



Since 2012, the Neuroscience Research Institute has increased:

Active clinical research studies by 68%



Publications by 60%



Collaborative hub for 250+ neuroscientists



New awards by 7.3%



Total research funding by 37%



330+ total number of clinical research studies with 8,000+ participants

Neuroscience Research Institute *A Catalyst for Translational Research*



Carson Reider, PhD

The Neuroscience Research Institute (NRI) provides the research infrastructure for the Neurological Institute. “We are our research team’s advocates, identifying and leveraging resources and helping them navigate funding as well as regulatory and administrative processes,” says Carson Reider, PhD, administrative director.

In 2017, the NRI supported more than 200 faculty and 40 research staff across the five core Neurological Institute departments (Neurological Surgery, Neurology, Neuroscience, Physical Medicine and Rehabilitation, and Psychiatry and Behavioral Health). These physician scientists, whose areas of expertise are wide-ranging, are currently conducting over 330 active clinical research studies with more than 8,000 research participants enrolled.

“Whether basic science, investigative bench-to-bedside initiatives, or team scientists involved in large cooperative-venture clinical trials, our goal is to help our researchers be more efficient and effective by providing support and facilitating shared services,” says Douglas Scharre, MD, co-director of the NRI.



Douglas Scharre, MD

The NRI team supports fundamental and translational science efforts by providing seed/pilot funding, specialized grant/contract support, educational programs, regulatory consultation, study monitoring and biostatistics. They also help promote best research practices and team science, including interdepartmental collaborations and interdivisional cross-training and salary sourcing of clinical research staff. “True translational research is now happening across many neuroscience disciplines, largely because of the resources provided by the NRI,” says Phillip Popovich, PhD, NRI co-director.

Adds Dr. Reider, “As an administrative catalyst for translational research, ultimately we’re helping patient populations by affirming the value of this science and supporting it in practical ways.”



COMPREHENSIVE STROKE CENTER

Better Information for
Better Care

The time-sensitive nature of stroke care means that getting patient information quickly is a game-changer. Our stroke team now utilizes the RAPID response software system, allowing them to access CT angiogram and other brain imaging for patients securely on their smartphones or other devices in real time. “We can assess mismatch volume, mismatch ratio, large vessel occlusion — all without searching for these images or waiting for them to be interpreted,” explains neurosurgeon Ciaran Powers, MD, PhD.

Key members of the team receive an automatically generated notice of incoming information, explains Michel Torbey, MD, medical director of the Neurovascular Stroke Center. “Using this software streamlines our triaging, so we can get patients into the catheterization lab or provide thrombolytic therapy right away,” he says.

Seamless transfer to Ohio State’s accredited stroke rehabilitation program at Dodd Rehabilitation Hospital also enhances patient care, continues Dr. Torbey. “Our multidisciplinary team with special expertise in neurological disorders is a key contributor to our high level of service.”

Transforming the Landscape
of Stroke Care

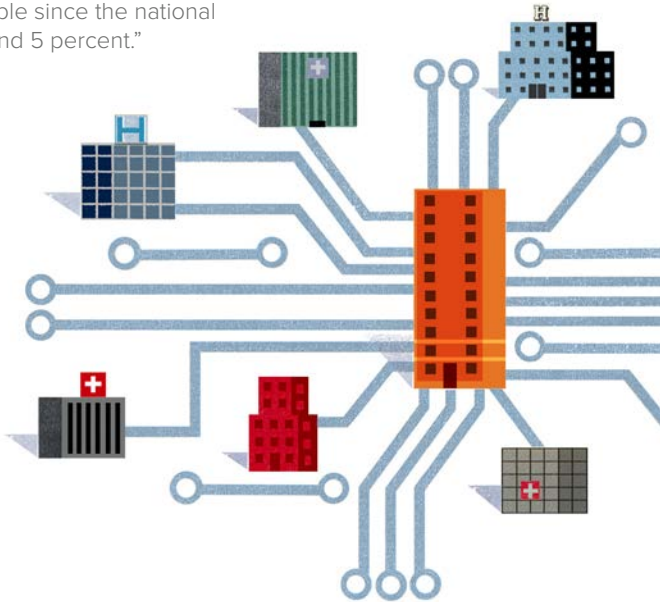
The stroke center was the third-highest recruiter for the national Diffuse 3 trial, which assessed the benefits of thrombolytic embolectomy within a 16-hour window. Results will be presented at the International Stroke Meeting in January 2018.

“By extending the window for care, we are offering life-altering therapies to patients whom, in the past, we wouldn’t typically treat,” Torbey says. Our NIH-funded regional coordinating center for clinical trials is also conducting research into minimally invasive removal of intracerebral hemorrhage and extracranial carotid disease as a risk for stroke, among other studies.

Reaching Out to Share Resources

The telestroke network has expanded to include 26 spoke hospitals, giving physicians in local facilities across Ohio the opportunity to tap the expertise of Ohio State specialists. The stroke team receives over 3,000 consultation calls per year.

“Your standard for stroke care shouldn’t be determined by where you choose to live,” Dr. Powers says. “Now more than 50 percent of the stroke patients from our spoke facilities are able to stay at their local hospitals and more than 20 percent of them are receiving tPA — which is incredible since the national average is around 5 percent.”





COMPREHENSIVE SPINE CENTER

Streamlining Access to
Personalized Care

When patients are in pain or injured, they need rapid access to expert consultation and effective treatment. The Comprehensive Spine Center has initiated a new triage model in which a team of nurse practitioners (NPs) provides initial intake services for patients. The NPs assess patients' symptoms, address their concerns and provide information about possible treatment options. They can also arrange for those in acute situations to be seen for a same-day visit in the spine clinic, where they can be evaluated further.

Streamlining care in this way helps the center provide the best individualized next steps for patients, says Albert Timperman, MD, director of the center. "We can refer patients to a specialist to begin treatment before their condition deteriorates further and possibly use a less invasive option than if they waited longer for care," he explains.

Three Pathways of Collaborative Care

In the center, neurosurgeons, orthopedic surgeons and specialists in fields that include rehabilitation, neurology, pain management, physical therapy, anesthesiology, radiology and psychology all partner for collaborative care delivery. "Since many of us are co-located, we

have great resources at hand," says Dr. Timperman. "We can take an MRI directly to a surgeon on site and he or she may be able to talk to the patient right away about treatment options and what to expect."

In addition to surgical solutions for spinal conditions, specialists also utilize procedural-based treatments to address patients' pain and functional issues. Spine center practitioners provide close to 500 interventional therapies per month. These include trigger point injections, intrathecal pain pumps, radiofrequency ablative procedures, epidural steroid injections, facet blocks and treatment of regional pain syndromes, and peripheral nerve and spinal cord stimulation. And nonsurgical treatments such as oral medications and physical therapy are always first-line options if possible.

Giving Patients Quality of Life

Dr. Timperman says it is extremely satisfying to help people who are feeling discouraged from dealing with spinal issues. "What we enjoy hearing is that they can resume the activities they love — walking for exercise, or being able to pick up a grandchild," he says. "Our goal is to be able to give them that quality of life back."



In fiscal year **2017** the spine center saw more than **32,000 patients** and performed more than **5,400 procedures**.





MENTAL HEALTH AND ADDICTION SERVICES

Combining Treatment Modalities for Success

Mental health care is evolving in response to new challenges such as the nationwide opioid crisis. And Ohio State specialists in psychiatry and addiction medicine are providing proactive treatments, says psychiatrist Julie Teater, MD, medical director of Ohio State's Talbot Hall Addiction Medicine program. "We often see patients who have struggled to give up these medications, have relapsed and feel they have run out of options," she explains.

Medication Plus Therapy to Benefit Patients

Talbot Hall offers medication-assisted treatment, such as naltrexone or buprenorphine, in combination with inpatient, outpatient, group or individual therapy — a strategy that can be especially effective to treat ongoing behavioral issues related to addiction.

And interdisciplinary clinic partnerships are giving practitioners additional insights, adds Dr. Teater. "For example, we are working with oncologists and hematologists who see patients who are likely to be exposed to high doses of opiates, such as those with sickle cell disease," she explains. "Often this exposure occurs in the teenage or young adult years, when they are especially vulnerable to becoming addicted."

A new initiative, Project DAWN, is tackling the crisis in another way: by providing patients who come to the emergency room with an opioid overdose reversal agent (naloxone) kit. Patients are given a brief training on how to use the kit, which is administered via a nasal spray. "These kits are also available at community events, and they are definitely saving lives," says Dr. Teater.

Multistrategy Approach to Pain Management

"We are exploring innovative ways to give people relief from unrelenting pain," says anesthesiologist and interventional pain management specialist Tristan Weaver, MD. In the pain clinic for opioid reduction, specialists are helping patients wean to below guideline levels for opiate medications — or get off of them altogether — within three to six months.

In addition, they are providing interventional treatments such as epidural blocks, radiofrequency ablation and spinal cord stimulation. "Often patients are taking the medications prescribed for them, but it is not alleviating their pain," says Dr. Weaver. "These treatments can make the difference."

Focusing on patient-reported outcomes, such as quality of sleep and feelings of stress, as well as lifestyle goals, is important, Dr. Weaver continues.

"If we can relieve someone's pain so that they can go back to work or resume exercising, for example, that's a true measure of success."



Breaking Developments at Ohio State's Neurological Institute



Addiction Medicine Fellowship Accredited by American Society of Addiction Medicine

The Department of Psychiatry and Behavioral Health will welcome its first class of Addiction Medicine Fellows for the 2018-19 academic year. The newly accredited fellowship program is one of the first 50 programs in the nation to begin training fellows in the prevention, evaluation, diagnosis, treatment and recovery of persons with the disease of addiction.



Alzheimer's Disease and Dementia Investments Announced

The Ohio State University has announced a new investment in the area of Alzheimer's disease and dementia research and treatment. Eight new faculty positions, including the recruitment of a prominent NIH-funded investor and national leader to direct the initiative, are planned to build upon the Neurological Institute's existing strengths in clinical and research efforts in this area.



Outpatient Stroke Rehabilitation Program Only CARF-Accredited Program in Ohio

Ohio State's Outpatient Rehabilitation program is the only program in Ohio to be accredited as an Interdisciplinary Outpatient Medical Rehabilitation Program: Stroke Specialty (Adults) by the Commission on Accreditation of Rehabilitation Facilities (CARF) International. Both inpatient rehabilitation programs at Dodd Rehabilitation Hospital and outpatient rehabilitation programs are now accredited by CARF in stroke care, providing a unique continuum of care for patients in our

community. In addition, outpatient programs are also CARF accredited in Brain Injury Specialty Programs, Spinal Cord Injury System of Care and Comprehensive Inpatient Rehabilitation Program (Adults). Inpatient programs at Dodd Rehabilitation Hospital are also accredited in Brain Injury Specialty Programs, Spinal Cord Injury System of Care, Cancer Rehabilitation Program and Comprehensive Inpatient Rehabilitation Program (Adults).



2018 BRAIN HEALTH & PERFORMANCE SUMMIT



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Featuring World-Class Keynote Speakers



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Social Commentator



Rosalind Picard, ScD
Professor and Entrepreneur

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June 5 - 7, 2019
Hilton Columbus at Easton



*At The Ohio State University Neurological Institute,
we don't just study neurological problems, we strive to solve them.*



THE OHIO STATE UNIVERSITY

WEXNER MEDICAL CENTER

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